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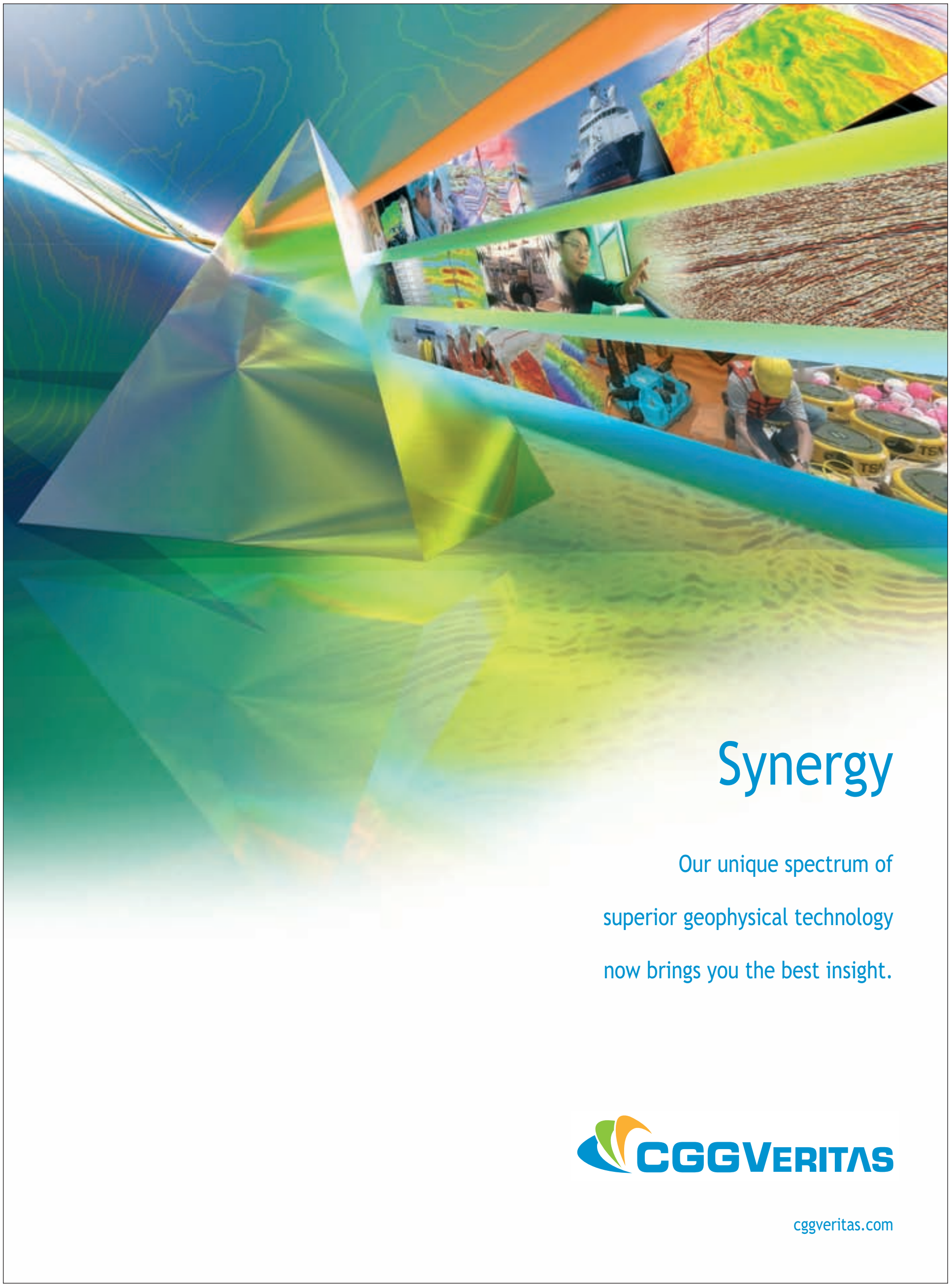

On the cover: An Irish view of the Gulf of Mexico. Members of Repsol's Gulf of Mexico exploration team recently spent four days in western and southwestern Ireland observing the "excellent analogs to our subsurface geology in the Gulf," said Repsol senior exploration geologist for North America Claudio Bartolini – here specifically, a beautiful outcrop of the lateral basin margin of the Upper Pennsylvanian Ross Sandstone. The exposed section consists of sandstone, siltstone and mudstone. The field trip leader was AAPG member David Pyles, of the Colorado School of Mines in Golden, Colo. The importance of deepwater outcrops is evident in a new AAPG publication that will be released in a matter of weeks. See story on page 24. Photo by Claudio Bartolini.

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PRESIDENT'S COLUMN

Congressional Visits Proved Interesting

By WILLARD "WILL" GREEN

During the first week of May six AAPG members – Jim Hill, Pete MacKenzie, Deborah Sacrey, Carl Smith, Dan Smith and I – traveled to Washington, D.C., joining nearly 300 scientists, engineers and business leaders who made visits on Capitol Hill as part of the 11th annual "Congressional Visits Day," an event sponsored by the Science-Engineering-Technology Work Group (see "Washington Watch," July EXPLORER).

Don Juckett and David Curtiss, of our GEO-DC office, coordinated the AAPG group.

The six of us each visited the offices of our home congressmen and senators and focused on three subjects:

✓ Future Work Force Needs of the Oil and Gas Industry.

✓ Preservation of Geological and Geophysical Data.

✓ Research and Development Needs of the Domestic Petroleum Industry in the 21st Century.

We left a two-page outline of the issues and requested action items with each visited office.

We also had an interesting visit to the office staff of the Senate Energy Committee. We learned that Sen. Jeff Bingaman (D-N.M.) and eight other senators had signed a letter to a subcommittee of the Senate Appropriations Committee requesting that funding levels for the programs at the DOE for oil and gas research and development be no less than the $62.6 million appropriated in fiscal year 2006 to carry out this important work.

David and Don arranged a meeting for me (also attended by Don) with Brian McCormack, special assistant to the president and deputy director of public liaison. His office is in the Executive Office Building, which has double security stations at the entrance. The purpose of this visit was to reinforce my invitation to President Bush to speak at the AAPG Annual Meeting in San Antonio.

The request is still viable but no commitment has been made.

* * *

The AAPG group in Washington was housed at the Army and Navy Club, arranged through the courtesy of Carl Smith, a member of the club.


Green

During our stay, my wife, Marianne, who loves to talk with people, met an interesting young lady – a Kurdish citizen of Iraq. She serves in Iraq as an interpreter on duty 24/7 for the U.S. Army in areas where enemy combatants are lurking. In May she was spending some time in the United States in order to eventually qualify for U.S. citizenship.

We invited her to visit us in Midland.

Last week we received a box by priority mail from Iraq, which had been opened and inspected. Inside the box were photos of her with Iraqi and U.S. military officers, a United States flag and a certificate, which reads:

"United States Army
Operation Iraqi Freedom

So that all shall know, this flag was flown in the face of the enemy for 9 minutes and 11 seconds and bears witness to the strength of the Iraqi and American people in rebuilding Iraq and denying a safe haven for terrorists."

* * *

Perhaps next year we will have more AAPG members interested in participating in Congressional Visits Day and similar events targeted at providing information to the nation's policy makers in a manner that reflects the value of geosciences professionals and their contribution to the nation's economic, environmental and energy security.

Washington is exciting; I look forward to my next visit.

Have a great day!

Will Green

Get Ready for This Year's ESW

Earth Science Week, an annual event that focuses attention on the status of earth science in education and society – and which celebrates its 10th anniversary this year – will be held Oct. 14-20.

This year's theme is "The Pulse of the Earth," and various local activities will promote public and profession awareness of the earth sciences.

The theme also will focus attention on geosciences research, such as that associated with the International Polar Year and the International Year of Planet Earth.

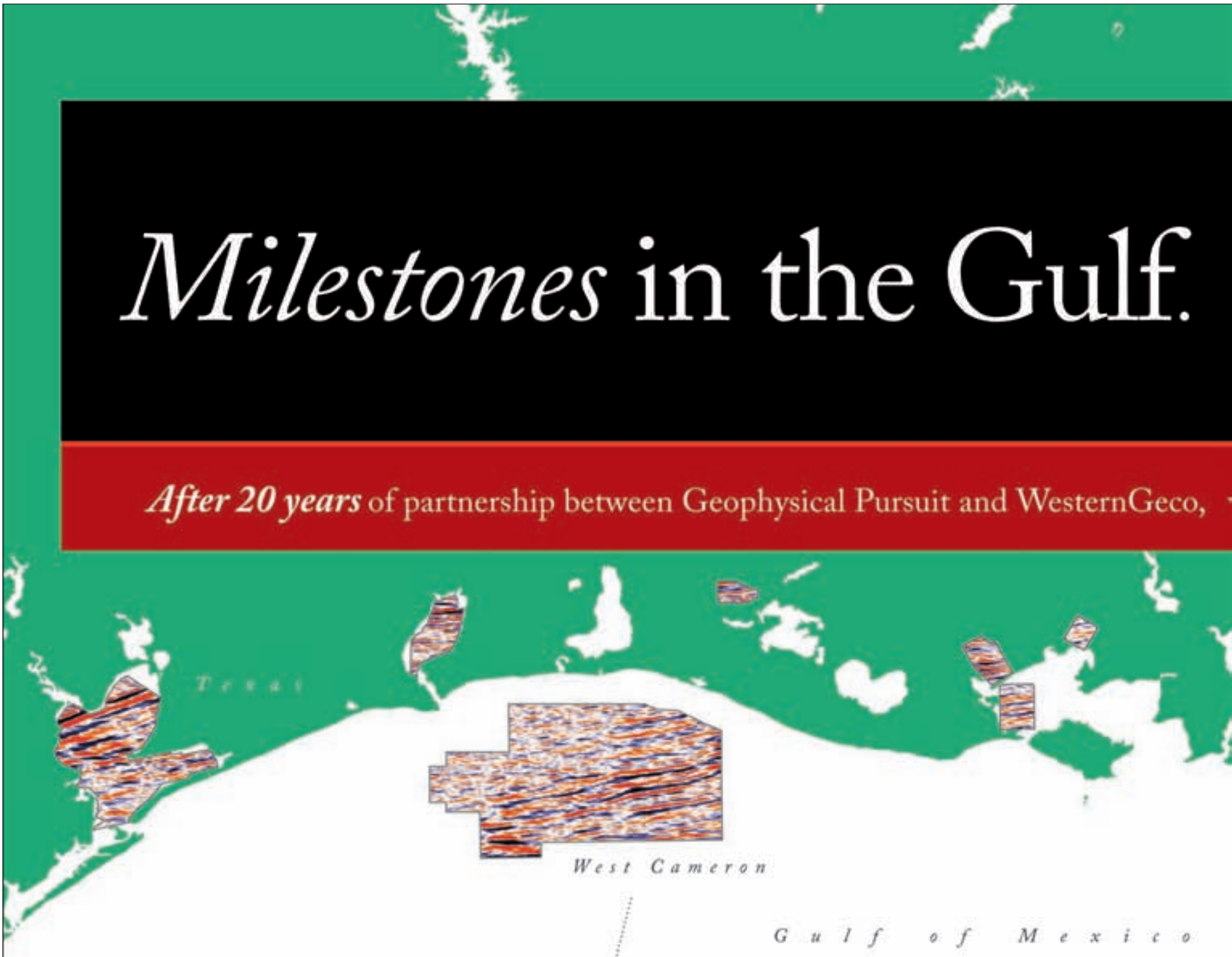
Through these major initiatives Earth Science Week will help spread understanding of the impact the earth sciences have on society.

A poster promoting Earth Science Week is inserted in North American issues of this EXPLORER, courtesy of the AAPG Foundation. It can be found inserted at page 44.

Members are asked to post or share the posters appropriately to promote the activities. ❑

Milestones in the Gulf.

After 20 years of partnership between Geophysical Pursuit and WesternGeco,



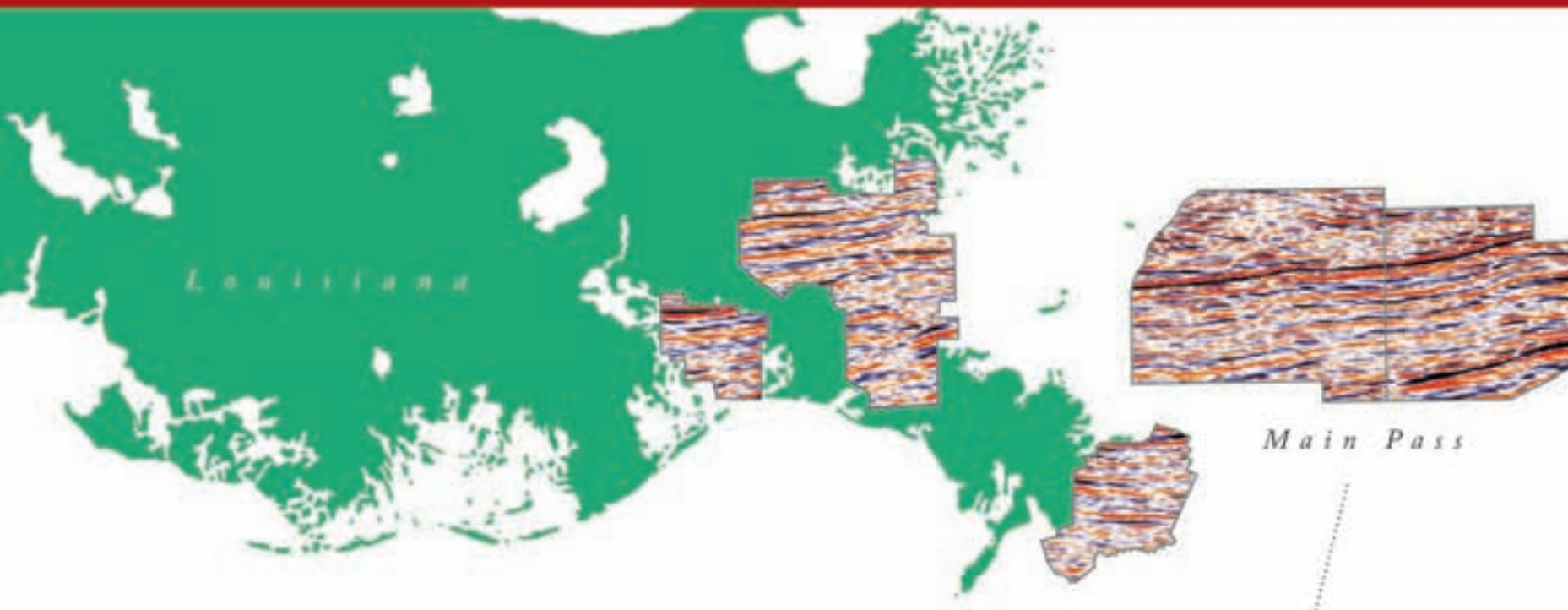
West Cameron

Generate new opportunities in West Cameron with 151 blocks of seamless data processed as a single entity, using industry-leading ***anisotropic*** curved-ray Kirchhoff PreStack Time Migration technology.

Acquisition Direction	East – West
Geometry	Inline Swath
Record Length	13 seconds
Maximum Offset	9,000 meters
Nominal Fold	120
Processed Bin Size	25 x 20 meters
Migration	Kirchhoff PrSTM

There are many. FIRSTLY, our new coverage of West Cameron now includes state-of-the-art long offset seismic data — with *anisotropic* migration processing. SECONDLY, our efforts in the Main Pass region result in a brand new data delivery — adding 75 blocks to the previous acquisitions. AND FINALLY, this month marks a 20-year alliance between Geophysical Pursuit and WesternGeco.

, we're still proud to deliver the best seismic data in the Gulf of Mexico and beyond.



Main Pass

Gain new understanding of this under-explored area before *Central GoM Lease Sale* (October 2007). The final 105 block product of the initial phase (MP4) is now available. The 75 block (MP5) phase is currently in processing and will be available in January 2008.

Acquisition Direction	North – South
Geometry	Inline Swath
Record Length	13 seconds
Maximum Offset	9,000 meters
Nominal Fold	120
Processed Bin Size	25 x 20 meters
Migration	Kirchhoff PrSTM

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Officer Candidates Named

Officer candidates for the 2008-09 term have been announced by the AAPG Executive Committee.

Candidate biographies and individual information will be published on the AAPG Web site and inserted in an upcoming EXPLORER.

The president-elect winner will serve as AAPG president in 2009-10. The terms for both vice president-sections and treasurer are two years.

Ballots will be available in spring '08.

A complete list of AAPG rules and guidelines governing the campaign – for candidates and supporters – can be found online at http://www.aapg.org/business/candidates/rules.cfm.

The candidate slate is:

President-Elect

❒ **John C. Lorenz**, Geoflight LLC, Edgewood, N.M.

❒ **Ronald A. Nelson**, Broken N Consulting, Cat Spring, Texas.

Vice President-Sections

❒ **David H. Hawk**, Energy Analysis and Answers/Consultant, Boise, Idaho.

❒ **W.C. "Rusty" Riese**, BP Americas, Katy, Texas.

Treasurer

❒ **Edith C. Allison**, U.S. Department of Energy, Washington, D.C.

❒ **Kay L. Pitts**, Aera Energy LLC, Bakersfield, Calif. ❑

Letter of Intent Signed

AAPG Considering PTTC Management

AAPG and the Petroleum Technology Transfer Council in early July signed a Letter of Intent for AAPG to assume management of PTTC activities.

The agreement provides for a due-diligence period of 60 days after which, presuming positive negotiations, the transition to an AAPG-managed PTTC would occur.

Since 1994, PTTC, funded primarily by the U.S. Department of Energy with funds matched by the states and industry, has been a recognized force for transferring exploration and production technology to domestic U.S. producers.

Serving industry locally through Regional Lead Organizations, typically at universities or geological surveys, PTTC's primary focus has been serving independents.

Congress last year declined to provide FY 07 funding for many elements of the DOE's natural gas and oil R&D program, from which PTTC drew its federal funds. DOE ultimately provided $1 million of funding through September 2008 to help PTTC transition to a primarily industry-funded organization.

PTTC's primary tool for transferring E&P technology is regional workshops, which are supplemented with a strong Web presence, newsletters and other personal outreach. Using these tools, PTTC connects producers, the service sector, consultants, researchers and others with the data and technology information needed to spur technology application.

Topics addressed by PTTC activities have covered the full spectrum of E&P operations, including exploration, unconventional resources, enhanced recovery processes, imaging technology, drilling and completion, hydraulic fracturing and many others. ❑

Summer NAPE Offers Prospects

Summer NAPE 2007, a property and prospect expo that has become one of the industry's top events, will be held Aug. 23-24 at the George R. Brown Convention Center in Houston.

The annual event, which last year attracted about 5,300 attendees and 525 booths, is sponsored by NAPE Expo LP, a group comprising AAPG, AAPL (the American Association of Professional Landmen), IPAA and SEG.

Summer NAPE, modeled after NAPE (formerly North American Prospect Expo), provides a mid-year marketplace for the buying, selling and trading of oil and gas prospects and producing properties. The event brings state-of-the-art prospects and properties from the United States and around the world, advanced technology and energy capital formation all together in one location.

A related E&P forum on "Perspectives on the U.S. Gulf Coast," sponsored by IHS, will be offered from 9 a.m. to 5 p.m. on Wednesday, Aug. 22, also at the Brown convention center.

Registration and other details are available online at http://www.napeonline.com/home2.asp. ❑

Photos, graphics courtesy of David Seneshen

Left, the Lisbon field, looking east of a sharp contact between the Jurassic Wingate Sandstone and Kayenta Formation. Note the subvertical joints in the Wingate Sandstone, which provide pathways for hydrocarbon seepage. Right, collecting surface soils from outcrop areas in the Lisbon geochemical study area.

Lichens, Free Gas Yields Clues

Geochem Offers Paradox Option

Editor's note: The poster "New Techniques for New Discoveries – Results from the Lisbon Field Area, Paradox Basin, Utah," will be presented Oct. 8 during the Rocky Mountain Section's annual meeting in Snowbird, Utah.

The theme for the meeting, which will run Oct. 7-9, is "Exploration, Discovery, Success."

Co-authors of paper are David Seneshen with Vista Geoscience (formerly Direct Geochemical) in Golden, Colo., and Tom Chidsey, Craig Morgan and Michael Vanden Berg with the Utah Geological Survey in Salt Lake City.

By LOUISE S. DURHAM
EXPLORER Correspondent

Operators have produced more than 53 million barrels of oil/condensate and 845 billion cubic feet of gas from Mississippian-age Leadville limestone in seven fields in the northern Paradox Basin region, referred to as the Paradox fold and fault belt, of Utah and Colorado.

Even so, only 100 wells have penetrated the Leadville over the entire 7,500 square-mile Paradox Basin. This equates to about one well per township, according to David Seneshen, vice president of Vista Geoscience (formerly Direct Geochemical).

The reason for the sparsity of wells is pretty straightforward.

"Exploration for Mississippian Leadville-hosted hydrocarbon reservoirs in the Paradox Basin is high risk in terms of cost and low documented success rates of about 10 percent, based on drilling history," Seneshen said.

"But the potential for more hydrocarbon reserves is enormous," he added.

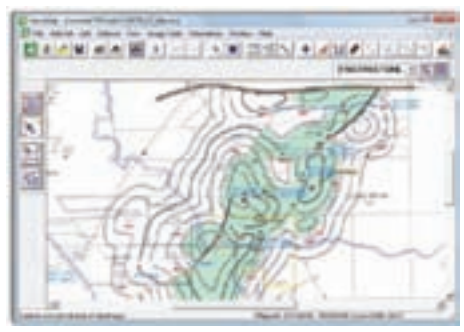
However, money looms as a major

See **Paradox**, page 10

Announcing the release of a brand new NeuraMap

The best just got better. NeuraMap, the oil and gas industry's application of choice for automated map digitizing, vector editing and quality improvement has been re-worked, re-built, and now... released.

This much-anticipated version has an even better, more intuitive interface, stronger editing capabilities, and updated features based on extensive user input. With NeuraMap, you can integrate paper maps into your interpretation workflow, increase productivity, and generate more reliable prospects.



If you currently own a copy of NeuraMap, you'll love the upgrade. It's even easier to use and has the features you need. If you don't have NeuraMap, once you've tried this automated map digitizing software, you'll never go back:

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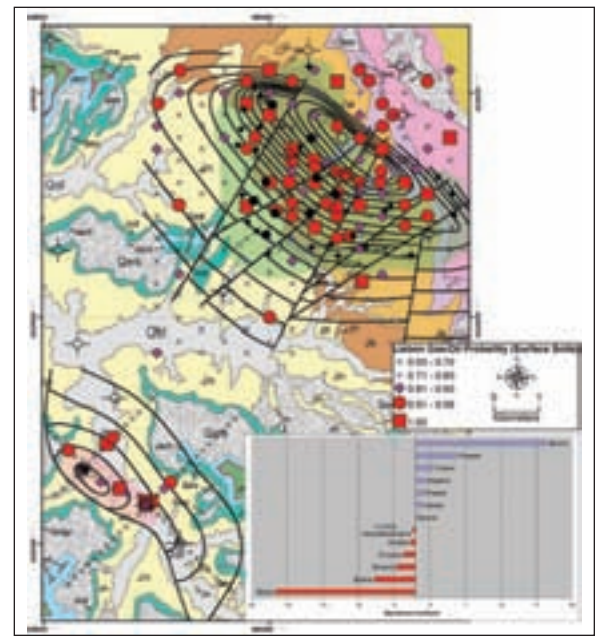
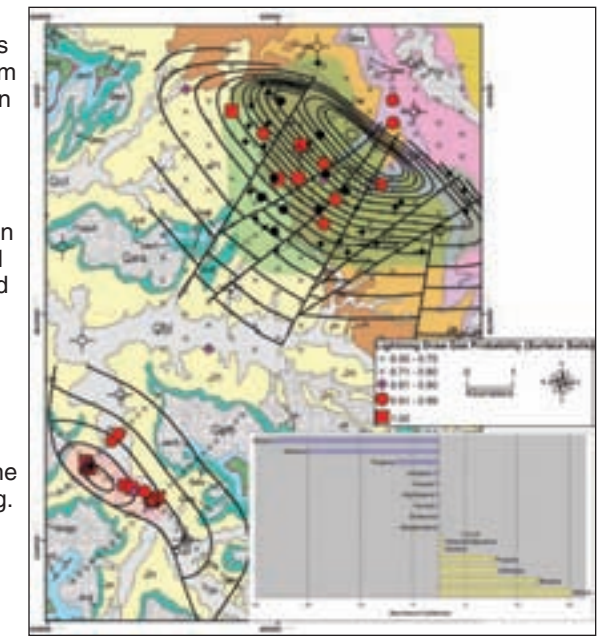
Turning Paper Into Petroleum



From left: Location of fields that produce from the Mississippian Leadville Limestone, with location of geochemical study; distribution of Lisbon gas-oil probabilities; and distribution of Lightning Draw Southeast gas probabilities. Graphics details and more information online at www.aapg.org.



Paradox

from page 8

obstacle to stepped-up exploration efforts, despite today's supercharged industry environment.

For the most part, it's independents who operate the Leadville wells, and they don't have the deep pockets required for big exploratory 3-D seismic shoots in this environmentally sensitive region.

Thanks to low cost surface geochemical technology, this may cease to be an issue.

Looking for Clues

Simply put, this technology focuses on various organic and inorganic geochemical anomalies in surface soils, outcrop fracture-fill soils and vegetation, and six-foot deep free gas that result from migration of hydrocarbon molecules from subsurface reservoirs up to the surface along fractures, joints and bedding planes.

The Utah Geological Survey (UGS), along with Direct Geochemical, recently completed a geochemical study in the Paradox Basin, which was funded by the U.S. Department of Energy – a report will be available near-future via the UGS.

The program was implemented over the Lisbon and Lightning Draw Southeast fields in Utah. It was designed to test the effectiveness of several conventional and unconventional surface geochemical methods for predicting productive and non-productive Leadville carbonate reservoirs.

"The main objective in testing these techniques is to find low-cost, non-invasive geochemical exploration methods that could be used to pre-screen large areas for subsequent geophysical surveys and lease acquisition," Seneshen said, "and also act as follow-up to classify geophysical anomalies as (either) productive or barren."

"Most of the samples we collected were surface soils," he continued, "but because there's so much outcrop, we also sampled soil and vegetative tissue (bryophyte moss and lichen) from joints in sandstone outcrops to assess organic and inorganic compositional signatures of ascending seepage.

"Both the surface soils and outcrop fracture-fill media work well for distinguishing between productive and non-productive areas."

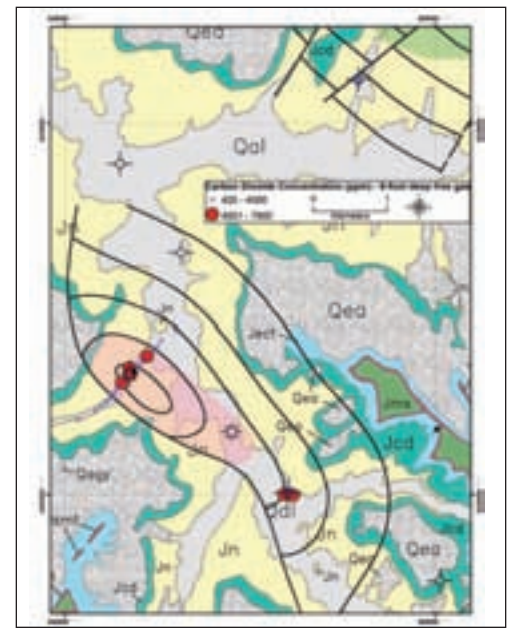
Free = Good

Free gas sampling also produced good results.

See **Geochem Study**, page 12

Left: Bryophytes (mosses) and lichen along curvilinear soil-filled, polygonal joints in Navajo Sandstone over the water-leg of Lisbon, which were used as samples for organic and inorganic geochemical analysis.

Right: Distribution of Lisbon gas probability derived from three-component discriminant analysis of thermally desorbed C1-C12 hydrocarbon from outcrop-fracture fill soils over the Lisbon's gas-cap, oil-leg and water-leg. Methane contributes most toward discrimination of microseepage over the gas-cap from that over the oil- and water-legs. Propane is the most important variable for distinguishing microseepage over the oil-leg from that over the gas-cap and water-leg. The location of the Lightning Draw Southeast gas field is predicted by the discriminant model.



Geochem Study

from page 10

"I don't think anyone has ever tried free gas over a Leadville reservoir," Seneshen said, "drilling down six feet and extracting air from the soil pores and analyzing that gas.

"We only did this over Lightning Draw Southeast field, and it worked especially well," he noted. "We got a good, distinct high-contrast hydrocarbon anomaly right over the gas cap of the field."

In fact, the free gas sampling technique is recommended as a follow-up to anomalies identified in a regional soil geochemical survey.

"Once you've found areas to focus in on and have shot 3-D and found structures," Seneshen said, "then you go over this with a Geoprobe and punch holes in the overburden and extract free gas out of the soil to better define the anomaly as to where you want to drill.

"You start big and then gradually focus in with the geophysics and more detailed geochemistry using free gas instead of the soils," he said, "the reason being the anomalies we see are quite narrow, like 700 feet across. This means you must take samples at short intervals.

"Because you're using a Geoprobe drill, it gets a little costly, but it's still a fraction of what seismic costs," Seneshen added. "And it's an excellent technique for following up seismic anomalies to see if there are hydrocarbons in the reservoir or just carbon dioxide and nitrogen – those reservoirs are only about a third hydrocarbons, a third carbon dioxide and a third nitrogen."

High Impact

Results from the recent study conceivably could have a major impact on further Leadville exploration in the Paradox Basin.

The main conclusion derived from the effort is that certain low-cost, non-invasive geochemical methods are effective as pre-screening and follow-up tools for exploring Leadville hydrocarbon reservoirs, according to Seneshen.

He noted they can see both of the project's target fields using combinations of hydrocarbons and trace metals in the soils and vegetation.

"We can use a regional technique taking samples every 1,500 feet," Seneshen said, "to focus further geophysical surveys or lease acquisitions.

"This conceivably could be applicable to other basins," he added, "but you would have to test there first, because with surface geochemistry every area is different." ❑

Capture, Costs Part of Equation

CO_2 Answers Are as Elusive as CO_2

By DAVID BROWN
EXPLORER Correspondent

Today's high product prices and demand for oil make tertiary recovery projects important and even necessary.

Carbon dioxide injection, better known as CO_2 flooding, is a technique of choice for enhanced recovery from older oil fields.

At the same time, concern about global warming has generated intense interest in carbon sequestration – injecting CO_2 into deep reservoirs for storage.

So it's high irony that CO_2 tertiary recovery projects and sequestration research are stymied by the same, restrictive problem:

There isn't enough CO_2.

"It's ridiculously expensive to extract the carbon dioxide in the purity that's required for CO_2 injection," said Gareth Roberts, president and CEO of Denbury Resources Inc. in Plano, Texas.

"Not all CO_2 is created equal. It depends on what it's mixed with, and the pressure is also important," he added.

Denbury Resources draws on a natural CO_2 supply from Jackson Dome, near Jackson, Miss., to feed most of its tertiary recovery projects.

Roberts said the oil industry needs CO_2 of 98 percent purity or more for enhanced recovery, to ensure miscibility for oil production.

Commercial supplies of CO_2 used in the food and beverage industry also are

"It's ridiculously expensive to extract the carbon dioxide in the purity that's required for CO_2 injection. Not all CO_2 is created equal. It depends on what it's mixed with, and the pressure is also important."

Roberts

Drahovzal

available, but they are even more pure and vastly more expensive, according to Jim Drahovzal, senior research geologist for the Kentucky Geological Survey in Lexington, Ky.

Drahovzal will serve as technical program chair for the AAPG Eastern Section annual meeting, "Winning the Energy Trifecta," Sept. 16-18 in Lexington.

The meeting includes a Sunday workshop on carbon dioxide flooding for EOR followed by two morning sessions on CO_2 sequestration.

He recalled talking to a commercial supplier who could deliver a useful amount of beverage-quality CO_2.

"The best price I understood was $90 per ton, delivered in one of these 20-ton tankers," Drahovzal said.

"It's a considerable thing when you're thinking about a 3,000-ton pilot," he noted, "like some people are talking about for these regional pilot projects."

Today's News: Wait

Behind most of the current interest in carbon sequestration is an assumption: The United States will require power plants and other industries to capture the CO_2 they produce.

But that hasn't happened yet, so there's no significant capture of carbon dioxide for research purposes or injection.

"The whole thing is kind of waiting right now in terms of legislation concerning CO_2, in terms of mitigating that to the atmosphere," Drahovzal said.

For that reason, many people working on CO_2 injection are looking at a 10-year time frame to develop CO_2/tertiary recovery flooding and CO_2/carbon sequestration on a large scale.

Roberts said Denbury Resources can recover natural CO_2 for $2 to $3 per ton. It contracts for captured, by-product CO_2 for about 1.5-to-two times that amount – roughly $3 to $6 per ton.

A tax on carbon emissions could persuade power generators and other CO_2 producers to capture carbon dioxide, but it would have to be a stiff tax, he said.

See **Sequestration**, page 16

HIGH PERFORMANCE IMAGING

TGS is proud to announce that Parallel Data Systems (PDS) has joined the TGS family of companies. PDS and TGS IMAGING allow us to offer a wide array of advanced imaging solutions to the oil and gas industry today. And the combined R&D effort will help TGS develop critical next-generation imaging technology for tomorrow. For more information about our exciting imaging future please contact your TGS representative at 713 860-2100.

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CO_2 Injection Gets Extra Attention

AAPG's Eastern Section will offer a special focus on carbon dioxide injection for enhanced oil recovery (EOR) and sequestration at its annual meeting in Lexington, Ky.

A full-day September 16 workshop, sponsored by AAPG, examines "EOR and the Expanding World of Carbon Dioxide Flooding." Instructors will be Steve Melzer of Melzer Consulting in Midland and Bernie Miller of Miller Energy Technologies in Lexington.

"Steve is an expert with CO_2 enhanced recovery. He's worked basically in West Texas. And Bernie has done work here in Kentucky," said Jim Drahovzal, the meeting's technical program chair.

The morning oral session on September 17 will include eight presentations on CO_2 injection, with emphasis on Michigan, Kentucky, Appalachia and the Illinois Basin.

The session also will look at sequestration potential in saline reservoirs. According to Sean Plasynski, sequestration technology manager for the U.S. National Energy Technology Laboratory, saline reservoirs could provide 10 to 40 times the CO_2 storage capacity of existing oil reservoirs.

A September 18 morning oral session will feature presentations on geologic sequestration technology and policy.

The meeting's poster sessions also include papers relevant to carbon sequestration, Drahovzal said.

Despite high interest in CO_2 injection, research has proceeded fairly slowly so far.

Drahovzal said Kentucky is considering funding for two deep wells to collect data for potential CO_2 sequestration projects.

"Two wells may be better than nothing," he noted, "but when you look at an entire state, it's not a lot."

– DAVID BROWN

Sequestration

from page 14

An alternate system of capping emissions and allowing companies under the limits to sell offsets also could lead to CO_2 capture, at a lower per-ton produced cost, Roberts noted.

"The carbon tax that would be required would be on the order of $3 an Mcf, which is on the order of $50 a ton, while the cap-and-trade would be something like $20 a ton," he said.

A Costly Project

Sean Plasynski is sequestration technology manager for the U.S. Department of Energy's National Energy Technology Laboratory (NETL) office in Pittsburgh.

He's faced with the problem of getting CO_2 supplies for injection research, and he acknowledged the cost of capturing produced carbon dioxide.

"Capture costs can be very expensive," he said. "To put in a main scrubber (in a power generating plant) can create an increase in electricity cost of 75 percent."

Beyond that, there's a transportation cost to move the CO_2 to an injection site or tertiary recovery project.

"In most cases you don't have a power plant sitting right on top of a producing field," Plasynski noted.

Drahovzal said new research targets CO_2 production from clean-coal technologies. One of those is Integrated Gasification Combined Cycle (IGCC), where coal is gasified and power plants produce electricity from both gas turbines and heat-recovery steam turbines.

"A lot of people are interested in seeing if we can separate CO_2 from things like IGCC or coal-to-liquid units. In both cases, those units would produce a pure stream of CO_2," he said.

NETL research into sequestration has a $100 million budget split between core research and development and infrastructure projects, according to Plasynski.

The core R&D work includes:

✓ Methods of capturing CO_2.

✓ Direct and geologic storage.

✓ Breakthrough concepts that improve economics.

✓ Work with other produced gases, like methane.

✓ Injection monitoring, measurement and verification.

The infrastructure work includes seven regional sequestration programs involving all but nine of the U.S. states.

See **CO_2 Injection**, page 18

CO_2 Injection

from page 16

"There's really no silver bullet here. All these things need to work together," Plasynski said.

Aside from the problem of getting CO_2 for injection research, he has to identify potential reservoirs for long-term carbon dioxide storage.

"First, you have to capture it before you can store it," he said. "But even if you could capture it for nothing, you better have a place to store it."

Significant Problems

Drahovzal said reservoir characterization is a significant problem in planning CO_2 injection for carbon sequestration.

"All of a sudden, there's a lot of money being thrown at this thing."

"We've been looking at sequestration potential for six years," Drahovzal said. "The problem is, many times we don't have good reservoir data.

"The other thing that worries us is fracturing. In many cases we don't know if they connect to the surface, or if they might connect to aquifers," he added.

Not every existing oil reservoir can be considered a candidate for CO_2 injection for storage, Plasynski said.

"You don't want to be in an active fault location. You want a deep reservoir with good, impenetrable caprock above it," he noted.

"You want it to be deep enough, because when you put CO_2 in it in a supercritical state, you want it to stay that way," he said.

But a secondary recovery waterflood doesn't eliminate a reservoir from consideration.

"A field that has a lot of injection wells is fine, as long as those have been filled," Plasynski said.

It Makes Cents

When carbon sequestration can be linked to tertiary oil recovery, the economics improve dramatically, although recovery project economics are sensitive to CO_2 pricing.

"It's the other side of the story, and the side that makes more sense," Roberts said.

He sees existing fields as prime candidates for CO_2 storage – if there is a future emphasis on carbon sequestration.

"They've trapped oil and gas for millions of years, and they'll probably trap CO_2 for that long, also," he said.

Denbury Resources operates primarily in Mississippi, Alabama, Louisiana and Texas.

"The cheap oil is all gone – it's a peak oil issue," Roberts said. "It's important to get all the oil out of the ground you can, especially in friendly places like the southern United States.

"They are very interested in increasing production from these older fields," he noted. "And they are happy to register these sites as sequestration sites."

Roberts said his company negotiates for new sources of CO_2 supply in addition to Jackson Dome, and operates a transmission system for its tertiary recovery projects.

"We move about 500 million cubic feet of CO_2 a day and plan to increase that to one billion," he said. "We're flooding a dozen fields.

"Just with the sources we're negotiating with now and with the new-builds, we could probably produce man-made resources of up to 2 Bcf/day," he added.

Needed: Geologists to the Debate

While Roberts is enthused about CO_2 injection for enhanced oil recovery, he's less optimistic about carbon sequestration to combat emissions.

"The whole idea of capturing CO_2 – if you look at what's going on around the world, the amount that's likely to be sequestered is just a drop in the bucket," he observed.

Sequestration also will contend with both technical and legal issues: "The legal definition of where the gas goes is a problem, unless you own the land for many miles in every direction," he said.

Despite the many challenges, CO_2 injection for enhanced recovery and sequestration probably will attract even more attention in the coming months and years.

"In a sense we're not very far down the track, but now everyone is becoming concerned," Drahovzal said. "And they're so concerned that they want answers tomorrow.

"All of a sudden, there's a lot of money being thrown at this thing," he added.

And it's clear the future of CO_2 injection will require a large number of well-trained, specialized geologists who understand reservoirs.

"The geologists need to get involved in the debate," Roberts said.

"Most people involved in CO_2 injection are not geologists and don't understand what happens when you inject it into the ground," he observed.

That's becoming a problem as CO_2 legislation emerges without input from the larger scientific community.

"Ordinary people don't understand the physical world, yet they're making rules and passing laws based on that lack of knowledge," Roberts said.

Drahovzal recalled listening to a speaker who claimed research into CO_2 injection and sequestration is today's equivalent of the nuclear research Manhattan Project.

"That may be overblown," he said, "but it's going to take a lot of really high-tech people in both engineering and geology to make this thing go." ❑

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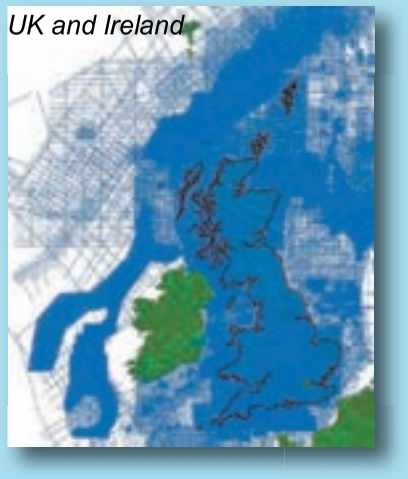

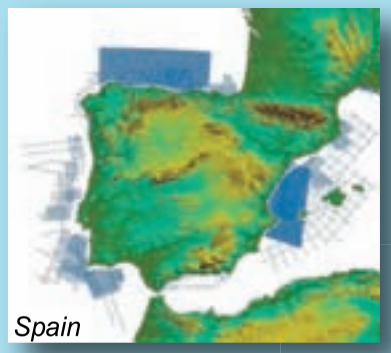

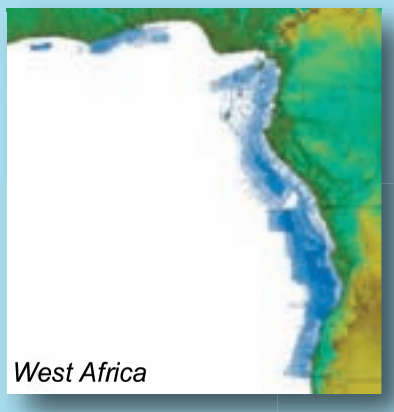

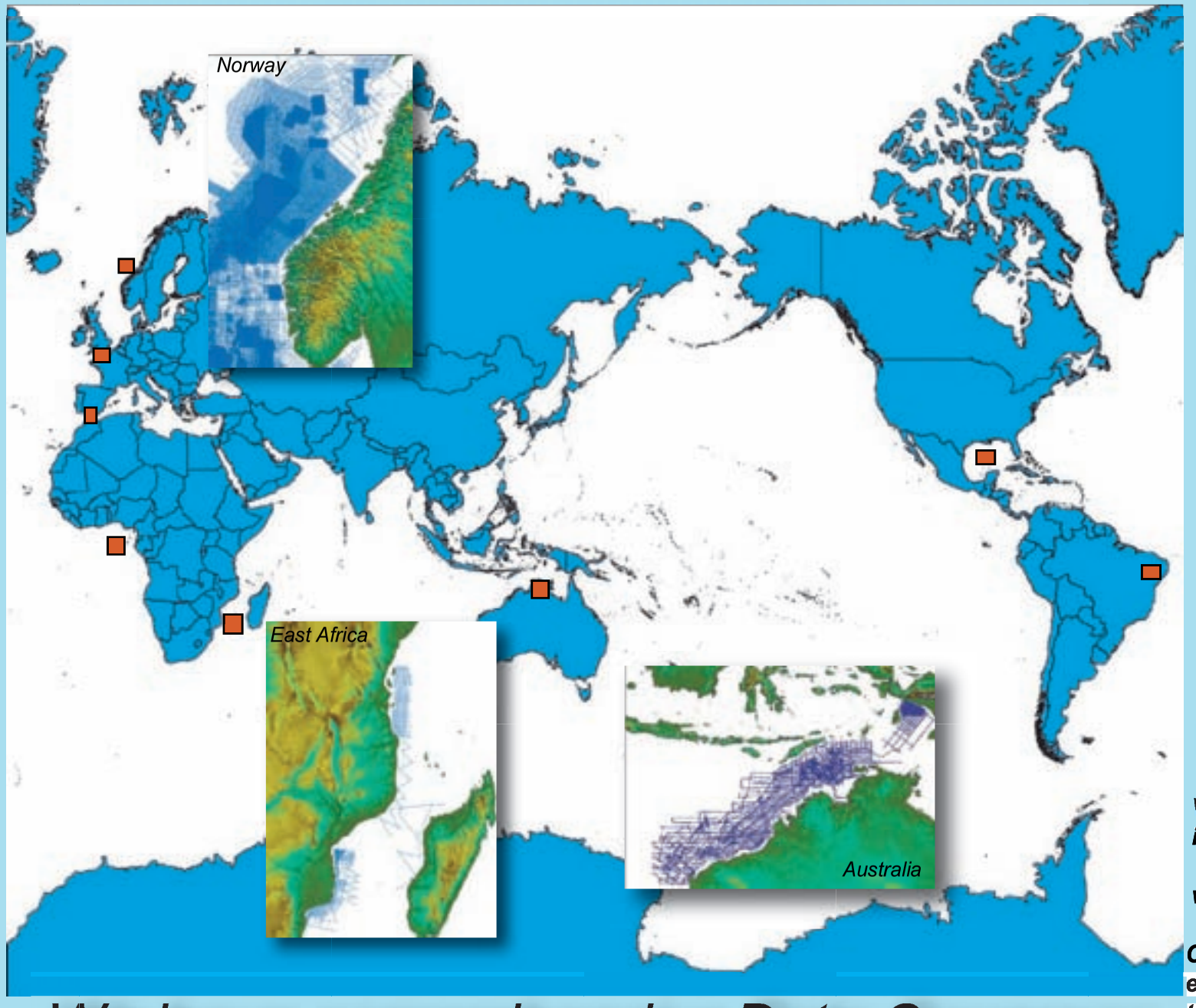

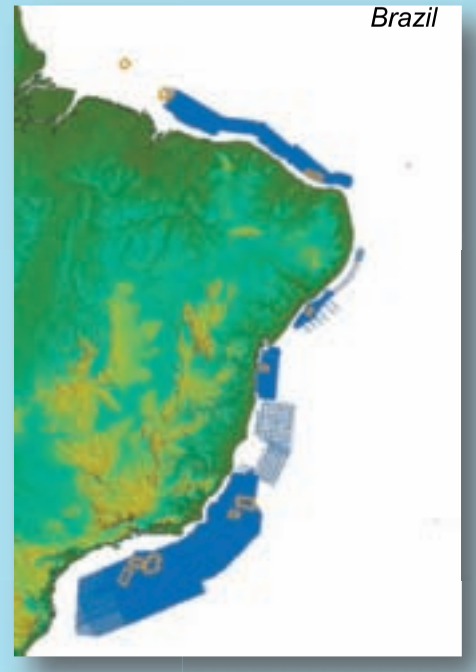

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Slick New Tools Used to Reduce Risk

Deep Seeps Tip Off Oil Hunters

By LOUISE S. DURHAM
EXPLORER Correspondent

In offshore areas such as the deepwater Gulf of Mexico, it's not uncommon for oil emanating from source rocks to bypass natural trapping mechanisms and leak upward to the seafloor.

Given that natural seals sometimes are flawed, entrapped oil also may rise to the surface via such conduits as fractures and faults.

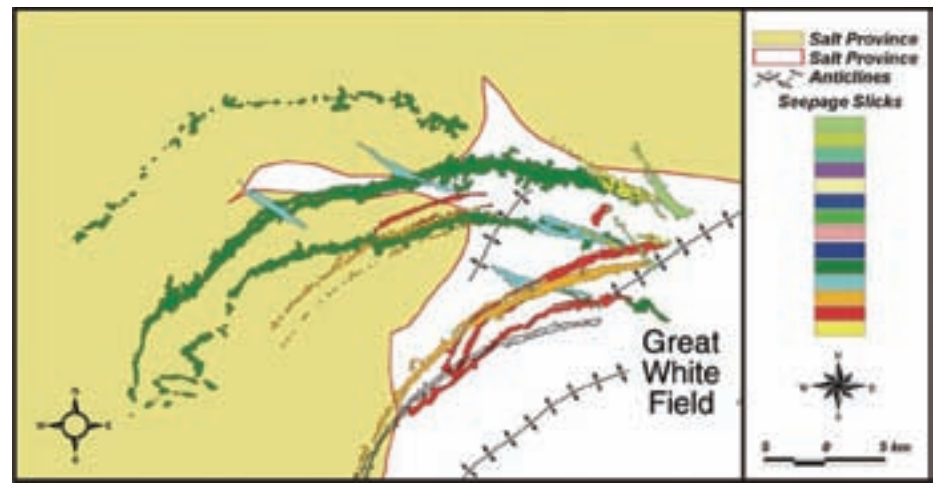
Identifying these natural seeps can prove invaluable to explorers looking for indications of a hydrocarbon source in their areas of interest.

It comes as no surprise that oil seeps have become a business in their own right.

An example of this was presented in at least one paper at the recent AAPG Annual Convention in Long Beach, Calif., when Marcio Mello, founder of High Resolution Technology & Petroleum (HRT) in Rio de Janeiro, Brazil, gave a talk on the effectiveness of high resolution geochemistry technology, satellite oil slick detection and direct geochemistry methods in assessing exploration risk in the deep and ultra-deepwater Gulf of Mexico.

"Natural oil seeps and high-resolution geochemical methods have historically provided invaluable information to oil explorers in frontier areas for assessment of lease and exploration basins," Mello said.

"Foremost, they indicate the presence of active generative hydrocarbon source rocks," he added, "without which there can be no hydrocarbon accumulations."



Graphic courtesy of High Resolution Technology

Taking a new view to find sucess in deepwater exploration: Colors of the oil slick represent different aqcuisition time for Radarsar images.

Global Possibilities

More evidence of oil seeps' growing profile comes from U.K.- based Infoterra, which recently completed mapping the offshore oil slicks in the Arctic area to add to its global offshore oil seeps database.

The database encompasses over 60 million square kilometers of offshore basins.

This database has been acquired via interpreting radar satellite data and screening offshore basins worldwide to a water depth of approximately 3,000 meters, according to Andy Wells, director of sales at Infoterra.

The database comprises more than 12,300 ERS (European Remote Sensing) satellite equivalent scenes.

"Oil seep identification is a complex process," Wells noted, "due to the depth of water, variability in leaking petroleum systems and man-made pollution within the offshore frontier basins."

The Infoterra team characterizes and ranks the slicks as probable natural seepage or man-made pollution and also maps rigs, platforms and ship traffic for a more complete picture of the controls on oil slick distribution.

Even though current oil prices north of $70 help to keep the drill bits turning, exploration costs have escalated along with commodity prices, making prospectors eager to embrace anything that reduces project risks – and oil seeps fit neatly into that category.

A 'Feel-Good' Factor

"Oil seeps give companies the feel-good factor when exploiting a frontier area," said Martin Insley, an AAPG member and senior geologist at Infoterra. "If you see an oil seep, the idea is you have at least a petroleum play fairway.

"But that's only the tip of the iceberg,"

See **GOM Success**, page 22

GOM Success

from page 20

Insley said. "The real interest comes if you put that into a geological context with some seismic or other data – the first thing it tells you is there's oil being generated in that region.

"If you have seepage, it's usually from a reservoir rather than a source," Insley added, "and some will say, 'well, my reservoir's breached and that's not good news.'

"But you need a lot of oil, a substantial reservoir to create a long-term seep," he noted, "so it depends if you're upbeat about it or see it as a negative."

Conversely, when you take a global perspective, there are areas with little or no seepage – which can present a quandary for the prospectors.

Mello

"The combination of high resolution geochemical methods and oil seeps can provide clues about hydrocarbon origin, type and age, and thermal evolution of the source rocks."

"The idea is you'll either have no petroleum system in place in those areas," Insley said, "or you'll have a very efficient seal to the point where there's no chance of oil escaping to the surface.

"One of the questions we face is whether it's bad news if a company evaluates an area and finds no oil seeps," Insley added. "But if you understand the geology of an area, then quite often you say there's a very good seal in this region, and that's why we don't see any seepage."

Risk in the GOM

Oil seep evaluation in the pricey, high-risk deepwater environment can provide an array of crucial information to explorationists.

"The high cost of offshore deep and ultra-deepwater exploration has made the identification of oil slicks and seeps a well-accepted risk assessment methodology in offshore basins all around the world," said HRT's Mello, who chaired AAPG's highly successful 1998 international conference in Rio de Janeiro.

"In fact, the combination of high resolution geochemical methods and oil seeps can provide clues about hydrocarbon origin, type and age, and thermal evolution of the source rocks," Mello added.

He noted that a recent project involving high resolution geochemical technology (HRGT) and oil slicks in the Gulf of Mexico allowed identification and characterization of oil mixing, extension of oil cracking to gas and quantification of accumulations in the subsurface.

The objective of the HRGT program, which was spearheaded by HRT, was to assess exploration risk in deep and ultra-deep waters of the northern Gulf. The project was based on RADARSAT-1 satellite data; it kicked off in January 2006 and concluded June 2007.

More than 1,000 seepage slicks were identified, with 727 of these thought to be representative of oil clusters. An oil cluster was interpreted as a group of RADARSAT-1 seepage slick polygons that share the same source point in a specific geographic space, according to Mello.

"These results indicate a 100 percent probability that an interpreted seepage cluster slick occurs as a result of the convergence of the optimum tectonic, temporal and environmental scenarios," he said.

"And they confirm the presence of a prolific and active petroleum system in the subsurface of most of the investigated area."

'Promising Technology'

The slicks detected during the GOM project are geographically and geologically associated with the regional salt complex trend in the area. They were subdivided into four main exploration areas:

- ✓ Alaminos Canyon.
- ✓ Keathley Canyon.
- ✓ Garden Banks.
- ✓ Green Canyon.

Using technology from HRT associate Biomarker Technology, the project participants were able to analyze some oils using piston cores associated with the oil slicks identified in the sea surface.

The proprietary technology used included diamondoids (geochemical method to characterize percentage cracking from oil to gas and also to quantify amounts of gas in subsurface traps) and compound specific carbon-isotopic analysis of diamondoids, according to Mello.

The technology can identify oil type and link it to the original source rock.

When queried about the future of natural oil seeps and HRGT to evaluate hydrocarbons, Mello replied, "This is the most promising technology to help reduce exploration risk in deep and ultra-deep frontier areas all around the world."

He noted HRT is currently applying this technique in a number of deep and ultra-deep areas besides the GOM, including locales in Brazil, Colombia, Peru and South Africa.

"It is very important to emphasize that the identification of the natural oil slicks in deep and ultra-deep water in any sedimentary basin is proof of the presence of an active source rock system," Mello said.

"Without such a system, no oil accumulation can occur." ❑

Examples of deep-water outcrops, as examined in the upcoming AAPG Studies in Geology 56, from France (left) and Ireland.

Outcrops Book Gives Deep Look

Getting the Big Picture Via 'Tools of the Trade'

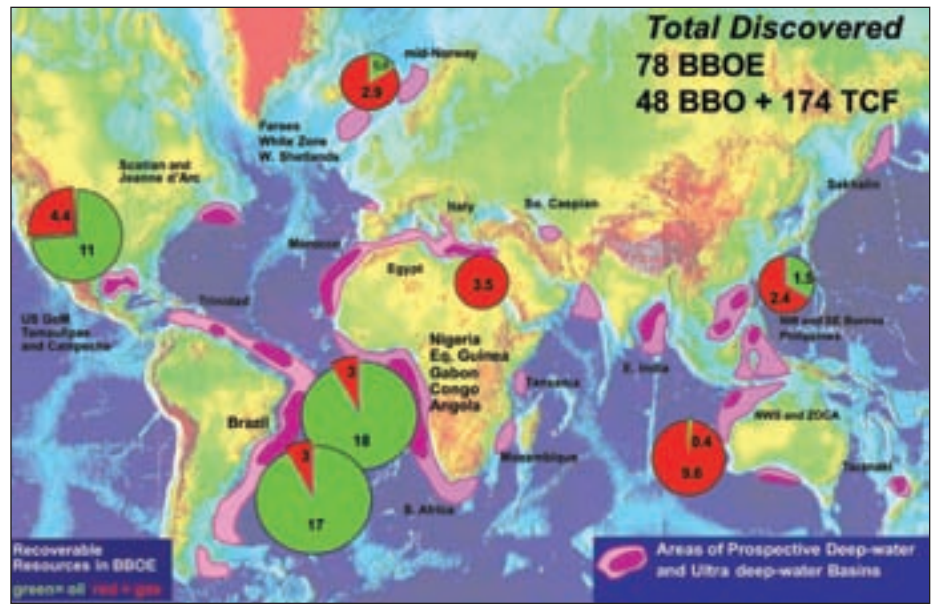
(Editor's note: AAPG publications manager Beverly Molyneux said that AAPG Studies in Geology 56, The Atlas of Deep-Water Outcrops*, is expected to be available in a matter of weeks. Watch the AAPG Web site for details.)*

By BARRY FRIEDMAN
EXPLORER Correspondent

Coming soon, perhaps to a bookcase near you, is a publication that exposes some exposures that matter a lot to geologists.

And for that reason, it matters a lot to the scientific interests of explorationists everywhere.

AAPG's *Atlas of Deep-Water Outcrops*, a detailed, statistical compendium of many of the world's deep-water outcrops and classic depositional systems, is intended to provide a "vast collection of architectural data that may be used for conceptual models and detailed reservoir modeling," according to book co-editor Joe Studlick.



That's for the science.

"It is needed now," he continued, "because of the current development challenges and expected reserves associated with such deep-water reservoirs."

That's for the explorationists.

Or as Studlick put it, "That's what this is all about."

Roger Shew, another of the compendium's four editors, cautions that while the atlas is neither a guide for the general public nor a direct answer to energy policy, it is a significant achievement.

"We wouldn't have undertaken this

See **Outcrops Atlas**, page 26

Photo by Claudio Bartolini.

They're just looking for clues: Repsol geoscientists studied – and enjoyed – excellent exposures of the Upper Pennsylvanian Ross Sandstone, west-southwest Ireland.

Outcrops Atlas

from page 24

work if we didn't believe there was a need for the book," Shew said. "We believe we have provided an atlas that is both important for the E&P industry as analog data, but also that is important to the geologic community in understanding deep-water depositional systems."

Specifically, for the energy industry exploring for and developing deep-water prospects globally, it provides "a comprehensive look" at an important source of analog information.

"That," Shew said, "should help the geoscientists and engineers more efficiently and economically explore for and develop these costly and often technically difficult reservoirs.

"Understanding the range of reservoir architectural types, baffles and barriers, and properties provide a critical component for deep-water exploration and development."

Choices

The Atlas (Studies in Geology 56), expected to be available this fall, was compiled and edited over a three-year period by the late Tor Nilsen, consultant, former U.S. Geological Survey geologist and a legendary instructor for AAPG; Studlick, senior general manager, Maersk Oil America Inc., Houston; Shew, lecturer, Departments of Geology and Environmental Sciences, University of North Carolina at Wilmington; and Gary Steffens, geological adviser, Shell International E&P, Houston.

Steffens says the compilation, co-published by AAPG and Shell International Exploration and Production, is the "first time that almost all classic turbidite outcrops, as well as many new ones, have been compiled using a standard format (11- x 17-inch) for easy comparison and analysis.

Upper Pennsylvanian turbidites of the Ross Formation, western Ireland; these strata record submarine fan deposition on the basin floor of the restricted Shannon Basin. Pennsylvanian rocks were affected by compressive deformation at the end of the Permian, during the assembly of Pangea.The excellent outcrops are great analogs for understanding subsurface deep-water environments in hydrocarbons exploration.
Photo by Claudio Bartolini

"It was an enormous job both in terms of shear volume of data as well as getting hundreds of authors to agree to a single format," he added.

True, there have been other articles and even a few atlases on deep-water deposits, but Steffens said that until now there never was a compendium that addressed both qualitative and quantitative aspects on such a diverse number of outcrops around the world – including those on all seven continents and 21 countries.

In all, it has 103 separate outcrops, spanning most of the geologic time scale (from the Neoproterozoic to the Miocene), including those in:

- ✓ The Gulf of Mexico.
- ✓ The North Sea.
- ✓ The Canadian Rockies.
- ✓ Offshore Brazil.
- ✓ Offshore West Africa.
- ✓ France.
- ✓ Ireland.
- ✓ South Africa.
- ✓ Spain.
- ✓ West Texas.
- ✓ Southern California.
- ✓ Borneo.
- ✓ Patagonia.
- ✓ The Tibetan Plateau.

"The *Atlas* had several goals," Studlick said, "including the primary goal of standardizing statistical data on the outcrops – items such as net to gross, bed lengths, thicknesses, texture and aspect ratios. This statistical data facilitates better reservoir descriptions, which improve geological and reservoir models in all phases of exploration, appraisal and production."

continued on next page

continued from previous page

Steffens underscored that the atlas is not only focused on the sand geometries in the outcrops but also the shale architecture, which is important for understanding baffles and barriers in deepwater reservoirs.

Another realized goal, Shew said, was the standard presentation format of outcrops via photomosaics, lithologic sections, detailed facies and architectural element descriptions.

By doing this, he said, readers will be able to compare various outcrops and subsurface reservoir examples.

"We eliminated those outcrops that are inaccessible, difficult to travel to, little studied, poorly exposed and/or lacking a large 2-D or some 3-D perspective," he said. "We characterized 75 outcrops by basin setting, age and depositional setting as key selection parameters."

Photo by Claudio Bartolini

Beautifully bedded sandstones of the Ross Formation (Upper Pennsylvanian), in western Ireland.

(Having) The Write Stuff

There was nothing magical about the number of outcrops featured; in fact, the editors say they started with a wish list of about 25 key outcrops, having personally visited many of them.

As more scientists and researchers became involved in the project, word spread of the work and the number of contributions quickly grew.

Studlick jokes, "It was the power of e-mails."

The unintended but beneficial consequence was that new outcrops that had heretofore been briefly described or unpublished were now chronicled.

"It was both gratifying and a treat to see and read the many outcrop descriptions that were offered," Shew said.

Still, there were obstacles along the way – mainly the "shear volume of information." The atlas is one of the largest on a single geologic topic that has been published.

The breadth of the work was something that AAPG Distinguished Educator awardee Stephan A. Graham, professor and petroleum geologist at Stanford, had long been advocating.

In the preface to the compendium, he wrote, "Outcrops have long been the *tools of the trade* for geologists trying to better understand the architecture, facies and evolution of deep-water depositional systems.

"Most importantly," he continued, "outcrops serve as accessible examples of deep-water systems that can be studied at a range of scales as analogs for the buried but economically important deep-water systems that are the targets of modern hydrocarbon exploration."

Graham, though, echoes the caveat of many scientists: "Given that many deep-water outcrop analogs are derived from foreland basins and other active margin settings, it is frequently questioned whether these analogs can be used in passive-margin subsurface settings where the petroleum industry has focused its activities throughout the past few decades," he said.

"The value of outcrop data is not questioned, but proper analog usage will only be validated when new generation process modeling and seismic/well studies of near-seafloor-fan systems are integrated and calibrated to outcrop rock data."

It's All There

These new processes, Shew said, already are taking place, but he cautioned that the work of the true geologist hasn't really changed since James Hutton, the father of modern geology, sat on a rock and suggested that the processes occurring in the present were the same processes that had operated in the past.

"We still rely on the ability of the geologist to describe and observe the relationships seen in outcrops, interpret their significance and apply them to other data such as cores, logs and seismic in the subsurface to provide answers on depositional environments and on the heterogeneities that may control reservoir fluid flow," he said.

"The difference now is that we have numerous programs (visualization software and 'caves,' reservoir modeling, etc.) that allow us to create complex models and scenarios that will include more geologic variability for more complete reservoir models," he said. "Hence the need for more statistically based reservoir data – outcrops and subsurface data. Analogs are still critical."

Highlighted in the book are some of the new ways that are being used to acquire or analyze data, such as with GPS, LIDAR, range-finding and then, of course, modeling of the outcrop data.

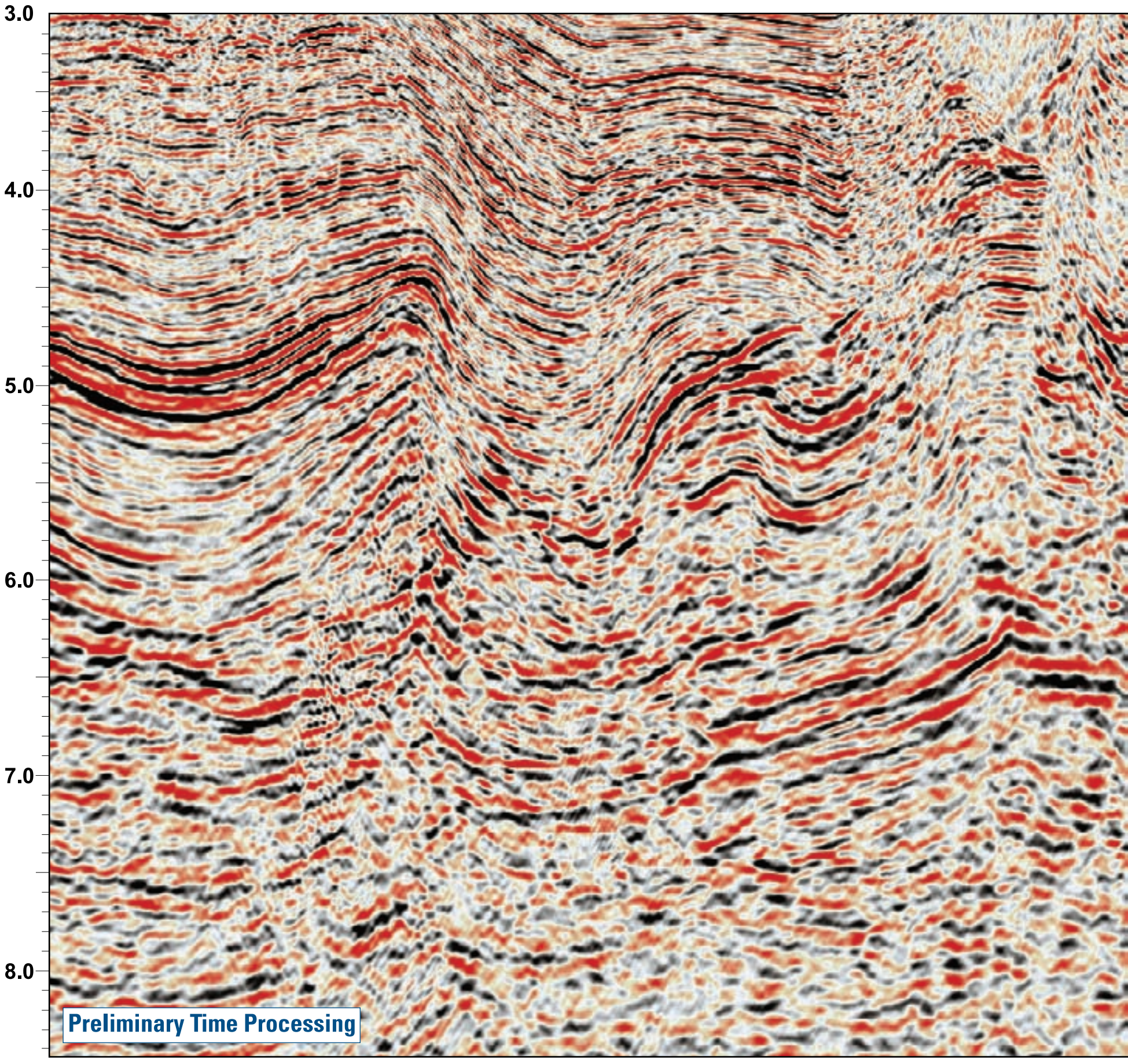
"However, much of the data requires good old-fashioned leg work and descriptions on the outcrop face," Shew added.

The data, in short, is in better shape than ever – in part because of more efficient means of transporting information between scientists and editors and vice-versa. By converting old 11- x 17-inch format photos to .pdf files, for example, Shew estimates two years of work were saved.

In addition to the hardcopy Atlas, a CD is included in the back of the book with 37 AAPG BULLETIN-style articles on the overview topics and more detailed reviews of selected outcrops.

And other than providing a comprehensive guide to "where" the world's most significant outcrops are located, the authors agree that perhaps the most important accomplishment is, as Steffens says, "having all the data in one place." ❑

EASTERN DELTA 3D



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Over 100 OCS blocks of newly acquired Ocean Bottom Cable data will be available for the October 2007 OCS lease sale. Contact your TGS representative to review the available products.

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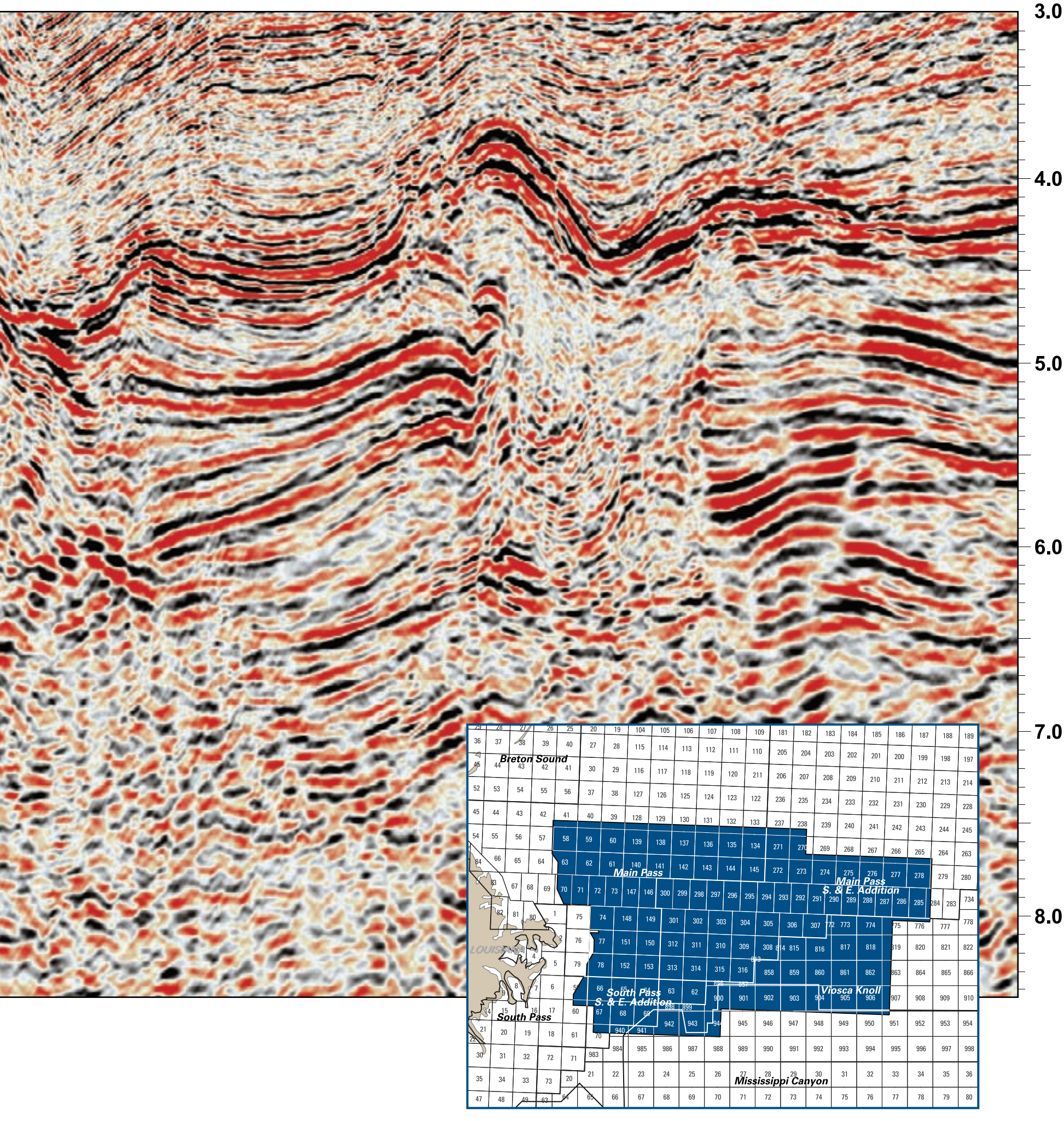

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Series Headed to Schools

'Earth' Taps Geologists' Insights

By DENNIS KING
EXPLORER Correspondent

As an action-adventure filmmaker, director Pierre de Lespinois has scaled the heights of the Andes, the Alps and the Himalayas, dived a mile below the ocean's surface and kayaked alone down a 300-mile stretch of the Amazon River.

So he knows first-hand something about the beautiful and daunting environments that make up the many and varied faces of Earth.

His venturesome spirit, his technical expertise and his vast experience on TV productions, feature films and documentaries are more than enough to make de Lespinois the ideal candidate to direct the rigorous, ambitious documentary series "Faces of Earth," which began airing in late July and continues in early August on The Science Channel.

The four-part, high-definition documentary series – produced by the American Geological Institute with support from the AAPG Foundation and other sponsors – utilizes cutting-edge computer graphics technology, animation, aerial photography and advanced film production techniques to paint vivid portraits of the powerful natural forces that constantly forge and re-forge the multiple faces of Earth.

The series urges viewers to "look up, look around, look deep below," and then it carefully explains what's revealed through the insights of those who can read the natural world best – geoscientists.

It follows those scientists, including some AAPG members, as they employ questing minds, adventurous spirits and high technology to see the Earth as we've never seen it before, and to understand how humans are both a force of nature and a product of an ever-changing planet.

Through the magic of film, the groundbreaking series takes viewers into the core of the Earth, beneath vast oceans and straight into the eye of the most catastrophic storms on the planet.

In the process, it shows how the Earth was made, how it works, what's threatening the planet and what it will look like in the future.

An example of the graphics used to illustrate the dynamic processes in "Faces of Earth."

Graphic, photo courtesy of American Geological Institute

The four parts of the "Faces of Earth" series are:

✓ "Assembling America" is "a traverse across North America, exploring how the land we see today is the result of hundreds of millions of years of Earth's processes interacting." It aired on July 23.

✓ "Shaping the Planet" is a global look at how the Earth works – from the greatest depths of the inner Earth to the surface we live on – where "the dynamic processes are revealed where they impact humans directly, from Ethiopia to Italy to Tibet." It aired on July 26.

✓ "Building the Planet" explores the planet's birth and evolution. "Follow geoscientists as they learn how each part of Earth interacts together through time, protecting us from solar winds to the energy and mineral resources that drive our society." (Aug. 2.)

✓ "A Human World" explores the relationship between humans and Earth, showing how the planet has defined and shaped our civilizations, and how humans have interacted with the planet. (Aug. 9.)

The Science Channel is available through cable and satellite services. For more information and listings check http://science.discovery.com. ❑

The Adventure Continues

"I was always drawn to filmmaking as a kind of adventure," de Lespinois said, "but I also love it as a quest for knowledge. To me, being a filmmaker is like being in college your whole life."

And one of the best experiences of working on "Faces of Earth," the director said, was tapping the wisdom, insights and discoveries of scores of the world's finest geoscientists to bring reasonable context to all the dazzling imagery his crews created on screen.

"We interviewed and worked with the top geologists and geoscientists from around the world – so many that we couldn't possibly include them all in four hours of film – and believe me, our crew really went to school to ensure that every aspect of what we put on screen was scientifically accurate. We were checked and re-checked every step of the way.

That will prove to be an excellent move

See **Faces**, page 32

Geological Society of London Bicentennial Conference 1807–2007

Earth Science in the Service of Society

10-12 September 2007

Queen Elizabeth II Conference Centre, Westminster, London

This international conference reviews the current state of the Earth sciences, and demonstrates their relevance to important issues in society today. Days one and two will run in four parallel sessions: Earth and Planetary Interiors; Environment; Resources; The Earth System. Day three will be devoted to a plenary session on Earth's Future. Distinguished speakers will present new results and ideas relevant to our understanding of the planet and how these affect key environmental issues, present and future, including: natural hazards, climate change, energy and water resources. See our website for further details and draft programmes.

Bicentennial Field Excursions

As part of the Bicentennial Conference, the Society has organised an exciting program of field excursions, which aims to be a celebration of British Geology. The variety of excursions planned include sites of Classic British Geology and locations of Special interest covering all parts of the stratigraphic column as well as aspects of environmental, economic and social interest. The programme provides an opportunity for participants to experience Britain's varied scenery and culture, and also to appreciate the contribution that geology has made to the economy and quality of life of Britain and the wider world. Places are limited, so to avoid disappointment, register now!

We have come up with a number of schemes to reward group bookings made for the conference:

Corporate incentives:

- Register at least 20 delegates and get a free meeting room for either day one or two (allocated on first come first served basis and no extras or catering incl.)
- Register at least 20 delegates and get a free insert in the delegate bags (you must create, print and supply insert)
- Register at least 20 delegates and get a half page b&w ad in the abstract book
- Register at least 30 delegates and get a full page, full colour ad in Geoscientist
- Register at least 25 delegates and get a half page, full colour ad in Geoscientist
- Register at least 15 delegates and get a quarter page, full colour ad in Geoscientist

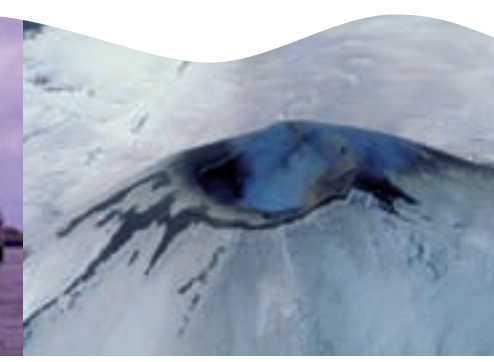
Student incentives:

- Register at least 10 students and get a free meeting/study group room for one day on either day 1 or 2 (allocated on first come first served basis and no extras or catering incl.)
- Register at least 10 delegates for days 1 & 2 and get free passes to day 3 for all 10

Field trips:

- Register at least 5 delegates for selected field trips and get day 3 passes for all 5 of those delegates. Please visit our website, www.geolsoc.org.uk/bicentenary for further information.






Join us at the conference and register online now!
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'Faces' Will Leave Lasting Impression

By DENNIS KING
EXPLORER Correspondent

When he was a young Air Force pilot, Arthur R. Green said he was required in training to memorize all the constellations in the heavens.

It was something of an ordeal at the time, but later, as an exploration geologist traveling the globe, Green said he was always thankful for that basic understanding of the universe around him and found great comfort in his hard-earned knowledge.


Green

"Wherever I was in the world, whether I was in a desert in the Middle East, in the Arctic or anywhere else far from home, I could always look up and see my friends, the stars," said Green, a long-time AAPG member now retired as chief geoscientist for ExxonMobil Exploration.

"Having that knowledge has always seemed a precious thing to me. To know how the universe around you works, to understand your place on the planet seems to me to be a very basic part of being alive and living on the Earth."

It was that deep, abiding understanding of the value of science education that inspired Green to become involved early on in envisioning a comprehensive film project on geosciences that would eventually evolve into "Faces of Earth," the four-part documentary series that premiered on The Science Channel.

"Art was very active in the formative process of the series, helping define the scope and general science approaches," said Christopher Keane, AGI's director of communications and technology and an executive producer on the series.

Green said he worked closely from the start with AGI and its former executive director, the late Marcus E. Milling, in defining the aims of the documentary series. And later he was encouraged by Milling to make a strong case to his bosses at ExxonMobil to become a major financial underwriter of the project.

"It was Marcus, with his strong commitment to earth sciences education, who really had the vision and kept things moving forward," Green said.

Our Need to Know

The author of many geologic studies and published papers, and a noted lecturer on petroleum exploration and global energy, Green said he is "consistently dumbfounded" by the lack of basic science literacy he finds among the general public as he travels around the country.

"It's amazing to me that something so important to life and the health and well-being of our country and our planet seems to be ignored by so many people," he said. "It's amazing how little people know about our use of energy, where that energy comes from, (and) how we're going to deal with increasing demands in the future.

"That's why I believe it's so important that we provide useful, interesting and dynamic tools to help people understand how the Earth works," he continued. "That's what 'Faces of Earth' is all about."

As a long-time AAPG member, Green said he is especially pleased that the AAPG Foundation agreed to sponsor the series and contribute funds specifically to support its educational mission after the cable TV broadcast.

"We need to encourage people to ask hard questions, look carefully at the world around them and engage in discussions about the future of the Earth," he said. "If we can get more people thinking about the state of the Earth and how to better care for the planet, then we'll all be better for it.

"And if we can inform people and educate them on how the Earth works, let them understand that it's a living, constantly shifting and evolving thing, then we'll all be able to feel more at home in the universe and understand our place in it." ❑

Faces

from page 30

in years to come, because going to school is exactly the fate that awaits this series. "Faces of Earth," in addition to providing some riveting TV and filmmaking, will eventually be used in schools for educational purposes.

It's one more reason why de Lespinois wanted to get it just right.

"Marrying that kind of rock-solid science to the futuristic quality of special effects and CGI on film was a challenge at times," he said, "but an exhilarating experience."

A Perfect Match

As founder of Evergreen Films, the full-service production company tapped by Discovery Communications to complete the series, de Lespinois seems uniquely suited to the task. Winner of three Emmy Awards, along with 13 nominations and dozens of international prizes for programs he's created, de Lespinois boasts a resume that includes science-oriented works, both dramatic and documentary, such as "The Secret Adventures of Jules Verne," "Inside the Space Station," "When Dinosaurs Roamed America," "Weather Extreme: Tornado," "Alien Planet" and "The Science of Star Wars."

Noted for his ability to capture and communicate the essence of excitement, de Lespinois directed action photography for Winter Olympic Games in Canada, France and Norway and in the process co-developed a live-action camera mount and tracking system (dubbed "Cablecam") that allows a camera to "fly" through the air for more than 2,000 feet.

He also pioneered a style of point-of-view filmmaking in athletic competition that has brought him numerous technical awards.

Much of this expertise was brought to bear, he said, in the making of "Faces of Earth."

"The funny thing is," de Lespinois said, "a lot of the imaging technology we use in high-definition filmmaking is very similar to technology that geoscientists use in their field work. Even things like the use of miniatures and models, which we use for special effects, are things that scientists

See **TV Series**, page 34

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More science than you can shake a pick at.

TV Series

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often employ in their studies.

"In fact," he continued, "some of the special-effects software specifically developed for use in the film industry is now being widely used for scientific applications. I think that's pretty exciting."

A 'Theatrical' Event

Evergreen Films' laboratory of animation and special-effects wizards is housed at Meteor Studios in Montreal, a joint venture of Discovery Networks and Evergreen, and the talent there was employed extensively to create some of the breathtaking tableaux, visual vistas and powerful natural phenomena seen in "Faces of Earth."

"We have about 150 artists and the most innovative technical tools of the trade, and since the studio was founded in 2000 we've done over 90 productions for clients in the U.S., Canada, England and France," de Lespinois said.

Recent Hollywood productions involving Meteor artists and technicians include the films "Scooby Doo 2," "Catwoman," "The Exorcist" and "Fantastic Four."

"What we're doing there is light-years ahead of what was done on screen in the 1970s and '80s," he said. "Today, with the increased load of visual effects being used in documentaries like 'Faces of Earth,' you have to design your show just like you do a theatrical film. We're not just going out and shooting what happens. We're designing everything to tell a story from the beginning."

The story of Earth through the eons is indeed a vast subject, the director admitted.

"To me, the most interesting thing I learned from this project was how the Earth is fluid and is constantly shifting and changing," de Lespinois said. "To understand that age-old process is important for every person living on the planet. It helps us put the problems we face today into perspective. We need to understand how the Earth works and how we influence it and how it influences us. Those things should be basic to every human being's education."

On the "set:" AAPG member Charlie Kerans was one of the geoscientists featured in "Faces of Earth," the four-part Science Channel series that eventually will be used for educational and outreach purposes.

Educational Outreach

On that education front, de Lespinois points out that the four hours that will be aired on The Science Channel represent only the tip of the iceberg, so to speak.

"We shot more than 160 hours of footage," he said, "so clearly there is a treasure trove of additional material and vital information that can be used for educational add-ons and valuable auxiliary purposes."

AGI has a detailed plan in place to use the series' footage and animations to provide educational ancillary materials for the classroom. The blueprint calls for DVD and Web-based materials, as well as printed instructional materials, that will be useful for students "from grade school to graduate-level studies," said Colin Mably, AGI's senior adviser for communications technology.

"Of the 160 hours of footage shot, about 20 hours are useful for our purposes," Mably said. "That's a very rich archive of materials that we plan to use in a number of ways."

The educational add-ons will be rolled out over the next months, he said, with the first being a boxed-set DVD of the four "Faces of Earth" episodes, complete with soundtracks, original narration, Spanish narration and narration linked to instructional materials.

Additional DVD offerings tied directly to classroom curricula – featuring topics such as "High School Environmental Science," "Earth Science in the Community" and "Investigating Earth Systems" – will be made available to educators.

Also, Web-based downloads are planned to appeal to teachers wanting to customize lesson plans, to home-schoolers, to students preparing presentations and to outreach educators in museums, parks and community centers.

Interview footage from 38 geoscientists will be formatted on the Web in a glossary of questions and answers on specific geoscientific topics. The Web site also will feature downloadable CGI and animation segments from the "Faces of Earth" archive.

Finally, a career awareness component is planned for the Web site targeted to middle-school students and featuring such topics as "Jobs that geoscientists do" and "How to become a geoscientist." Another will be aimed at high school students to help inform them, their parents and school counselors on career opportunities in the geosciences.

The AAPG Foundation, one of seven sponsors of the series, contributed $100,000 to the project, specifically toward "taking the next step" in providing a public outreach mechanism for the series.

AAPG Foundation Trustee Chairman Jack C. Threet said the Foundation bequest "represents about a third of the cost of developing, producing and distributing the ancillary materials, and was a major factor in bringing in the other two-thirds of the necessary funding."

Other sponsors of "Faces of Earth" along with the AAPG Foundation are the AGI Foundation; Discovery Communications; ExxonMobil; the Jackson School of Geosciences at the University of Texas at Austin; Rive Gauche International Television; and the U.S. Geological Survey. ❑

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For complete details on any of the field seminars and short courses listed below, call +1 918 560-2650 or visit http://www.aapg.org/aug/

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Begins and ends in Great Falls, Montana.
$2,600 per person ($100 more after 8/13/07)

Sedimentology and Sequence Stratigraphic Response of Paralic Deposits to Changes in Accommodation: Predicting Reservoir Architecture, Book Cliffs, Utah
Perfect for geologists, geophysicists and reservoir engineers working in exploration and production settings.

September 20-27, 2007
Begins and ends in Grand Junction, Colorado.
$2,100 per person ($200 more after 5/11/07)

IN THE CLASSROOM

FALL EDUCATION CONFERENCE: Exploration Of Stratigraphic Traps
Join us for an entire week of intense strat traps sessions. Badges ARE transferrable. Includes course notes, refreshments & buffet lunch each day.

September 10-14, 2007
$1,295 for AAPG members. $1,395 for non-members ($100 more after 8/20/07)
(Houston, Texas)

Practical Salt Tectonics
For those working in salt basins worldwide who need either an introduction to salt tectonics or an update in this rapidly evolving, fascinating field.

August 20-22, 2007
$895 for AAPG members. $995 for non-members ($100 more after 6/11/7).
(Houston, Texas)

November 16-17, 2007
$850 per person ($100 more after 10/4/7).
(Athens, Greece with AAPG European Region meeting)

Basic Petroleum Geology for the Non-Geologist
Ideal for anyone who needing an overall perspective of petroleum geology, exploration, drilling and production.

August 28-30, 2007
$1,195 ($100 more after 7/28/07)
(Houston, Texas)

September 18-20, 2007
$1,195 ($100 more after 8/18/07)
(Denver, Colorado)

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Knowledgable with oil reservoirs but not necessarily conversant in enhanced recovery techniques? This course is specifically for you!

September 16, 2007
$50. (Lexington, KY at the AAPG Eastern Section meeting)

Seismic Stratigraphy and Seismic Geomorphology into the 21st Century
Ideal for anyone who needing an overall perspective of petroleum geology, exploration, drilling and production.

September 22-23, 2007
$650 for AAPG members. $750 for non-members ($100 more after 8/24/7).
(Houston, Texas)

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More science than you can shake a pick at.

Communication Lines Opened

VGPs: The Sharing Business

By BARRY FRIEDMAN
EXPLORER Correspondent

"I try to share with students that petroleum geology is real geology."

That from Rebecca Dodge, an associate professor in the department of geosciences at the University of West Georgia, on what some university geology students think of the profession that many will eventually join.

To that end, Dodge has been sharing some of her experience and expertise as part of AAPG's Visiting Geoscientist Program, a program that brings professional geoscientists together with students from throughout the United States, Canada and 30 other countries.

For more information on AAPG's Visiting Geoscientist program – whether to arrange for a visit or to volunteer your expertise to the program – contact Mike Mlynek at students@aapg.org, or go online to http://www.aapg.org/education/vgp/about.cfm.

In a sense, the goal of the program, which began in 1974, is to help prepare the industry and the students for each other by providing and opening better means of communication between each other.

Eduardo Berendson, an international reservoir geologist who specializes in reservoir geomodeling, stratigraphic problems and project management for the Hague-based Agip KCO CENI joint venture and *still* finds time to be a member of the program, says this aspect is perhaps the most important.

"The VGP is important," he said, "because the AAPG is facing with the widest age- and knowledge-gap that ever existed in the history of the association."

He goes on to say the industry as a whole and AAPG members in particular "have the spirit, the knowledge and ultimately the responsibility to pass on their wisdom to the future of the association."

Valary Schulz, senior geologist at Wynn Crosby in Plano, Texas, and a frequent contributor to the program, agrees:

"In the big schools, with large petroleum geology departments, there are numerous opportunities for students to interact with successful graduates," she said, "but we need a whole lot more geologists than will be graduated by those five or 10 universities.

"And there are many bright, curious, scientifically minded students who have never considered a 'career' in geology, but they like it," she continued, "and need only a small amount of encouragement to spark that fire we all in this profession share."

Dodge, who holds seminars on environmental and resource management applications and is also the director of GLOBE Partnership, sees another dynamic.

She notes that the program is especially valuable during this particularly volatile time in the petroleum industry "... because colleges and universities are finally starting to think about the possibility of reinvigorating, restarting or developing petroleum curricula and programs."

The Program

More than 200 colleges and universities have participated in the VGP, and VGP committee chair Chuck Caughey has a group of more than 90 speakers for the coming school term.

Those speakers, offer talks on a variety of subjects over the globe.

Some of the specific expertise includes sessions on coal, environmental, hydrogeology, petroleum exploration and producton, geochemistry, seismic stratigraphy, planning and administration, resource economics, and trends in employment, recruiting and careers, to name a few.

VGP speakers typically spend a half to a full day with the students, often tailoring their remarks and visits to those schools where they can do the most good – something Dodge, Berendson and Schulz, for example, have been doing for many years.

They, and others in the program, also visit with faculty members to discuss specific needs and problems within the department. They then meet with students to not only review career opportunities in the profession, but also to discuss specific technical topics, such as reservoir engineering, slope tectonics, 3-D reservoir modeling, putting together oil and gas prospects, environmental forensics, etc.

The strategy is that by exposing students to these "heavy hitters" in the field, both sides will benefit: Students will get a real-life look at what's out there and industry gets a look at its future talent pool.

"I always tell the students that in the real world to be technically correct is not enough anymore, but equally important is to be aligned and in context with other disciplines," Berendson said.

"For a geologist to complete a geocellular model, for example, not

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addressing the petrophysicist concerns and the reservoir engineer uncertainties is unacceptable."

Schulz says the problem with many young geology students is even more fundamental.

"Most notably absent from most students' courses of instruction is any sense of business," she said. "Although some may have had exposure through their parents or prior summer jobs, the natural resource industry is highly insular, and the typical 'man on the street' has no comprehension of this market driven profession.

"Additionally, many academicians have stepped from student to professor," she added, "and have had no industry experience or contact – and are therefore unqualified to prepare their students for the commercial aspects of their chosen field."

A Personal Touch

Dodge, too, believes this generation of students has been raised on the need for collaboration and the ability to master the increasingly complicated high tech aspect of the profession, but they are not as familiar with the specifics of how those in the field actually search for and develop oil today.

She has noticed, though, that while the sense of fieldwork still "sells well" with students, it is the high-tech aspect of the industry that is the more powerful attractant now.

"During a visit, I typically have about one hour with students to talk about careers," Dodge said. "Often I'm speaking at an institution that does not have a petroleum focus or curriculum. I try to emphasize that exploration usually involves teamwork – with people from other disciplines – and that the industry uses the very highest levels of technology at all phases of exploration and production."

For his part, Berendson says he also tries to let students know the relationship works both ways.

"When given a chance, I relate to students the opportunities and challenges this industry has given me and others," he said, "such as international traveling, exposure to foreign cultures and many lessons on the importance of multicultural sensitivity."

As to the exposure to global cultures, Schulz believes that what's needed is more than just a cursory understanding.

"More important today than at any other time in history is the need to own another language," she said. "In today's global and mobile environment the individual who can speak, write and understand French, Russian, Chinese or Spanish will have a distinct advantage in the work force."

The Right Stuff

In any profession, incoming students need to learn not only the basics, but the new technology skills – the ability to use software tools and computers. In the geosciences that also means, for example, becoming familiar with environmental aspects of petroleum exploration.

Dodge says part of her job is to bring that into each visit.

"That tends to melt a bit of cynicism about the industry," she said, "underscoring the notion that many have – even geology students and faculty members – that the industry is non-friendly to the environment."

Berendson believes that students entering the field need a professional dimension both outside of the classroom and beyond the laboratories.


Dodge


Berendson


Schulz

"I tell students that professional geologists today navigate in a high-tech career, whether you are evaluating logs on a rig, generating prospects in an office or even performing fieldwork in remote areas (using GPS systems).

"I emphasized that information technology is a prerequisite in our professional work," he continued. "I let them know that acquiring more skills and broadening their knowledge are ultimately their responsibility, not the school they are attending or the company that they might work for."

Dodge, who is also the interim director of the AmericaView Consortium, says that a visiting campus call by an industry professional can help move things in the right direction and enhance efforts – along with student chapters and grants-in-aid – to get petroleum geology not only back in the curriculum of schools but back in the consciousness of the students.

For Berendson, who chaired AAPG's student chapter in Indonesia in 2004-05, these visits provide an opportunity for him to both look forward and back.

"I always take the time to share some personal learning, like planning for success," he said. "You cannot decide what to deal with today unless you know where you want to be tomorrow."

"Most importantly," Schulz said, "is to follow your interests, be absorbed and passionate about your specialty and the career will follow. Learn how to learn, and then be nimble."

She then tells a story that perhaps best exemplifies the program's goal of keeping alive the geologic link and health of the profession.

"I really enjoyed the chance to interact with the students," she said, "and the highlight was speaking to my alma mater (University of Saskatchewan, Saskatoon campus), and having my dad attend the talk, as he was one of the early graduates from there in 1934." ❑

Position Papers Updated

Climate Statement Prompted Changes

The 14 AAPG Position Statements have been reviewed and updated by the DPA Government Affairs Committee and approved by the AAPG Executive Committee, including the much-discussed Climate Change statement.

Upon DPA's recommendation, the Positions' format was changed from sometimes-lengthy discussions to a more brief presentation that states "Issue, Background and Statement."

Position Paper issues approved include:

- ❒ Atlantic Outer Continental Shelf Resources
- ❒ Hydraulic Fracturing
- ❒ Preservation of Geological and Geophysical Data
- ❒ National Petroleum Reserve-Alaska Access
- ❒ Arctic National Wildlife Refuge Access
- ❒ United States National Energy Supply
- ❒ Climate Change
- ❒ Tax Reform
- ❒ Natural Gas Supply Concerns
- ❒ Reformation of the Endangered Species Act
- ❒ Reformation of the Clean Water Act — Wetlands Access
- ❒ Offshore OCS Access
- ❒ Research and Development Needs
- ❒ Oil and Gas Workforce Needs in the 21st Century

The Climate Change Statement (see accompanying box) has been by far the most controversial. The discussions about the Climate Statement drew attention to the Position Papers as a whole as well as the process of their initiation, crafting and approval.

Consequently, the 2006-07 Executive Committee crafted a written Position Paper process, which names the Division of Professional Affairs as

continued on next page

AAPG's Statement On Climate Change

The Issue

In the last century growth in human populations has increased energy use. This has contributed additional carbon dioxide (CO_2) and other gases to the atmosphere.

Although the AAPG membership is divided on the degree of influence that anthropogenic CO_2 has on recent and potential global temperature increases, the AAPG believes that expansion of scientific climate research into the basic controls on climate is important.

This research should be undertaken by appropriate federal agencies involved in climate research and their associated grant and contract programs.

Background

Geologists study the history of the Earth and realize climate has changed often in the past due to natural causes. The Earth's climate naturally varies constantly, in both directions, at varying rates and on many scales. In recent decades global temperatures have risen. Yet, our planet has been far warmer and cooler than today many times in the geologic past, including the past 10,000 years.

Certain climate simulation models predict that the warming trend will continue, as reported through NAS, AGU, AAAS and AMS. AAPG respects these scientific opinions but wants to add that the current climate warming projections could fall within well-documented natural variations in past climate and observed temperature data.

These data do not necessarily support the maximum case scenarios forecast in some models. To be predictive, any model of future climate should also accurately model known climate and greenhouse gas variations recorded in the geologic history of the past 200,000 years.

Statement

✓ AAPG supports expanding scientific climate research into the basic controls on climate, specifically including the geological, solar and astronomic aspects of climate change. Research should include understanding causes of past climate change and the potential effects of both increasing and decreasing temperatures in the future.

✓ AAPG supports research to narrow probabilistic ranges on the effect of anthropogenic CO_2 on global climate.

✓ AAPG supports reducing emissions from fossil fuel use as a worthy goal. (However, emission reduction has an economic cost, which must be compared to the potential environmental gain.)

✓ AAPG supports the premise that economies must retain their vitality to be able to invest in alternative energy sources as fossil fuels become more expensive.

✓ AAPG supports the pursuit of economically viable technology to sequester carbon dioxide emissions and emissions of other gases in a continuing effort to improve our environment and enhance energy recovery.

✓ AAPG supports measures to conserve energy, which has the affect of both reducing emissions and preserving energy supplies for the future. ❏

Colorado Feels Economic Impact of O&G

Western Basins Grab E&P Attention

By DIANE FREEMAN
EXPLORER Correspondent

A surprising new economic impact study of oil and gas production in Colorado shows that the industry is a valuable contributor to the state's economy, and that E&P efforts have shifted to the western basins.

The new oil and gas study, conducted by the Colorado Energy Research Institute (CERI), concluded that the oil and gas industry contributed $22.9 billion to the state's economy in 2005 – or 6.1 percent of the total gross state product.

The industry, both directly and indirectly, generated about 70,000 jobs, or 2.2 percent of the state's employment and 3.2 percent of the total earnings, according to the report.

It also documented the industry's shift to the western basins, said Dag Nummedal, AAPG member and institute director.

"It's not entirely unanticipated," Nummedal said, "but it's changed over the last three to five years once gas prices really started growing.

"The Denver Julesberg Basin is still big, but the Piceance and San Juan basins are growing, along with the Paradox Basin," he said.

Growth in the San Juan Basin has continued and is even stronger since it is coupled with the increase in coalbed methane production there.

Of the state's five major oil and gas basins, the biggest economic impact came from the San Juan and Paradox basins in the state's southwestern section. They contributed $3.9 billion to the economy, according to the report.

In northwest Colorado, the Piceance Basin ranked second with a $3.4 billion impact.

The 111-page report, released in late June, showed that natural gas is by far the dominant contributor to the industry's growth in Colorado.

Another surprise finding was that Denver has become a regional hub for several producing gas companies.

"There's a tremendous economic output by these companies," Nummedal said. "Many produce gas in Utah, Montana or Wyoming, but they have their regional headquarters in Denver – they do all their project management and exploration on the Rocky Mountain region from here."

Until the early 1980s, all the major energy companies operated offices in Colorado. When the industry slowdown occurred, they began pulling out of Denver, with most corporate headquarters moving to Houston, he said.

Now many have re-established regional offices in Denver and that has made a significant economic impact on the city, he said.

The oil and gas industry paid $870.5 million in business, personal, state and local taxes in 2005. It spun off jobs in government, professional services, retail, health and social services.

"It's certainly one of the largest industries in the state," Nummedal said.

The report noted that a total of 30 percent of Colorado counties now have at least 200 wells. Weld County has the largest number with almost 10,000, followed by both Rio Blanca and La Plata counties, each with 2,000 wells. ❑

For more information on this subject, visit the AAPG Web site.

continued from previous page

the principle author, and may also include soliciting comments from members at large on proposed positions deemed controversial. DPA subsequently recommended additional clarification and the newly approved procedures are posted on the DPA Web site.

The new Climate Change Statement approval comes after over two years of discussion sparked by the proposal at the 2004 Annual Convention in Dallas for a "Climate Change Card" to be produced and distributed to AAPG members. A review of the cards' content drew divergent opinions.

Members were invited to comment on the card online through October 2006. The passion expressed led the Executive Committee to investigate not only the Climate Change Statement, but the overall Position Paper process as well, leading to the new written, posted policy.

Following the comment on the card a select ad hoc Climate Change Committee was formed to review and/or recommend a new climate statement. That statement, with review of the Division of Environmental Geosciences and the DPA, was offered online in May 2007 for review and drew 93 posted responses.

The responses were taken into account by the EC, and, with further collaboration with DEG and DPA, approved the new statement.

Additionally, a new Global Climate Change Committee has been created with a charge to investigate appropriate ways for the association to become involved in climate change "solutions." Committee members are being named.

The review and revamping of the Position Papers was performed and led by Carl J. Smith, chairman of the DPA Government Affairs Committee.

The statements can be accessed at: http://dpa.aapg.org/gac/index.cfm. ❑

WashingtonWATCH

GEO-DC Summer Schedule Busy

By DON JUCKETT

Debate on energy legislation and defense spending will likely take center stage.

This month marks the twentieth month of operation for the AAPG Geoscience and Energy Office in Washington, D.C., and we, like the rest of Washington, are enjoying the lull that accompanies the Fourth of July recess as the nation's legislators return to their individual states.

We anticipate that upon their return, debate on energy legislation and defense spending will take center stage – which means August and September promise to be event-filled months for us, too.

* * *

We emerged from Congressional Visits Day in early May and immediately embarked on the final planning for the AAPG/SPE International Multidisciplinary Reserves Conference (see page 41), organized by AAPG, SPE, the World Petroleum Council, the Society of Petroleum Evaluation Engineers and the UNECE Group of Experts of Resource Terminology and hosted in late June by the GEO-DC office.

While we are awaiting the analysis from the 130-plus participants' responses to the program, the conference was gauged as a strong success by the organizers and the participants.

The conference objective was to bring together a community of senior and influential individuals to explore the impacts and next steps in endorsement of the new SPE/AAPG/WPC/SPEE Petroleum Resource Management System. The spectrum of disciplines of the conference participants included the accounting, banking, investment, analyst, government and consulting as well as the expected geological and engineering representatives.

This conference was a first of its kind to make an effort to engage a broad cross section of the international community that creates and uses petroleum reserves and resource data.

* * *

The National Petroleum Council, a federal advisory body to the secretary of energy, was scheduled to release its "Global Oil and Natural Gas Report" in mid-July.

The report is a culmination of a vast amount of work, performed at the request of the secretary of energy, in what can only be described as a far reaching and comprehensive evaluation of oil and natural gas demand, supply and alternatives for hydrocarbon fuels in the context of global geopolitical uncertainty projected into the next 25 years.

A significant number of AAPG members contributed to the chapters associated with the endowment and supply portions of the study, which engaged the international producing community – both the government and private sectors – as well as the alternative fuels sector and the "peak oil" community.

Electronic copies of the report can be viewed at http://www.npc.org.

* * *

On July 27, AAPG/GEO-DC sponsored a U.S. Geological Survey Congressional Briefing on Energy and Climate Change.

This briefing, held in the Rayburn House Office Building, was part of a regular series organized by the USGS as part of its charter to provide science information for congressional staff on areas within the prevue of the USGS.

This was the first opportunity for AAPG to display the new position statement brochure that has been prepared by the Government Affairs Committee and approved by the Executive Committee.

AAPG/GEO-DC served as both host and master of ceremonies for this event.

* * *

On Aug. 5-9, members of the Government Affairs Committee (GAC) and GEO-DC will staff an AAPG booth at the National Conference of State Legislators (NCSL).

This will be the first year that the AAPG will have its own booth for the event, although AAPG has participated for several years in cooperation with several geological organizations through the GAC.

At the conclusion of last year's NCSL meeting in Nashville, Tenn., the GAC determined that there was merit in having a separate booth for AAPG in order to promote the importance of the petroleum geosciences at the state level.

* * *

GEO-DC is cooperating with the Eastern Section annual meeting organizers to coordinate a four-hour session on "Geology and Public Policy." The session will feature two congressional staffers – one from the House and one from the Senate – who will provide Section participants with a glimpse of what it takes to impact legislation at the Washington, D.C. level.

Work continues on the energy and minerals schools reinvestment act with AAPG members contributing language that helps to provide faculty and students at the historical energy geosciences and energy institutions with financial support and support the rejuvenation of many of these institutions. The legislation would bolster areas that were not fully recognized in the National Academy of Sciences study "Rising Above The Gathering Storm."

The focus of this legislation will be to

continued on next page

SEC Head Attends

D.C. Reserves Meet Draws Diversity

By LARRY NATION
AAPG Communications Director

Discussions about the changing nature of reserves accounting and the need for more consistent definitions were the top themes of the International Multidisciplinary Reserves Conference, held in late June in Washington, D.C.

AAPG was co-sponsor of the meeting, in cooperation with the Society of Petroleum Engineers, the Society of Petroleum Evaluation Engineers, the World Petroleum Congress and the United Nations.

Conference co-chair Peter R. Rose noted that the invitation-only conference attended by 130 persons met its goals, attracting a mix of geologists, engineers, bankers, regulators, accountants and economists and engaging in high-level discussions with technical professionals who define and generate reserve estimates.

Christopher Cox, chairman of the U.S. Securities and Exchange Commission, spoke to the group at a reception, underscoring the "powerful tool of interactive data" being instituted at the SEC.

At a luncheon earlier, SEC director of the Division of Corporation Finance John White noted how "the growing trend toward truly global, high-quality accounting methods has heightened the need to converge interactive data taxonomies and software tools to allow for cross-border analysis of companies."

He told the group of a volunteer program where companies are invited to participate in the SEC's new interactive reporting system, where data is pegged in a standard protocol for reporting purposes. Anadarko and Petrobras are participants from the energy sector.

"Taxonomies for the oil and gas industry are in development," White said, and, like the taxonomies for all other industries, will include data tags for all U.S. GAAP financial statement and footnote disclosure.

With about a third of the attendees from outside the United States, it also was noted that a system has been proposed to smooth the differences in international reporting versus U.S. accounting requirements.

In another luncheon address, Guy Caruso, director of the U.S. Energy Information Administration, led the group through the newly released EIA outlook to 2030, which projects world energy to grow 57 percent from 2004 to 2030, despite the relatively high world oil and natural gas prices.

However, the report surmises that the higher prices at about 2015 will dampen growth for oil and liquid fuels use; energy shares of natural gas, coal and renewable energy sources are expected to grow over this period.

Liquids consumption is still expected to grow strongly, however, reaching 118 million barrels per day in 2030. The United States, China and India together account for nearly half of the projected growth in world liquids use. ❑

SEC Chairman Christopher Cox, center, chats with conference co-chairs Mike Black of SPE, left, and past AAPG president Peter R. Rose.

continued from previous page

endow work force training at all levels, from the training of field personnel to the graduate level university programs.

Together with industry efforts, this legislation could provide a significant boost to both trainers and trainees for the oil and gas industry of the future.

(Editor's note: Don Juckett, head of AAPG's Geoscience and Energy Office in Washington, D.C., can be contacted at djuckett@aapg.org; or by telephone, 703 575-8293.)

PROFESSIONAL NEWS BRIEFS

Pedro Alarcón, to senior manager-exploration, Petro-Tech, Lima, Peru. Previously manager-geosciences, Petro-Tech, Lima, Peru.

Barry Borak, to principal, Huff Private Equity Energy Fund, Morristown, N.J. Previously independent consultant, Waban, Mass.

Steven H. Brachman, to exploration manager-Houston district, Petro-Hunt, Houston. Previously division geologist, Pogo Producing, Houston.

Peter A. Dea, to president and chief executive officer, Cirque Resources, Denver. Previously president and chief executive officer, Western Gas Resources, Denver.

Karen Dean, to senior geologist, Petro-Canada Resources (USA), Denver. Previously senior staff geoscientist, Williams Production, Denver.

Mark A. Earley, to geophysical adviser, Wilcox exploration group, EOG Resources, Corpus Christi, Texas. Previously geophysical adviser, regional studies-U.S. onshore, Kerr-McGee/Anadarko, Houston.

Joe Ellis, to senior geophysicist, DeGolyer & MacNaughton, Dallas. Previously principal consultant, Landmark Graphics, Houston.

Gonzalo "Gonz" Enciso, to senior associate, Rose & Associates, Houston. Previously vice president, the Exploration Portfolio, and chief geoscientist, Hydro Gulf of Mexico LLC, Houston.

Ian R. Gordon, to senior geophysical adviser, international new ventures, Noble Energy, Houston. Previously staff geophysicist, Anadarko Petroleum, Algeria.

Gary S. Grinsfelder, to vice president-exploration, TXCO Resources, San Antonio and Houston. Previously executive vice president-exploration and business development, Output Exploration, Houston.

Jon Herber, to senior geologist, Denbury Resources, Plano, Texas. Previously with Rosewood Resources in Dallas.

Sanggam Hutabarat, geologist, Saudi Aramco, Dhahran, Saudi Arabia. Previously chief geologist, Kufpec, Jakarta, Indonesia.

Wade D. Hutchings, subsurface manager-gas asset team USPO, Marathon Oil, Houston. Previously team leader-Angola B32 exploration, Marathon Oil, Houston.

Mike E. Johns, to vice president-geoscience, Bonanza Creek Energy, Bakersfield, Calif. Previously geoscience manager, Bonanza Creek Energy, Bakersfield, Calif.

Michael W. Langeler, to exploration manager, Cornerstone E&P, Irving, Texas. Previously group lead-East Texas, EnCana USA, Dallas.

Gopal K. Mohapatra, to geophysical adviser, Hess Corp., Houston. Previously senior exploration geophysicist, ExxonMobil Exploration, Houston.

Chris Platt, to manager-petrophysics, Pearl Oil (Thailand), Bangkok, Thailand. Previously consulting petrophysicist, Chevron Thailand E&P, Bangkok, Thailand.

Glenn Rising, to geophysical adviser-GOM exploration, Hess Corp., Houston. Previously geophysical adviser-U.S. onshore exploration, Anadarko Petroleum, Houston.

Nour El-Din Mohammed Salama, to geologist, Al-Azhar University, Toukh, Egypt. Previously special geologist, Al-Azhar University, Toukh, Egypt.

Gregory S. Slutz, to GIS coordinator, Chevron Southern Africa Strategic BU (SASBU), Luanda, Angola. Previously GIS specialist, Chevron Energy Technology, Sugar Land, Texas.

Carl J. Smith has been awarded the 2007 Outstanding Alumnus award by the Reading (Pennsylvania) High School Alumni Association. Smith, formerly state geologist of West Virginia, is retired and resides in Morgantown, W.Va.

Richard L. "Rich" Smith, to vice president, exploration and business development, Stone Energy, Lafayette, La. Previously general manager-deepwater exploration, Dominion E&P, New Orleans.

Bob Stancil, to vice president-geology, Plantation Petroleum Companies, The Woodlands, Texas. Previously senior vice president-exploration, Ignis Petroleum Group, Plano, Texas.

Berry H. "Nick" Tew has been voted president-elect of the Association of American State Geologists (AASG). He will serve as AASG president in 2008-09. Tew is state geologist and oil and gas supervisor, Geological Survey of

continued on next page

Members Assume AASG Posts

Chacko John, Louisiana state geologist and director of the Louisiana Geological Survey, heads the list of AAPG members who will serve as officers of the Association of American State Geologists during the 2007-08 year.

John, who also is a professor at Louisiana State University in Baton Rouge, La., will be the AASG president for the coming year, succeeding current AAPG president-elect **Scott Tinker**, of Austin, Texas, who will serve on the board as past president.

Other AAPG members who will serve as AASG officers this year are:

❒ President-elect – **Berry H. (Nick) Tew**, Tuscaloosa, Ala.

❒ Treasurer – **Vince Matthews**, Denver.

❒ Historian – **James C. Cobb**, Lexington, Ky.

❒ Statistician – **Harvey Thorleifson**, Minneapolis. ❑

Anne Payne Ends AAPG Career

Anne Payne has retired as AAPG information systems manager after 41 years of service.

Payne was an airline stewardess for Delta Airlines before first coming to AAPG in 1964 as a word processor. She trained as the new technology progressed and ultimately became the chief architect of AAPG's customized data system and overseer of the Association's mainframe.


Payne

She also supervised the Association's switchover to iMIS association software. ❑

Member's Words Live On, and On, and On ...

It's official. An AAPG member is getting full credit for a notable quote that has been translated into every language spoken by lawyers all over the globe:

"Sue the bastards."


Yannacone

The Yale Book of Quotations (Yale) gives credit for the phrase to Victor Yannacone Jr., a lawyer practicing in Patchogue, N.Y., and an Associate member who has been active in various AAPG public outreach initiatives.

(No. Lawsuits were not involved).

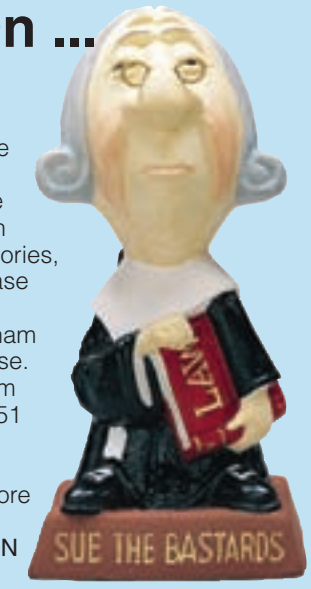
The quote also was cited giving Yannacone origination credit in an issue earlier this year of the New Yorker magazine.

Yannaconne helped found the Environmental Defense Fund in 1967 and, following the example of the civil rights movement, won several major environmental victories, including the first air pollution case brought in an American court.

He also was counsel for Vietnam veterans in the agent orange case.

In the quotations book, William Shakespeare has a whopping 451 quotes to Yannacone's one. The suspicion is that lawyers – in particular – quote Yannacone more often.

– LARRY NATION



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Alabama and State Oil and Gas Board of Alabama (respectively), Tuscaloosa, Ala.

Jan-Henk van Konijnenburg, to BC10 subsurface team leader, Shell Brazil E&P, Rio de Janeiro, Brazil. Previously senior geologist, Shell Malaysia E&P, Miri, Malaysia.

Brent J. Voorhees, to staff geologist, Mid-continent and Alaska business unit, Chevron North America E&P, Anchorage, Alaska. Previously affiliated consulting geologist, Petrotechnical Resources of Alaska, Anchorage, Alaska.

Dave Weinberg, to principal, Practical Risk, Rio Rancho, N.M. Previously senior technical adviser, U.S. Department of Homeland Security, Washington, D.C.

Rick Whitehead, to geologist-international new ventures, Apache Corp., Houston. Previously geologist-North Louisiana/Carthage, Anadarko Petroleum, The Woodlands, Texas.

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

GEOPHYSICAL CORNER

Diving Into Gas Hydrate Systems

(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 deals with gas hydrate and seismic attributes.)

By DIANA SAVA
and BOB HARDAGE

The need to understand deepwater gas hydrate systems is increasing, as several quarters of the geosciences world wants answers about:

✓ The use of hydrate as an energy resource.

✓ The role of hydrate in seafloor stability.

✓ Hydrate linkage to shallow-water flow.

✓ The nature of hydrate system architecture.

Gas hydrate is a solid material in which water molecules link together to form a cage, or clathrate, which encloses a single gas molecule. Several of these clathrates then link together to form a basic "unit volume" of crystalline hydrate.

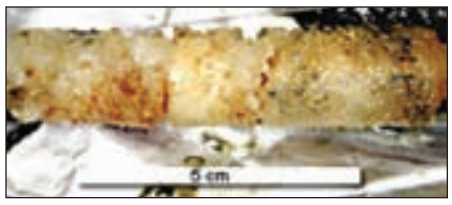

Photo courtesy Ian McDonald, Texas A&M

Core recovered from the Johnson Sealink cruise in the Gulf of Mexico in July 2001.

Depending on the type of gas molecules that are trapped in these cages, the number of clathrates that are linked to form these unit volumes may be 8 (Structure I), 24 (Structure II) or 6 (Structure H).

Because this ice-like material affects V_P and V_S seismic propagation velocities in deepwater sediment, it appears that accurate measurements of V_P and V_S made across deepwater, near-seafloor strata may allow hydrate concentrations within these strata to be estimated.

However, a major problem that confronts geophysicists who attempt to use seismic attributes to infer hydrate concentration in deepwater systems is that no one knows with confidence how these small unit-building blocks of hydrate are distributed within their host sediment.

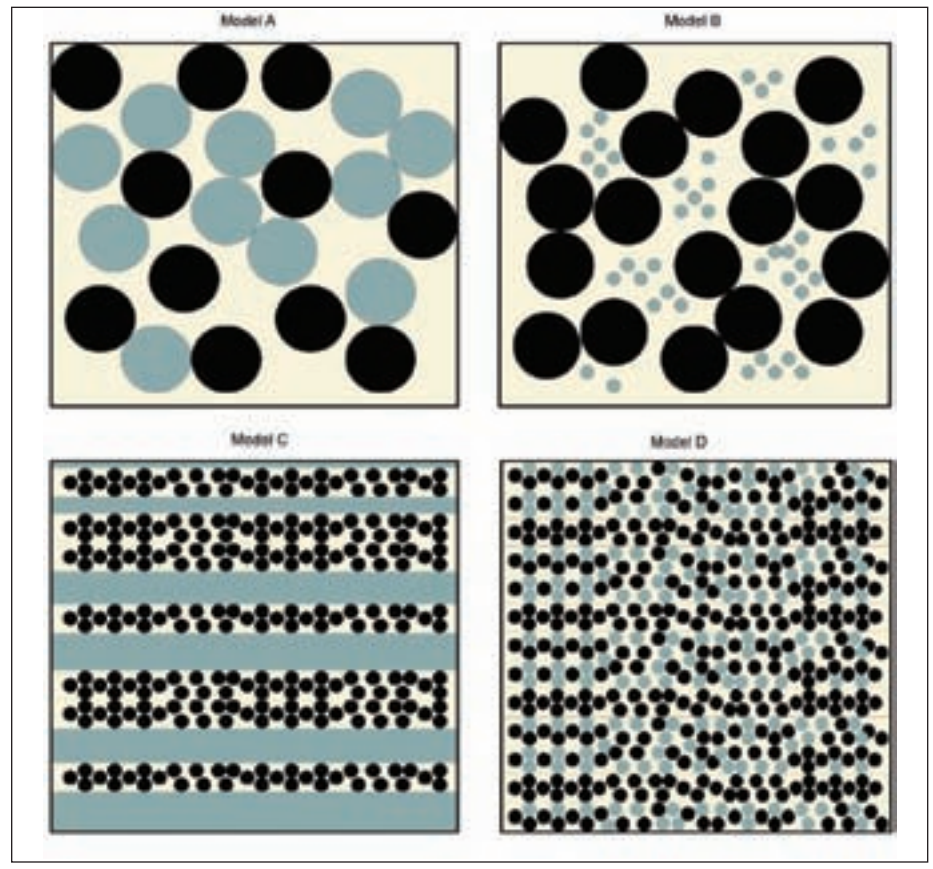

Figure 1 – Four possible models of gas hydrate systems: (A) load-bearing hydrate; (B) pore-filling hydrate; (C) thin layers of pure hydrate intercalated with layers of hydrate-free sediment; (D) thin layers of load-bearing hydrate intercalated with thin layers of hydrate-free sediment. Hydrate is represented in blue, with sediment in black.

* * *

Four possible hydrate-sediment morphologies are illustrated in figure 1:

✓ Model A assumes that the unit volumes of linked clathrates make physical contact with the sediment grains, become a part of the matrix and bear part of the sediment load.

✓ Model B assumes that the unit hydrate volumes float freely in the pore spaces and do not bear any sediment load.

✓ In Model C, many unit volumes link together to form thin layers of pure hydrate, and the hydrate system is a series of these pure-hydrate layers alternating with layers of hydrate-free sediment.

✓ Model D is similar to "C," except the layers of pure hydrate are replaced with layers of uniformly dispersed load-bearing hydrate, the concept described by "A."

In some areas, hydrate no doubt exists in vertical fractures and dikes, but for brevity, vertically oriented hydrate distributions are not included in this suite of models.

The dilemma confronting hydrate investigators is that for any given hydrate concentration, seismic propagation velocity changes significantly for each of these possible hydrate distributions (Model A, B, C and D).

For example, P-wave velocity V_P for each of these four hydrate models is illustrated in figure 2 as a function of hydrate concentration, and S-wave velocity (V_S) behavior is shown in figure 3. For a fixed concentration of hydrate (say a volumetric fraction of 30 percent), V_P can range from 3,300 m/s (Model D, fast mode) to 2,000 m/s (Model C, slow mode), and V_S can vary from 1,600 m/s (Model D, fast mode) to 200 m/s (Model B).

As a result, seismic-based and well-log-measured values of V_P and V_S cannot be used to predict deepwater hydrate concentration unless you know how the hydrate is distributed inside its host sediment.

* * *

This lack of understanding about hydrate-sediment morphologies in deepwater strata exists because there is such a paucity of laboratory analyses of cores that traverse deepwater hydrate systems.

For seismic and well log analyses of deepwater hydrates to accelerate at a faster pace, deepwater cores:

✓ Must be obtained.

✓ Must be maintained in their in situ temperature and pressure environment.

✓ Must be subjected to laboratory studies while maintaining these in situ conditions.

These laboratory tests must be designed so that the spatial distribution of hydrate throughout each test sample is accurately defined for specific hydrate systems.

Only then can researchers decide whether Model A, B, C and/or D, or some other hydrate morphology model, describes the rock physics concepts that have to be used to relate V_P, V_S and other seismic attributes to hydrate concentration in each type of hydrate environment that needs to be evaluated in deepwater basins. ❑

(Editor's note: Sava and Hardage both are with the Bureau of Economic Geology in Austin, Texas.)

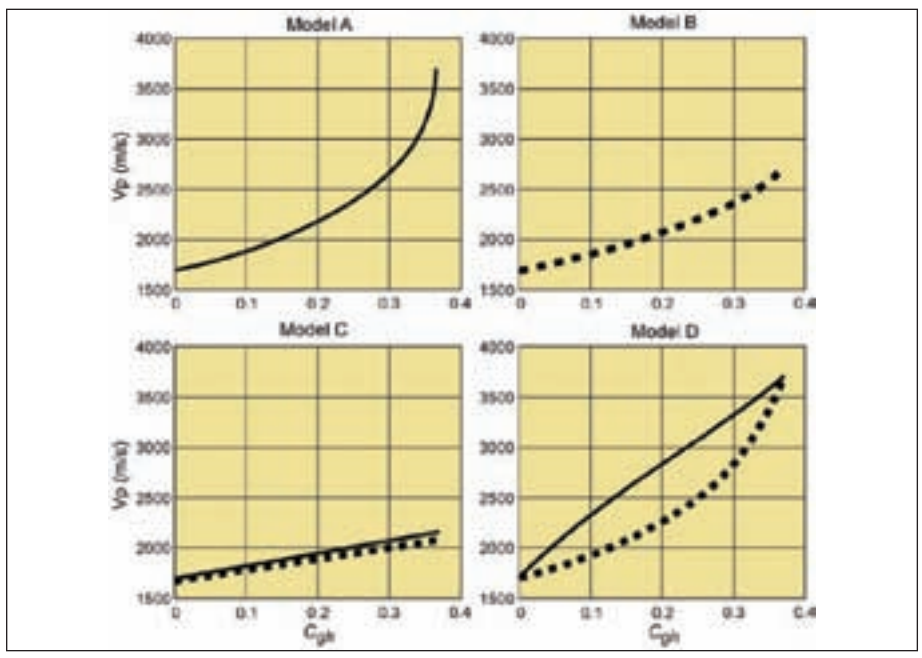

Figure 2 – P-wave velocity V_P shown as a function of the volumetric fraction of hydrate (Cgh) in deepwater sediment for each of the four hydrate-sediment models illustrated in figure 1. Layer Models C and D allow both a slow mode (dashed curve) and a fast mode (solid curve) to propagate. Sediment porosity is assumed to be 0.37, and the effective pressure is set at 0.01MPa.

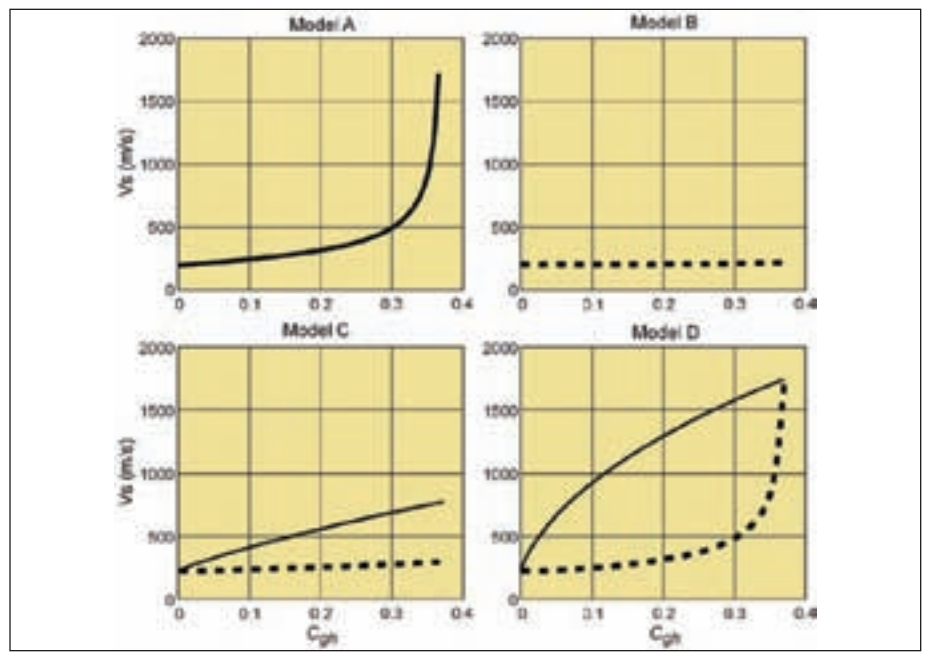

Figure 3 – S-wave velocity V_S shown as a function of the volumetric fraction of hydrate (Cgh) in deepwater sediment for each of the four hydrate-sediment models illustrated in figure 1. Layer Models C and D allow both a slow mode (dashed curve) and a fast mode (solid curve) to propagate. Sediment porosity is defined to be 0.37, and effective pressure is assumed to be 0.01 MPa.

Abstracts Sought For San Antonio; Deadline Sept. 27

Now is the time to prepare and submit your abstracts for the next AAPG Annual Convention, which will be held April 20-23 in San Antonio.

It's also time for exhibitors to reserve your place in what promises to be a large and exciting exhibits hall.

This year's convention theme is "Deliver the Conventional; Pursue the Unconventional," and members of the hosting South Texas Geological Society are preparing a program that addresses the challenges of unconventional plays – including shale gas, oil shale and coalbed methane.

Abstracts, which should be submitted online at www.aapg.org/sanantonio, are due Sept. 27.

The convention's technical program, which will involve forums as well as the usual paper and poster sessions, will be built around 12 areas. They are:

- ✓ Hydrocarbons from Shale and Coal.
- ✓ Deepwater Slope to Basin Systems.
- ✓ Structural Geology.
- ✓ Sedimentology and Stratigraphy.
- ✓ Reservoir Characterization and Modeling.
- ✓ Hydrocarbon Systems and Basin Analysis.
- ✓ New and Expanded Plays in North American and Global Basins.
- ✓ Geospatial Technology and Astrogeology.
- ✓ Environmental Concerns Related to Resource Development.
- ✓ Alternative Energy.
- ✓ Shaping Our Industry: People and Policy.
- ✓ Student Presentations.

For either exhibition space details contact Steph Benton at 1-918-560-2696; or e-mail to sbenton@aapg.org. For sponsorship opportunity details contact Randa Reeder-Briggs at 1-918-560-2660; or e-mail rreeder@aapg.org. ❑

USGS Director Is Mid-Continent Lunch Speaker

Mark Myers, the recently named director of the U.S. Geological Survey, will be the All-Convention Luncheon speaker for this year's annual convention of the AAPG Mid-Continent Section.

The meeting will be Sept. 8-11 at the Airport Hilton Hotel and Convention Center in Wichita, Kan. The theme is "New Ideas – More Oil and Gas."

Exploring that theme will be 52 papers and 15 posters that reflect the state-of-art developments on everything from shale gas to multi-component 4-D seismic in sandstone reservoirs. They will be complemented by a sold-out exhibits area.

New this year for the Mid-Continent is an emphasis on student participation, first with no registration fees, and second via a job fair for students, to be held on Monday and Tuesday, Sept. 10-11.

Myers, an AAPG member, is Alaska's former state geologist and head of Alaska's Geological Survey. He is the 14th director of the USGS since its inception in 1879.

For registration or more information, go online to www.aapg.org. ❑

IN MEMORY

LeBlanc

Rufus J. LeBlanc, an AAPG Powers Medalist, honorary member and internationally renowned geologist, died Tuesday, June 19, in Houston after a short illness. He was 90.

LeBlanc, who spent more than 40 years at Shell's Bellaire Research Laboratory, was best known for his pioneer and exemplary work on recent sediments, synthesis of Gulf Coast geology – and Cajun stories.

He received the AAPG President's Award in 1974; honorary membership in 1981; and the Sidney Powers Memorial Medal, AAPG's highest honor, in 1988.

Eldon Fredyrick Frazey, 84
Derby, Kan., Feb. 22, 2007
Charles Lewis Jones, 75
New Orleans, May 19, 2007
Rufus Joseph LeBlanc, 89
Houston, June 19, 2007
Reese E. Mallette, 75
Birmingham, Ala., May 5, 2007
Asa Duncan McRae, 86
Dallas, May 10, 2007
Michael Bruce Mickey, 61
Encinitas, Calif., April 5, 2007
Theodore "Ted" Allan Small, 83
San Antonio, June 8, 2007
Charles Buckner Spradlin, 75
Wichita, Kan., May 26, 2007
Laura Jean Ullrich, 52
The Woodlands, Texas
April 11, 2007 ❑

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

REGIONS AND SECTIONS

Elections Enter Online Voting Era

(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.

News items, press releases and other information should be submitted to the EXPLORER/Regions and Sections, P.O. Box 979, Tulsa, Okla. 74101.

Contact: Carol McGowen, AAPG's Regions and Sections manager, at 1-918-560-9403; or e-mail to cmcgowen@aapg.org.

This month's column deals with AAPG's new online election service.)

BY CAROL McGOWEN
Regions and Sections Manager

AAPG headquarters staff continually strives to improve services to members worldwide – and the latest evidence of this is the new online voting service for our Regions and Sections.

With the close of the organization's fiscal year on June 30 came the end of many AAPG elected officer terms. Traditionally, AAPG Sections, Regions or affiliated societies seek headquarters assistance with their officer elections.

Staff assistance involves validating the qualifications of officer candidates, creating the paper ballots and overseeing the printing and mailing of ballots and election instructions.

And then there is the sorting and counting by headquarters staff of individual paper ballots returned to AAPG headquarters in sealed envelopes – the entire process taking up to two months.

This year, with the help of AAPG's IT department, a new online voting process has been developed, and the Middle East Region was the first to test and utilize this quick, efficient and secure election method.

(Our thanks to AAPG Middle East Region President Aboud Afifi for his leadership to eagerly embrace the new process – and for his assistance to help test the newly designed system.)

Step by Step

Here's how the process works:

✓ The Region president submits officer candidate names to AAPG headquarters, and an electronic ballot is created.

✓ AAPG headquarters sends a test e-mail to all members in the region who have provided an e-mail address as part of their membership record.

The test e-mail contains a "message from the president" announcing the upcoming election and new online voting process – thus alerting members to the upcoming election but also checking the validity of the e-mail addresses.

Headquarters staff monitors and records all "bounce back" e-mails. Those members who do not use e-mail or those with a faulty e-mail address will not be left out of the voting process; they will receive a traditional paper ballot as before.

✓ One week later, a second e-mail announces the opening of the election, a deadline after which votes will no longer be accepted and online voting instructions. Members are directed to the "Members Only" area of AAPG's Web site where they can log in with their username (AAPG membership number) and password.

If you have forgotten your password, click on "Reset My Password" and follow the instructions (see page 50).

✓ Once logged on, members can easily follow the instructions to the electronic ballot, where they select their choice of candidates by clicking on the circle adjacent to each candidate's name. There is no limit to the number of times a vote may be changed BEFORE submitting the ballot. Members are encouraged to check their ballot carefully before hitting the "submit" button.

Safeguards

There are a number of safeguards to maintain security and accuracy:

✓ Logging on with an AAPG member number ensures only AAPG members are able to vote.

✓ The electronic ballot allows only one vote for one candidate for any one office.

✓ The online system will accept only one ballot per member. If a second vote is attempted, members will see a message on their computer screen stating, "Thank you for your vote submitted on ___ date. Members may vote only once in this election."

✓ By hitting the "print" button before submitting the ballot, members may print a copy of their ballot for recordkeeping and to further safeguard the accuracy of their vote.

The two-part vote counting mechanism is designed to be equally secure.

✓ Votes are automatically counted and recorded on an electronic scorecard.

✓ Each time a ballot is submitted, an e-mail of that ballot is created. The e-mails automatically go to an e-mail account, which allows each e-mail ballot to be viewed, printed and manually

continued on next page

Middle East Region Officers Elected

The newly elected officers of the AAPG Middle East Region are:

❒ President – Abdulkader (Aboud) Afifi (through June 30, 2009).

❒ Vice president – Chris Heine (through June 30, 2010).

❒ President-elect - Husain al-Otaibi (through June 30, 2009).

❒ Secretary – James W. Tucker (through June 30, 2009).

❒ Treasurer – Ahmed Hameda (through June 30, 2009).

Early Registration Means Big Savings for Athens

If you're planning to attend the AAPG European Region Energy Conference and Exhibition in Athens, Greece, there are hundreds of reasons why now would be a good time to register.

Register by Sept. 19 and you could save up to $275 off the registration fee.

Athens 2007, the first joint venture meeting between AAPG and the AAPG European Region, will be held Nov. 18-21 at the Megaron International Conference Centre.

The meeting's official technical program and registration announcement has been mailed and both are now available online at www.aapg.org/athens.

The meeting's theme is "Challenge Our Myths," which will include three main areas: Regional, Technical and a Management Forum on "Energy Supply and Demand Perspective on Current Dynamics."

The entire technical program will offer 348 technical presentations – 228 oral papers in five concurrent sessions and 120 full-day posters.

Some of the technical program highlights include:

✓ A session on "Untraditional Theories and Ideas in Global and Large Scale Geology," which will examine the basis for the concept of subduction zones.

✓ Updates on recent exploration and production within key petroleum regions in the Mediterranean, North Africa, Middle East, Caspian, Black Sea, Russia, North Sea, Norwegian Sea and the Barents Sea.

✓ Updates on carbonate and clastic reservoirs, structural geology, heavy oil, unconventional resources and resource estimation.

✓ A look at the energy supply and demand picture.

Greece's multi-dimensional history and culture will provide the setting for a number of social activities, including visits to:

✓ Classical and historical locations in and around Athens – including the Acropolis and Agora.

✓ Archaeological and Byzantium museums.

✓ High-tech displays at the Hellenic Centre, planetarium and Olympic Complex Centre.

✓ Nearby islands of Aigina and Spetses.

✓ Vineyards and wineries in Attica.

Remember, registration and other meeting details are available online at www.aapg.org/athens.

And remember to register by Sept. 19 to save a lot of money. ❑

The Acropolis is just one of the attractions that Athens holds for those attending the AAPG-AAPG European Region Energy Conference and Exhibition.

continued from previous page

counted, if necessary.

Once the election is closed, the Region president is immediately notified of the winners. Then at the Region president's direction, an e-mail is sent out by AAPG headquarters notifying all members in the Region of the election results. ❑

FOUNDATION UPDATE

Foundation Donors

The names that appear here are of those who have made donations to the AAPG Foundation in the past month – predominately through adding some additional monies on their annual dues statement.

To these people, and to those who have generously made donations in the past, we sincerely thank you.

With your gifts, the AAPG Foundation will continue its stewardship for the betterment of the science and the profession of petroleum geology.

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FOUNDATION UPDATE

The AAPG Foundation recently received generous gifts to fund new Digital Products subscriptions at three universities, and the Foundation Trustee Associates have announced two new members.

The new Trustee Associates are:

❒ **Larry Jones**, Houston.

❒ **Charles Williamson**, Sonoma, Calif.

Their membership brings the Associates total to 265.

Jones, last year's chairman of the AAPG House of Delegates, also has provided funding for a Digital Products Subscription for the University of Nebraska, Lincoln, in honor of professor M. Stout.

The month's second gift toward a Digital Products Subscription is from **M. Ray Thomasson** and his wife, **Merrill Shields**, for the University of Missouri, Columbia.

Thomasson, of Denver, is an AAPG Honorary Member and past president.

The third gift is from **John H.** and **Colleen Silcox**, for the University of California-Berkeley.

The DataPages online university subscriptions provides access to all AAPG publications from 1917 through the present, including the AAPG BULLETIN, Environmental Geosciences and AAPG special publications. In addition, the current collection of over 600,000 pages includes over a dozen geological society collections with more being added continually.

More than $462,500 has been received for university subscriptions since the program started in 2005.

For more information, or to provide this gift to your alma mater, contact Rebecca Griffin with the Foundation at 918-560-2644.


Jones


Thomasson


Shields


Silcox


Silcox

* * *

In other Foundation news, the A.I. Levorsen Memorial Award is getting a makeover.

Robert Levorsen, of Novato, Calif., recently provided a generous gift that the Foundation will use to update the Levorsen Award plaque originally established in 1966 by Dr. A.I. Levorsen's friends to create a lasting memorial to him.

The Levorsen Award is presented at each AAPG Section meeting to the individual presenting the best paper, with particular emphasis on creative thinking toward new ideas in exploration. The winners – including co-authors – also receive a copy of A.I. Levorsen's book, *Geology of Petroleum*. ❒

Eastern Section Meets Sept. 16-18 In Lexington, Ky.

"Winning the Energy Trifecta" is the theme for this year's annual meeting of the AAPG Eastern Section, which will be held Sept. 16-18 in Lexington, Ky.

The meeting, set at the Lexington Convention Center, offers a two-day technical program, workshops and a variety of field trips to view geologically significant areas of Kentucky.

The meeting theme, organizers said, "reflects the triple challenge faced by the energy industry in exploring, developing and sustaining energy resources."

Meeting highlights will include:

✓ Training courses for Geographix™ and Petra™ geological software.

✓ Workshops on CO_2 enhanced oil recovery and unconventional reservoir analysis (see related stories, page 16).

✓ A "Devonian Shalebration," which is a special display of Devonian organic-rich shale cores from the Appalachian, Illinois and Michigan basins.

✓ A tour of Mammoth Cave, the world's longest known cave system, and a coal geology trip to southeastern Kentucky.

✓ Participation in a teachers' workshop at the Falls of the Ohio State Park near Louisville.

For registration or more information, go to http://www.esaapg07.org. ❒

WWW.UPDATE

Be Empowered: Set Your Password

By JANET BRISTER
Web Site Editor

You've got the power.

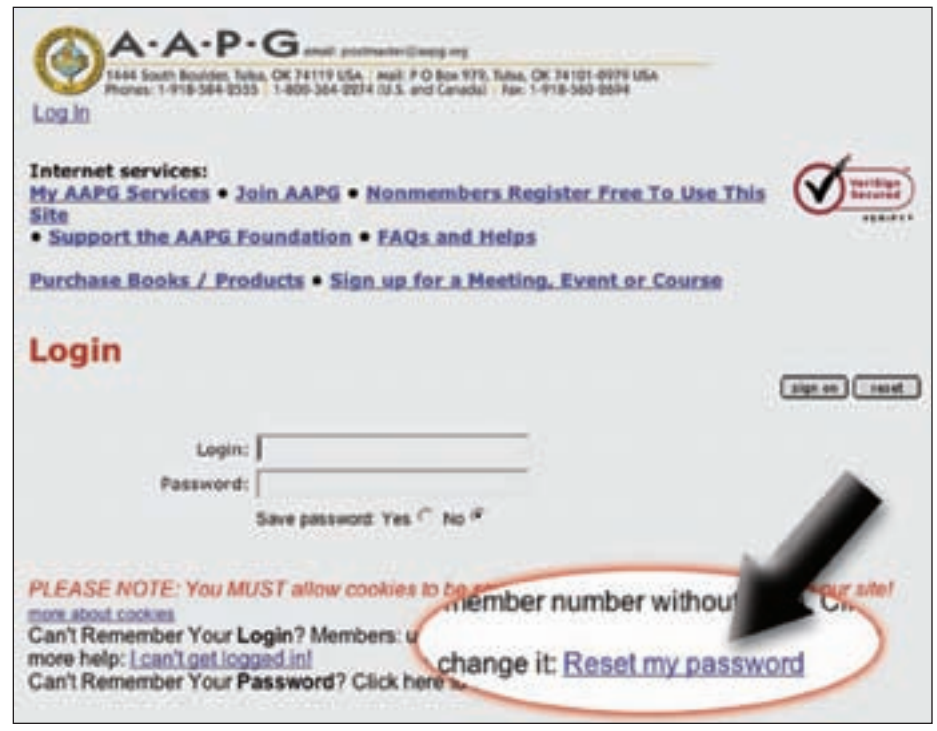
For some that brings to mind a head-bangin' beat and a little smile of a song from the past.

Yet that's the phrase that came to my mind as I started to address password usage and the fact there are still members not using their "members only" access.

With a password you have the power to pay your bills, share (or not share) your life-information with others and gain access to proprietary data for your eyes only.

Stop and think for a moment how many passwords you use on a daily basis. There's the security code for work or home; ATM machines, voice mail, e-mail, bill-paying, shopping, data mining, computers, laptops, cell phones, keyless car entry … the list never ends.

With our trusty four-digit (and beyond), alphanumeric, non-random easy-to-remember (yeah, right!) password we have a lot of power to open doors of all kinds.



The Beat Goes On

Passwords have become a necessary part of our electronic world. Those of us who prefer electronic over traditional communication embrace passwords and have found a strategy that works.

By strategy I refer to managing those passwords, keeping them simple enough to remember, finding a combination of alpha and numeric characters that makes a password universally accepted, yet still simple … stuff like that.

Sounds simple, right?

Well, there are some of you saying "No" to that question. You see the word "password" and lock up. You simply want to do your research and move on. Pay your bill and continue your day.

It's all about empowerment.

On the other side of this power equation are the people who are granting you access. At times they give you complete control over your login configuration and at times they ask you to conform to their system's requirements.

AAPG falls somewhere in the middle of that strategy.

AAPG has asked for some conformity to assist in better managing and synchronizing passwords with members' information and activity.

All AAPG members have been issued a unique number as their member ID. This is your "Login" code and is printed on your membership card. This does not vary for anyone.

However, you have control over your password. Here are the guidelines:

✓ Four to 32 character limit.

✓ Alpha and numeric characters only (no symbols such as $, _, !).

✓ Watch your case – it is case sensitive so if you use a capital letter it must always be a capital letter.

Memories

Sometimes we forget these passwords or can't remember the initial one assigned to us.

We have a procedure to remedy.

On the members only login page look for the "Reset my password" link. You provide us your e-mail and quickly an e-mail is sent providing you a link to reset your password.

If the e-mail you provide does not match the e-mail AAPG has in your record you'll know immediately and should call AAPG for assistance.

Just because you have the power to electronically do business with AAPG doesn't mean you are expected to never call and talk to your AAPG staff. It just means you can do business when it is convenient for you – wherever you happen to be!

Good browsing! ❑

MEMBERSHIP AND CERTIFICATION

The following **candidates** have submitted applications for membership in the Association.

This does not constitute election, 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. (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

California
Orndorff, Harold A., Aera Energy, Bakersfield (K.L. Pitts, J.R. Schwalbach Jr., D.M. Miner)

Kansas
Clark, George R., Kansas State University, Manhattan (M. Hubbard, C. Oviatt, P.C. Twiss)

New York
Hill, Barbara M., consulting geologist, Liverpool (reinstate)

Texas
Boedeker, Jennifer Savickas, Schlumberger, Houston (J.M. Wilson, H.L. Buscher, J.N.Vogt); **Daal, Julieta Josefina**, IHS, Houston (E. Guevara, F. Bello, E. Moldovanyi); **Kapitan-White, Elsa K.**, Schlumberger, Sugar Land (G.M. Gillis, K.S. Glaser, W.D. Riser); **Makhonin, Alexey**, ExxonMobil Corp., Houston (T. Apotria, J.C. Tingey, C.J. Lopez); **Roeling, Barbara O.**, Daniel B. Stephens & Associates, Austin (K.S. Hopson, M.A. Jacobs, R.W. Ruggiero); **Saudale, Ellya**, Schlumberger, Houston (R.J. Amstadt, R.A. James, W.W. Xu); **Zahm, Christopher Kent**, the University of Texas at Austin, Houston (S.W. Tinker, F.J. Lucia, E.C Potter)

Utah
Carney, Stephanie M., Utah Geological Survey, Salt Lake City (T.C. Chidsey Jr., C.D. Morgan, D.E. Tabet)

Wyoming
Mellinger, Kurt, ConocoPhillips, Cody (reinstate)

Algeria
Mokhtari, Nasser, Sonatrach Exploration, Boumerdes (J.C. Lorenz, S.P. Cooper, R. Bracene)

Australia
Lund, David Gerard, Oil Search Ltd., Sydney (K.C. Hill, R. Heidorn, G.M. Bradley); **O'Leary, Robin Patrick**, Origin Energy, Brisbane (R.J. Suttill, G.J. Kemp, D.C. Lowry)

Bangladesh
Akhtaruzzaman, Md, Petrobangla, Dhaka (G.R. Taylor, S.R. Lawrence, A. Wilcockson)

Canada
Freeman, Michael Edward, Belloy Petroleum Consulting Ltd., Calgary (D.L. Oicle, B.A. Fyke, R.K. Sullivan); **Orr, Lindsay L.**, Enerplus Resources Fund, Calgary (L.A. Griffith, K.G. Root, C. Steudler); **Watson, Raymond Neil**, Husky Energy, Calgary (I.K. Sinclair, E. Scott, C F. Lamb)

England
Lee, Peter Gerard, Chevron, London (D.E. Lawton, C.E. Fordham, P.P. Roberson); **Rebata Hernani, Luisa Amparo**, Badley Ashton & Associates, Horncastle (K.R. Adamson, M. Ashton, D.M. Bliefnick)

Germany
Luning, Sebastian, RWE Dea AG, Hamburg (J.D. Smewing, D.R.D. Boote, S. Johnsen)

Greece
Tassos, Stavros T., National Observatory of Athens, Glyfada (G. Lunde, K. Gerdes, S. Johnsen)

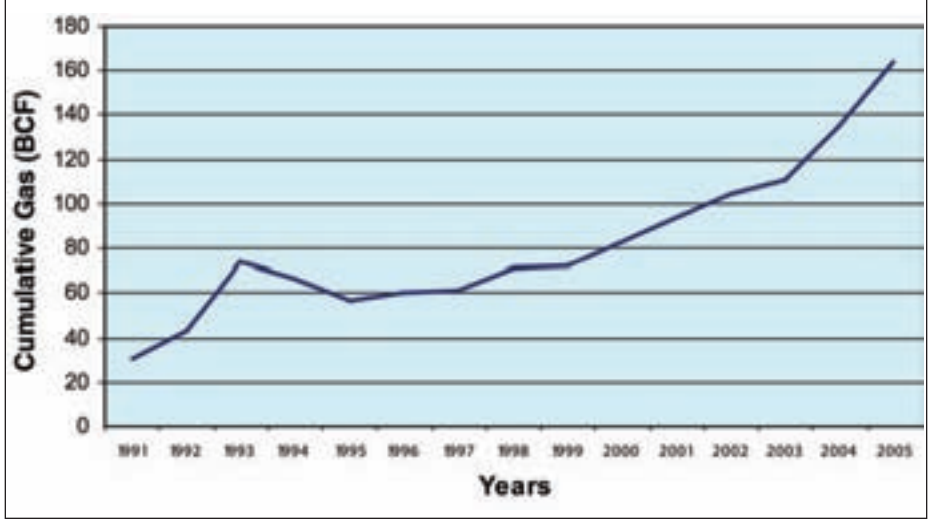
India
Roy, Ananda Shankar, Baker Atlas, NAVI MUMBAI (G.U. Das, A.A. Bal, S. Sanyal)

People's Republic of China
Longzhang, Wang, China University of Geosciences, Wuhan (S. Li, J. Ren, H. Zongquan)

Portugal
Santos, Fernando Monteiro, University of Lisbon, Lisbon (H. Matias, P.R. Kress, J.R.V. Brooks)

United Arab Emirates
Lucas, Noel Billote, Halliburton, Abu Dhabi (W.H. Abbott, E.V. Tamesis, K.J. Wells) ❑

A graph on Utah's cumulative gas production curve for the eastern Uinta Basin that was published in the July EXPLORER (page 14) included incorrect information. The corrected graph, showing cumulative gas measured in BCF, is published here.



READERS' FORUM

Editor's note: Letters to the editor should include your name and address and should be mailed to Readers' Forum, c/o AAPG EXPLORER, P.O. Box 979, Tulsa, Okla. 74101, or fax (918) 560-2636; or e-mail to forum@aapg.org. Letters may be edited or held due to space restrictions.

Training

I am a long-retired geologist, once chief explorationist for Texaco with a 32-year career in the oil business, and I have been noticing over recent years that the study of geology in a university setting is suffering more each passing year.

The rationale for this is that industry has an ever-lessening demand for geologists, which has resulted in an ever-shrinking pool of new students in this science.

My experience over my 85 years tells me that geologic training has prepared me not only for understanding geologic phenomena and their imprint on looking for oil, but also for an understanding of other sciences and for the beauties of nature. And beyond that, it conditioned me to expect the unexpected, to deal with serious uncertainties and to make decisions that required leaps of judgment beyond what was factual.

Geologic training is unique among the sciences because it touches on all of the natural sciences and requires the student to relate all such evidence as it appears in nature. Making decisions under uncertainty, with the attendant occasional failures stemming both from lack of needed data and misinterpretation of the existing evidence, has given me a talent of significant value in the business world. The willingness to act before the bulk of pertinent evidence is at hand provides a timely advantage over competitors.

Competent, traditional geological training at the academic level, when the focus was on thinking out the solution against a background of rigorous training in the science, has produced independent geologic thinkers for decades. My experience with hundreds of explorationists has led me to seek out such individuals with preference over more "technically" trained candidates.

The country needs more of such scientists, both in industry and academia.

Richard B. Palmer
Burlington, N.C.

Pay Up

For many, many decades the oil geologist has been severely, seriously UNDERPAID relative to many, many professions and industries. During these decades the world has thrived on cheap oil and commodity assets of all types.

Underlying the delivery of these benefits to the world, at this cheap commodity "party," have been our people – the ones with imaginations, skill and training to find, produce, transport, refine and deliver oil and gas to society.

The cheap oil and gas commodity "party" is clearly over. The time for "our people" to severely, seriously thrive is NOW.

It is also time that our AAPG leadership stopped with the platitudes about "serving mankind's needs," etc., when talking about AAPG geologists and the role that they serve in society. What they need to do is to start beating an angry drum with oil company managements, politicians and Wall Street, etc., that experienced oil geologists are "scarcer than hen's teeth," and you don't just graduate them out of school and turn them into oil finders.

Minimum base salaries for 15-plus years experienced people need to be in the $500,000 to $1 million range. As an industry, (engineers, geophysicists, oil field hands in general), we are still grossly underpaid relative to: The dot com punks, Silicon Valley as a whole, the Wall Street crowd (Goldman Sachs split $16.5 billion in bonuses in 2006 – give me a break), the lawyers, the entertainment industry and so on.

Our oil industry leadership needs to quit apologizing to the Chuck Schumer's, the Chris Dodd's, Katie Couric, Bill O'Reilly, Meredith Viera, etc., ad naseum, for being who and what we are.

What our industry leaders need to say is real simple:

"Get down on your hands and knees and give real thanks that extremely smart men and women deliver to your corner gas station, to your house, to the manufacturing system that you need every day to live in a civilized society. We do it cheaply, (even at $90/oil – get ready, it's a fair price), we do it safely and we do it as efficiently as it can be done."

I have no doubt the lack of experienced real oil finders is holding back E&P projects around the world to some very measurable degree. The trained, experienced personnel are just not available – and the ones that are available need to be properly compensated.

Bradford R. Schmalfuss
Houston

continued on next page

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Oh, Canada?

Although I have a high regard for ALL the elected officers in this last election round (July EXPLORER), I find it troublesome that the first elected vice president-Regions is from Canada.

If AAPG truly wants to become an international society it would be better served by having the initial candidates for this position come from outside North America.

George Klein
Sugar Land, Texas

Time to Shift

Regarding your article "Hedberg Views World Resources" (January EXPLORER): I am glad to see this story published. It is one of the duties of the AAPG to publish the facts about the coming oil plateau, which eventually will be followed by a decline in the world oil production (see May EXPLORER).

The sooner an individual shifts her/his lifestyle to run off renewable energy sources, the better for that person and everyone else.

The sooner a city shifts its energy demands to be supplied by renewable energy sources, the better for that city, and everyone else. The sooner that a civilization shifts to renewable energy sources, the easier the transition to renewable energy sources will be for everyone.

We don't have to go flaming into a night of destruction, fighting over a diminishing fossil fuel supply, for Pete's Sake!

Heloise Lynn
Houston

CLASSIFIED ADS

POSITION AVAILABLE

Research Petroleum Geologist (Geologist IV)
Kentucky Geological Survey
University of Kentucky, Lexington, Kentucky

The Kentucky Geological survey, a research center of the University of Kentucky, invites applications for a position in petroleum geology. Experience in subsurface geologic, geochemical, and geophysical interpretations is needed. Responsibilities will include research on hydrocarbon reservoirs and production, EOR in the Appalachian and Illinois Basins, and carbon sequestration. The successful candidate will be able to develop new research programs and communicate scientific results in presentations, reports, and publications. A record of successful grant funding is preferred. Qualifications are Ph.D. in a geoscience discipline and three years experience or M.S. and equivalent industry or academic experience. Annual salary ranges from $55,000 to $90,000 depending on qualifications and experience. Applicants must apply through the University of Kentucky employment web site. To apply for position #SM517657, submit a UK Online application at www.uky.edu/HR/UKjobs. If you have any questions, contact HR/Employment, phone (859) 257-9555 press 2, or email ukjobs@email.uky.edu. Applications will be accepted until the position is filled. The University of Kentucky offers an attractive benefits package and is an equal opportunity employer and encourages applications from minorities and women.

* *

U.S. Geological Survey Mendenhall
Postdoctoral Research Fellowship Program

The U.S. Geological Survey (USGS) invites applications for the Mendenhall Postdoctoral Research Fellowship Program for Fiscal Year 2009. The Mendenhall Program provides opportunities to conduct research in association with selected members of the USGS professional staff. Through this Program the USGS will acquire current expertise in science to assist in implementation of the science strategy of its programs. Fiscal Year 2009 begins in October 2008.

Opportunities for research are available in a wide range of topics. The postdoctoral fellowships are 2-year appointments. The closing date for applications is November 9, 2007. Appointments will start October 2008 or later, depending on availability of funds. A description of the program, research opportunities, and the application process are available at http://geology.usgs.gov/postdoc. The U.S. Geological Survey is an equal opportunity employer.

* *

Senior Geologist: Houston, TX. Apply geological concepts to maximize rate and reserves profiles for the Cleveland reservoir. Ensure high quality and timely geoscience support for reservoir management. Work with onshore tight gas reservoirs and horizontal well planning. Use seismic interpretation software to interpret seismic data and incorporate seismic attributes for enhanced horizontal well placement. Generate regional as well as field scale structural, net-reservoir and net-pay maps. Generate 3D static geological models(s) applying subsurface data integration skills to ensure all well data, 3D & 2D seismic interpretations and relevant production data are incorporated into 3D static geological model(s) on a regular basis for the Cleveland reservoir. Evaluate and integrate well log data with geological settings and well productivity. Provide wellbore image log interpretation, formation well log evaluation and core to log calibration as well as wellsite log acquisition quality control as needed. Provide geological support to wellsite staff and drilling engineers in high pace drilling rig operations. Requires B.Sc. in Geology plus 5 years of post-baccalaureate, progressively responsible experience as a Geologist including experience with onshore tight gas reservoirs, horizontal well planning and seismic interpretation. Contact BP America Inc., 501 Westlake Park Blvd., Houston, TX 77079 via email resume to Lois.Wilcox@bp.com, cc: Ron.Echols@bp.com. EOE.

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MISCELLANEOUS

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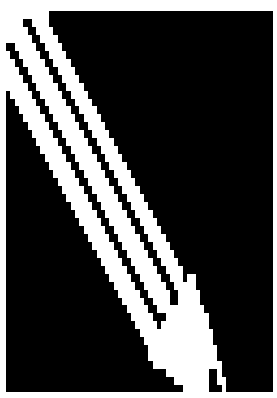

CLASSIFIED ADS

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DIRECTOR'S CORNER

Summer Begins With Discoveries

By RICK FRITZ

On the concept of "discovery," Sir Issac Newton was quoted to say that, "If I have ever made any valuable discoveries, it has been owing more to patient attention than to any other talent."

"Patient attention" is a good description to my personal early summer activities.

This year, a group of moms and dads formed the first official "all-girls" Little League Baseball team in Tulsa. The girls, all aged six to seven, selected pink and blue-gray uniforms and then decided that all the coaches should wear hot pink T-shirts.

Because it is a "first," the team has drawn some attention from the Tulsa media, and during their last game the local CBS affiliate did a special interest story and filmed part of the game.

I know they say that TV puts weight on you, but since I was dressed in a hot pink T-shirt it added about 250 pounds on me. I also get a lot of stares in the parking lot.

It has been great fun and I have discovered a lot about my daughter. The "Lady Cougars" have developed a following – now the bleachers are full of fans in hot pink.

Discovery is a great process!

* * *

During June, I spent some "discovery time" visiting members. Traveling and visiting with members is one of the best parts of my job.

✓ First, I visited Texas for the Houston House of Delegates year-end dinner and gave an update on AAPG activities for the past year at the invitation of Martin Cassidy, chair of the Houston HoD delegates.

Fritz

Texas, Malaysia, India – Traveling and visiting with members is one of the best parts of my job.

This is a dedicated group of members that meets each month (except for summer) to review new member applications. AAPG has one of the strongest peer review systems of professional societies and I always enjoy watching the process work. We appreciate all of those dedicated members who help with the membership process.

✓ Immediately after the HoD meeting I made a trip to Kuala Lumpur, Malaysia, and on to New Delhi, India, with then-AAPG President Lee Billingsley and his wife (and AAPG's "first lady"), Joanne.

Both of these countries have a high number of new and potentially new AAPG members, and the primary purpose of the trip was to build relationships and establish the foundation for new services.

In Kuala Lumpur we met with representatives from the Geological Society of Malaysia (GSM). The new president of GSM is Director General Yunus Abdul Razak, who is the head of the Mineral and Geoscience Department of Malaysia. We also met with the past president of GSM, Lee Chai Peng.

This is a very active group of geoscientists that represent government, academia and industry.

We also met with several Petronas geoscientists to discuss AAPG services.

While in Kuala Lumpur we attended the first committee meeting for the International Petroleum Technology Conference, which will be held for the first time in Malaysia in December 2008.

This will be the first joint meeting in Southeast Asia among AAPG, EAGE, SEG and SPE. SPE is the organizer of the conference.

✓ From Kuala Lumpur, we flew directly to New Delhi and received a warm welcome from representatives of the Association of Petroleum Geologists (APG) in India. This is an active growing group of geoscientists.

Dr. James Peters, GM-Basin Manager with ONGC was our host in India, along with Dr. P.N. Kapoor.

On our last day in India, Lee, Joanne and I had the opportunity to make presentations to the APG and APG's patron director D.K. Pande with ONGC. Before the presentations we had the privilege of meeting with the board of APG led by APG President Dr. Jokhan Ram, also with ONGC.

We discussed joint ventures including workshops, Hedberg conferences and a potential new GEO conference.

It was a very productive meeting and we look forward to working with APG and ONGC in the future. We especially thank Director Pande for his vision of how APG and AAPG can work together.

* * *

Albert Camus, a French author and philosopher, said that "You cannot create experience – you must undergo it!"

Certainly, this is true of AAPG and our industry. The people and networking part of our profession is the essence to discovery and future growth.

Non-Traditional Interest Increasing

Interest in Geothermal Heats Up

By J.L. RENNER

For many of you the next statement may be a surprise: Geothermal energy is used to produce electricity in 24 countries.

Leading the way with the largest geothermal capacity is the United States (2,544 megawatts electric, or "MWe"), followed by the Philippines (1,931 MWe), Mexico (953 MWe), Indonesia (797 MWe) and Italy (791 MWe) (*Bertani, 2005*).

When Chevron purchased Unocal it became the leading producer of geothermal energy worldwide with projects in Indonesia and the Philippines.

The U.S. geothermal industry is booming thanks to:

✓ Increasing energy prices.
✓ Renewable portfolio standards.
✓ A production tax credit.

California (2,244 MWe) is the leading producer, followed by Nevada (243 MWe), Utah (26 MWe) and Hawaii (30 MWe) (*Bertani, 2005*).

Alaska joined the producing states during 2006 with two 0.2 MWe power plants placed online at Chena Hot Springs. The plant uses 30 liters per second of 75-degree C water from shallow wells. Power production is assisted by the availability of gravity fed, 7-degree C cooling water (http://www.yourownpower.com/).

And a 13 MWe binary power plant is expected to begin production in the fall of 2007 at Raft River in southeastern Idaho.

Renner

Idaho also is a leader in direct use of geothermal energy with the state capital building and several other state and Boise city as well as commercial and residential buildings heated using fluids from several interconnected geothermal systems.

* * *

Existing U.S. plants focus on high-grade geothermal systems located in the West.

Interest in non-traditional geothermal development, however, is increasing.

For example, a comprehensive new MIT-led study of the potential for geothermal energy within the United States predicts that mining the huge amounts of stored thermal energy in the earth's crust not associated with hydrothermal systems could supply a substantial portion – 100,000 MWe – of U.S. electricity by 2050 with minimal environmental impact (Tester, et al., 2006, available at http://geothermal.inl.gov).

There also is renewed interest in geothermal production from other non-traditional sources, such as the over-pressured zones in the Gulf Coast and warm water co-produced with oil and gas.

Southern Methodist University recently hosted a conference on geothermal utilization associated with petroleum development. Details concerning the conference and the speakers' presentations are available at http://www.smu.edu/geothermal.

Ormat Technologies, a major geothermal company, recently acquired geothermal leases in one of the offshore over-pressured zones of Texas. Ormat and the Rocky Mountain Oilfield Testing Center (RMOTC) recently announced plans to jointly produce geothermal power from co-produced water from the Teapot Dome oilfield.

RMOTC estimates that 300 KWe capacity is available for geothermal development from the 40,000 BWPD of 88-degree C water associated with oil production from the Tensleep Sandstone (*Milliken, 2007*).

The Energy Policy Act of 2005 modified leasing provisions and royalty rates for both geothermal electrical production and direct use. Pursuant to the legislation the Bureau of Land Management (BLM) and Minerals Management Service MMS) published final regulations for continued geothermal leasing, operations and royalty collection in the Federal Register (Vol. 72, No. 84 Wednesday May 2, 2007, BLM p. 24358-24446, MMS p. 24448-24469).

* * *

Several Web sites periodically offer updated information related to the geothermal industry and the legislation and regulation affecting geothermal development. That includes:

✓ The Geothermal Energy Association publishes the "GEA Update" semimonthly and also summaries of existing geothermal projects and projects under development in the United States at http://www.geo-energy.org (see "Publications" and "Information" on their home page).

✓ The Nevada Division of Minerals periodically publishes the "Nevada Geothermal Update" and statistical data on geothermal development in Nevada at http://minerals.state.nv.us/forms/forms_ogg.htm.

(Editor's note: Renner, chair of EMD's Geothermal Committee, is with the Idaho National Laboratory in Idaho Falls.) ❑

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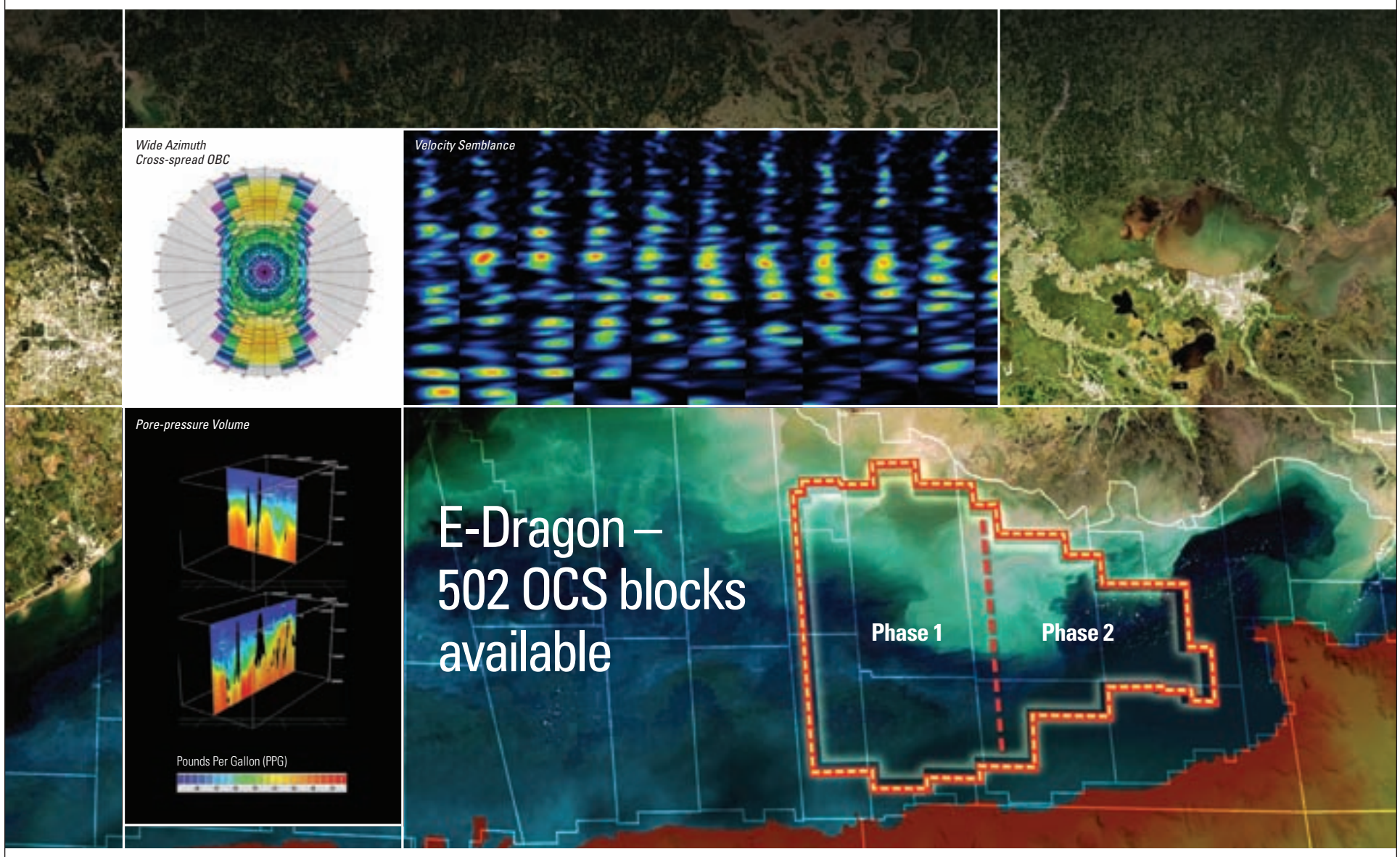

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