AAPG EXPLORER
JANUARY 2013

Rocky Road

The journey is his destination

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AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS AN INTERNATIONAL ORGANIZATION

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AAPG EXPLORER

PRESIDENT'S COLUMN

AAPG's Growing, Evolving Reach Continues

By TED BEAUMONT

As AAPG approaches its 100th anniversary in 2017, I wonder what the founders would think of AAPG now.


BEAUMONT

AAPG started when 122 men – most of them middle class, still in their 20s and educated at Midwestern or Eastern colleges – formed a group dedicated to the budding science of petroleum geology.

They thought in local terms – the group's original name was the Southwestern Association of Petroleum Geologists – but a year or so later the young geologists already dared to dream big enough to add "American" to the moniker.

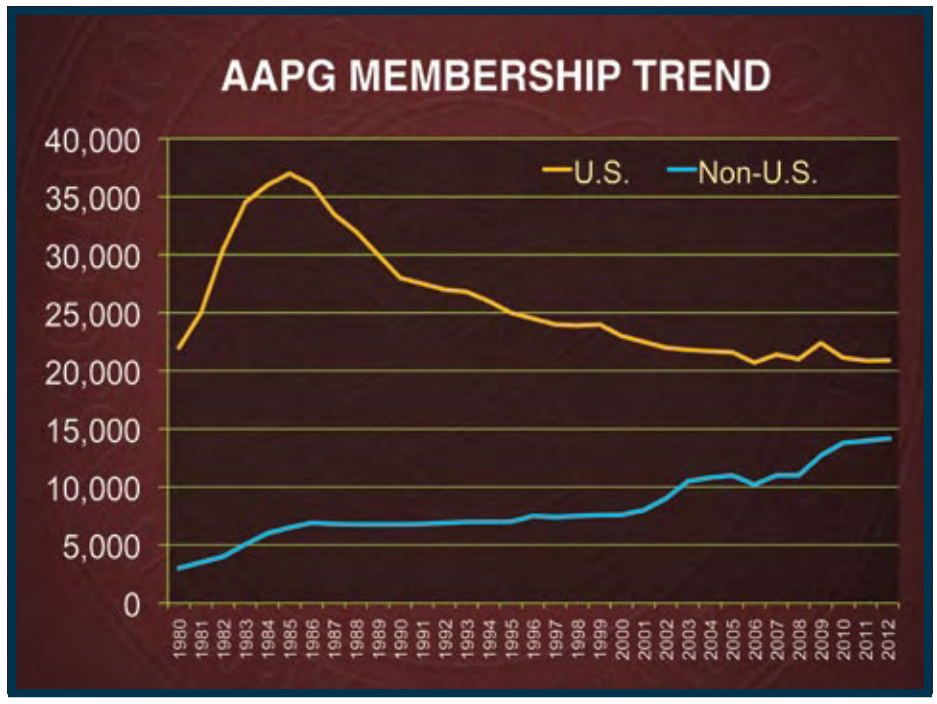
Today, AAPG has more than 36,000 members in 126 countries. Thirty-nine percent of AAPG members are non-U.S. residents – and the percentage is growing.

That growing non-U.S. contingent is a good thing and a natural part of the evolution of AAPG and our industry.

* * *

Around the world there is growing and recognizable enthusiasm for AAPG as evidenced by attendance and participation at AAPG-sponsored events like the International Conference and Exhibitions (ICE) or Geoscience Technology Workshops (GTWs).

This year, AAPG ICE was in Singapore, and the conference was a big success with over 2,100 attendees from 62 countries. Student attendees came from all parts of Southeast Asia, and their passion for AAPG was contagious and heartwarming.



I wish all the gray-headed members such as myself could interact with the Southeast Asian students to experience their excitement. They made me realize how important AAPG is to the international community. AAPG truly is an international organization.

Specifically, AAPG has six regions:

- Africa.
- Asia-Pacific.
- Canada.
- Europe.
- Latin America.
- Middle East.

We currently have offices in London, Dubai and Singapore, with staff and volunteers working diligently to deliver products and services to our members. For example, this year the AAPG Europe Region is hosting a Regional conference in Barcelona, Spain. And we're carefully evaluating where investments in additional offices can further extend the reach of AAPG.

As you probably know by now, the Latin America Region is host for the 2013 ICE, which will be held Sept. 8-11 in Cartagena, Colombia – the jewel of Colombia's Caribbean coast. Under the leadership of Victor Vega, the conference chair; Miguel Ramirez, Region president; and Victor Ramirez, Region president-elect, the 2013 ICE promises to be among the best ever.

As a result of activities like GTWs and the coming 2013 ICE, AAPG has become a catalyst for improving communication in Latin America. Countries that were inactive until recently are now actively participating in AAPG Latin America Region events. New relationships are developing between people, countries and companies – and even more interaction will occur as a result.

* * *

It is all very exciting and gratifying to see AAPG grow and lead the international petroleum geologic community. It must be similar to the excitement the founders of AAPG felt when they realized that the early association would be bigger than the one they first envisaged – one that just focused on the petroleum geology of the southwestern United States.

AAPG's founders must have been excited to see the enthusiasm of geologists from all over the United States for starting a new association. That's when they knew, nearly a century ago, that the name had to be changed to the American Association of Petroleum Geologists, to reflect the potential and possibilities that were rapidly emerging.

At some point in the not too distant future, it looks like the American Association of Petroleum Geologists may need to embrace this exciting global enthusiasm and face a similar decision.

Ted Beaumont

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REGULAR DEPARTMENTS

Scan this for the mobile version of the current web Explorer.

ON THE COVER:

AAPG member Patricio Desjardins, who works in the international exploration division for Shell in Houston, is an award-winning geologist who has been honored for his efforts studying and working with the Early Cambrian Gog Group in the southern Canadian Rocky Mountains – efforts that enabled him to enjoy an extensive amount of time doing what he loves best: Hiking through the mountains, observing the rocks at close range. That's him on the cover (and in the picture to the left), in the Canadian Rockies that he loves so dearly. See story, page 36. Photos courtesy of Patricio Desjardins.

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Statements, Bios Available Online

Video statements from all AAPG Executive Committee officer candidates continue to be available online at www.aapg.org.

The candidates were filmed responding to the statement, "Why I accepted the invitation to stand for AAPG office." Biographies and individual information for candidates also remains available online.

Ballots for the election will open in spring 2013.

The slate is:

President-Elect

❒ **Randi S. Martinsen**, University of Wyoming, Laramie, Wyo.

❒ **Kay I. Pitts**, Aera Energy, Bakersfield, Calif.

Vice President-Regions

❒ **István Bérczi**, MOL Hungarian Oil and Gas, Budapest, Hungary.

❒ **John G. Kaldi**, Australian School of Petroleum, University of Adelaide, Adelaide, Australia.

Secretary

❒ **Richard W. Ball**, Chevron Upstream, Southern Africa SBU, Houston.

❒ **Sigrunn Johnsen**, independent consultant, ProTeamAS, Stavanger, Norway.

Editor

❒ **Colin P. North**, University of Aberdeen, Aberdeen, Scotland.

❒ **Michael Sweet**, ExxonMobil Production, Houston.

Lander tabbed for keynote talk

Taylor Foundation Sets First Meeting in Houston

By VERN STEFANIC, EXPLORER Managing Editor

The inaugural meeting of the AAPG Charles Taylor Fellowship, featuring a keynote address by 2012 Pratt Award winner Robert H. Lander, will be held Feb. 4 at Rice University in Houston.

The gathering, which provides an opportunity for face-to-face interaction among the group's members, features a special dinner as a way to thank current and past members of the AAPG editorial board for their service.

Lander's talk will be titled "The Message Is the Medium: Reconciling Petrology and Rock Physics Models."

The Charles Taylor Fellowship was established last year by the AAPG Executive Committee as a way to help ensure that the BULLETIN remains the premier scientific journal of energy geoscience. It is a "special committee" that will be chaired by the AAPG Elected Editor, who currently is Stephen E. Laubach.


LAUBACH

The group comprises all former and current members of the Association's editorial boards. Initial priorities for the group have included improving editorial board operations, identifying suitable board and reviewer performance metrics and standards, monitoring of BULLETIN performance (including time-to-decision and other efficiency measures) and updating our reviewer database.

The Fellowship also takes an active role in identifying and soliciting topics for theme issues and may recommend review articles to be commissioned.

More than 300 people have been invited to the February dinner meeting.

Plans for the day call for several working sessions that deal with:

- Improvements to the BULLETIN editorial process.
- Selection of publication awards.
- Development of a short course for aspiring young authors.

"The Fellowship also is a way for AAPG to say 'thank you' to the more than 280 living former associate editors who have given their time and energy to the BULLETIN over the past several decades," Laubach said.

Charles Henry Taylor was AAPG's first editor, serving from 1917-19, and he was hailed as being a key figure in AAPG history.

His 1964 obituary called him the "father of AAPG."

Lander, who will speak during the dinner portion of the schedule, is with Geocosm in Durango, Colo. He and co-author Linda M. Bonnell received the Wallace E. Pratt Memorial Award – presented to honor and reward the authors of the best AAPG BULLETIN article in each calendar year – for the paper "A Model for Fibrous Illite Nucleation and Growth in Sandstones," which appeared in the August 2010 BULLETIN.

Fellowship members can attend the working sessions and dinner free of charge; a limited number of tickets to the dinner and Lander's talk will be available to the public on a first-come, first-served basis.

To request tickets, or for more information on the meeting, contact Tonia Greening at tgreening@aapg.org.

East Africa also boasted success

Surprise! North America Grabbed the Spotlight

By DAVID BROWN, EXPLORER Correspondent

Who would have expected to see North America and east Africa at the top of an article about global E&P developments?

The shocking resurgence of oil production in North America was 2012's leading energy story. Tight oil development, oil sands production in Canada and continued discoveries in the U.S. sector of the Gulf of Mexico all contributed to the boom.

Last year, deepwater discoveries on the Mexican side of the Gulf added a new angle.

In August, Mexico released preliminary information about a 350-million-barrel oil discovery in the Perdido Fold Belt. The Pemex Trion-1 well was drilled to 16,115 feet in 8,200 feet of water, about 110 miles from the Tamaulipas coast and 24 miles south of U.S. waters.

Officials said the discovery found about 1,050 feet (320 meters) of saturated oil pay with 18-25 percent porosity and as much as 250 md of permeability – enough for an estimated flow rate of up to 10,000 barrels per day.

Announcement of another significant discovery offshore Mexico followed just three months later, with news of the 125 million-barrel Supremo discovery for Pemex about 155 miles east of Matamoros. All reserve numbers are "3P" – proven, probable and possible.

The Supremo well, one of the deepest in the Gulf, was drilled in more than 9,500 feet of water.

North America led the way, but the entire world made 2012 a memorable year. Above, the Sakhalin II offshore platform, Russia.

Out of Africa

On the other side of the world, discoveries offshore Tanzania, Kenya and Mozambique turned the western Indian Ocean into an industry hot spot last year. Most of the new fields produced natural gas, with 80 trillion to 100 trillion cubic feet (Tcf) of gas in place, according to operator estimates.

Statoil and partner ExxonMobil reported a large offshore natural gas discovery with the Zafarani well in Tanzania's Block 2 license area, posting a preliminary resource estimate of 5 Tcf gas in place.

Zafarani was drilled in 8,470 feet of water to a total depth of about 16,700 feet, and encountered more than 390 feet of high-quality pay, Statoil announced.

That find was followed quickly by a second Statoil discovery just 10 miles away in Block 2, the Lavani well drilled in 7,875 feet of water. Lavani encountered over 300 feet of excellent quality reservoir sandstone, with a resource estimate of 3 Tcf, the company said.

Drilling offshore east Africa brought a string of successes in 2012 for a number of other operators, including ENI, BG plc, Tullow Oil and Anadarko Petroleum.

In June, Anadarko announced that its Atum exploration well offshore Mozambique, in Offshore Area 1 of the Rovuma Basin, found more than 300 net feet of gas pay in two high-quality Oligocene fan systems. The Atum well was drilled to a total depth of 12,665 feet in water depths of about 3,285 feet.

A gas complex containing Atum and the previous Golfinho discovery located about 10 miles to the northwest could hold 10 to 30-plus Tcf of recoverable natural gas resources, the company projected.

ENI also reported notable east African exploration discoveries, mainly in Offshore Area 4 off Mozambique. Its Mamba North East-2 gas field discovery, in high-quality Oligocene, Eocene and Paleocene sands, added 10-plus Tcf to the area's production potential, the company said.

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North American Impact

North America's much-improved oil and liquids outlook has global implications, according to Steve Trammel, research director and adviser-energy for IHS CERA in Englewood, Colo.

"It's staggering, really, what we're seeing here," Trammel said.

A recent IHS tight oil study covered 27 producing areas in the United States and Canada, he noted.

"We've just confirmed 47 billion barrels of economically recoverable oil and condensate," Trammel said.

"From where we are now, we're going to add five million barrels a day in the U.S. and Canada, and that's not counting the oil sands in Canada," he added.


TRAMMEL

"The Peak Oil guys are pretty quiet now, thanks to the creativity and innovation of the industry."

The study identified 39 billion barrels in contained natural gas liquids, and "if we talk about the dry gas associated with tight oil, there's 277 Tcf over the next 25 years," Trammel said.

He projected production of recoverable gas liquids and condensates to increase as much as four million barrels per day by 2021.

"If you add all that together, the total production increase could be 11 million barrels of oil equivalent (boe) per day," Trammel noted.

"We're really talking that North America could become energy self-sufficient over that timeframe. That's going to generate a whole global rebalance of supply," he said.

New finds within known producing areas are an intriguing feature of the North American tight oil picture: "Discoveries in known plays are the future," Trammel observed.

He said controlling costs will be critical for the industry, but the outlook for North American development remains highly positive. IHS projects "94 percent of these liquid resources could be produced at a price of $90 per boe, and about 65 percent can be produced at $60 per boe," Trammel said.

"Petrochemicals is going to be huge, too, because we have so much feedstock in the U.S. It's an amazing turnaround, what's happened," he said.

Without the big gas wells offshore east Africa, the industry would have seen declining natural gas discovery numbers around the world, said AAPG member Leta Smith, director, oil and gas supply for IHS in Houston. IHS projects 60 Tcf of recoverable gas from the recent exploration work in that area.

"It's all in the deep water, and of course the challenge is, 'How are you going to develop it?' We think it will be mostly LNG," she said.

Successful exploration off east Africa indicates "there's a lot more gas out there to be found" by deepwater drilling, Smith noted.

"In the past, companies weren't looking for gas offshore," she said. "It has been amazing how much gas has been found in deep water."

By contrast, the industry has seen slower success in international oil exploration in recent years, Smith added.

"One thing that's kind of interesting in crude oil is, discoveries of crude oil outside North America have been declining since 2010," she said. "We've seen declining licensing, as well."

She thinks higher oil prices are making work in older oil fields more attractive, possibly diverting interest away from new exploration projects in higher-risk areas of the world.

"The implications are that we may have seen declining oil exploration, but that will turn around once they run out of older fields to develop," she said.

In other areas of global exploration:

▸ Angola

Cobalt International Energy announced results in early 2012 from a subsalt oil discovery in Block 21 offshore Angola. Its Cameia-1 well was drilled in 5,518 feet of water to a total depth of 16,030 feet. Wireline evaluation confirmed a 1,180-foot gross continuous oil column with a more than 75 percent net-to-gross pay estimate.

The company's Cameia-2 follow-up became one of the world's most closely watched confirmation and delineation attempts.

In July, Cobalt said the second well reached basement at almost 18,000 feet. Log results confirmed the presence of a large hydrocarbon accumulation and confirmed lowest-known oil at least 440 feet deeper than observed in Cameia-1.

▸ Iraq/Kurdistan

Several discoveries and extensions broadened the potential of the Kurdistan Region of northern Iraq. DNO International of Norway said its Tawke-16 well flowed at a cumulative rate of more than 25,000 barrels per day from multiple, independently tested zones.

Tawke-16 was designed to appraise the undrilled northern flank of the Tawke field, DNO said. The well reached total depth of 7,770 feet and found over 1,150

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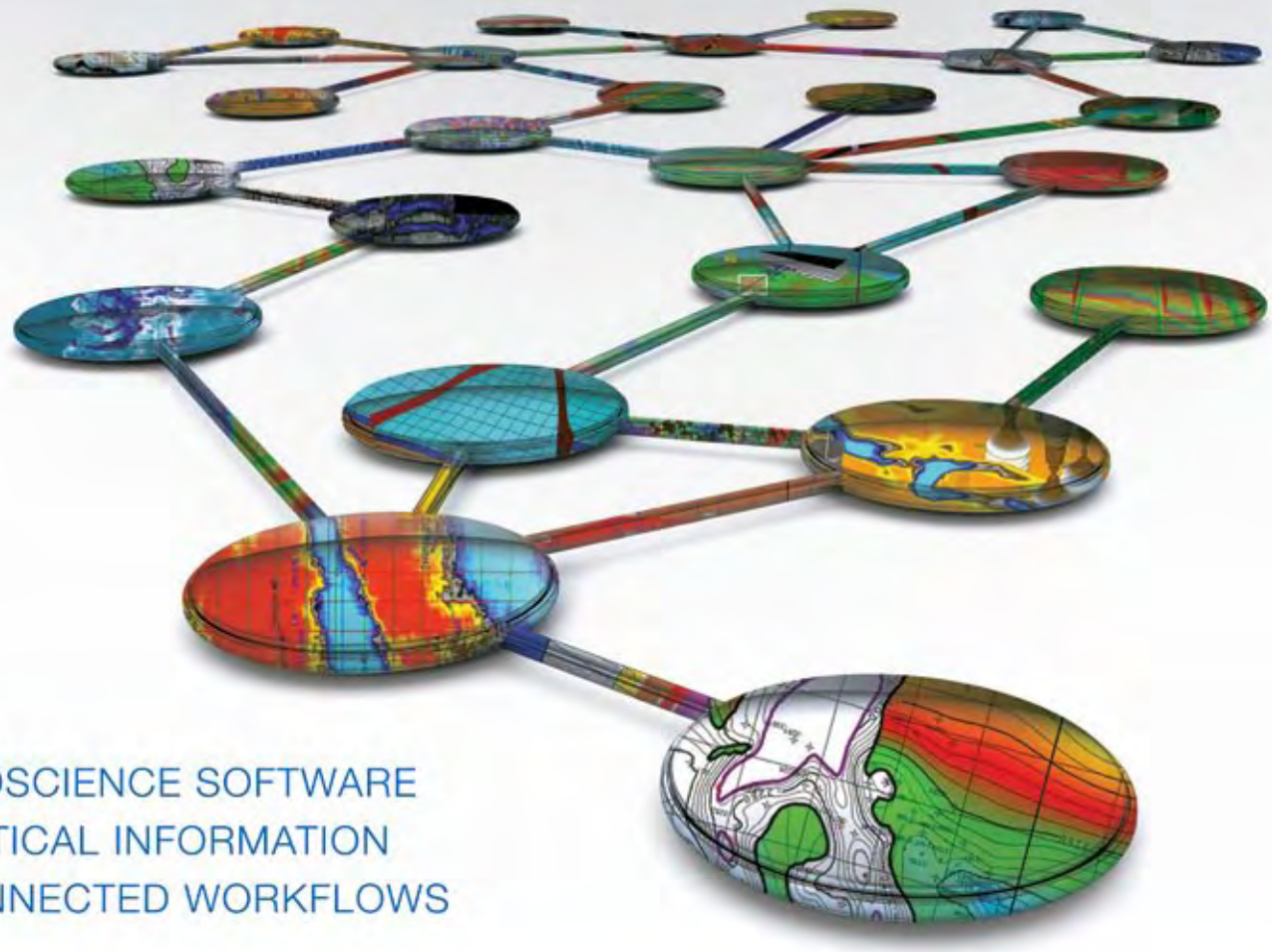

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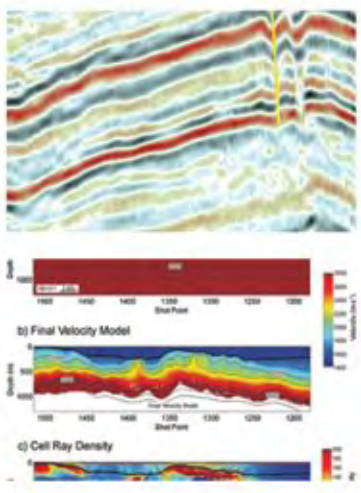

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IHS

Strong Technical Program Makes ATC a Success

This year's Arctic Technology Conference, held in early December in Houston, was once again a big success – and not just because the numbers were large.

Consider, instead, the impact of the technical program – a highly focused international collection of more than 150 presentations that addressed the technologies and innovations needed for Arctic exploration and production.

"The technical presentations were outstanding," said John Hogg, an Honorary AAPG member from Calgary, Canada, who chaired the ATC Technical Program Committee, "and for the first time the technical panels had great discussion around flow assurance and working with oil in the Arctic environment.

"The 2012 ATC meeting was quite successful," he added. "It built on the inaugural meeting and continues to grow in stature with Arctic-focused professionals, thanks to a strong Technical Committee and the support of the OTC (Offshore Technology Conference) board of directors."

The event attracted 1,243 attendees from 26 countries; the exhibits hall boasted 74 exhibitors from eight countries.

The top most represented (non-U.S.) countries were, in descending order, Canada, United Kingdom, Norway, Netherlands, Russian Federation, Finland, Japan, France, Sweden and Denmark.

Highlights included:

- Plenary session presentations on Arctic activity from **Jostein Mykletun** (Norway consul general); **James Hall** (director, Infield Systems); **Mohammed Zaki** (vice president-Russia, Total E&P); and **Robert Blaauw** (senior adviser global Arctic theme, Shell).
- A variety of panels, dealing with flow assurance challenges; oil spill preparedness; regulatory governance; and future directions for R&D between industry and academia.
- "Spotlight on Arctic Technology" awards were presented to **Ion** (for its under-ice towed marine streamer) and **Transkor Group Inc.** (for its Aqua MTM).

The next ATC will be Feb. 10-12, 2014, in Houston.

– VERN STEFANIC

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feet of gross continuous oil column in the Cretaceous.

Later in the year, London-based independent Afren announced that the Hunt Oil-operated Simrit-2 exploration well encountered more than 1,500 feet of net oil pay after drilling to 12,467 feet in the Ain Sifni PSC. Three drill stem tests at separate zones within the Triassic Kurra Chine formation yielded an aggregate flow rate of 13,584 barrels of oil per day, Afren said.

South America

Drilling in the Llanos Basin of Colombia primarily targeted crude, with several discoveries disclosed during 2012.

CEPSA and Gran Tierra Energy's Ramiriqui-1 oil exploration well in Llanos-22 Block, in the Andean foothills trend, was drilled to 19,519 feet measured depth. The Mirador formation produced initial natural flow rates of up to 2,525 barrels of oil per day. Total flow rates were restricted because of gas flaring limitations.

Industry interest grew sharply in the Vaca Muerta or Dead Cow shale play in Argentina. Observers have compared the Vaca Muerta's potential to the Eagle Ford play in the United States.

In late November, Americas Petrogas, Calgary, said the Los Toldos Este LTE.x-1 vertical well intersected the Vaca Muerta formation between 9,170-10,060 feet. After stimulation and clean-up, initial production reached 797 boe/day with 694 barrels of light sweet crude, it said. The initial 30-day average flow was 309 boe/day.

Other regions

✓ **Pakistan** continued to be a promising gas province. OMV completed the K-30 exploratory well on the Kadanwari block in the Middle Indus basin, which tested at 52 million standard cubic feet (scf) per day on choke.

Eni said the Badhra B North-1 exploratory well in the Khirtar Fold Belt region was drilled to 8,038 feet and found 177 feet of net gas pay in two thick Cretaceous sandstones of the Mughal Kot formation. The well flowed at 25 million scf/day and 35 million scf/day from the two sands.

✓ Oil discoveries kept piling up offshore **Brazil**.

✓ Drilling pushed production northward on the Norwegian Shelf in the **North Sea**.

Wintershall Norge said it found light oil with its Skarfjell prospect wildcat in PL 418 offshore Norway. Statoil and partners confirmed Skrugard and Havis prospect finds in the Barents Sea, with reserves of 400-600 million barrels of recoverable oil, and claimed the most northerly development on the shelf to date.

After a period of declining production, Smith says IHS now expects to see a small increase in North Sea oil production in the 2016-17 timeframe.

Multiple companies announced development and extension plans for recent crude discoveries. In an old story, a world that is supposed to be running out of oil keeps running into it.

"The Peak Oil guys are pretty quiet now," Trammel observed, "thanks to the creativity and innovation of the industry."

For the record, month by month

Worldly Pleasures: A Look Back at a Big Year

By DAVID BROWN, EXPLORER Correspondent

Some highlights from international activity in 2012:

January

A Statoil-led group announced a second giant oil and gas discovery in the Barents Sea off Norway at Havis, close to the group's 2011 Skrugard discovery on the same license.

February

- In the Llanos Basin in Colombia, Tecpetrol Colombia reported an oil discovery in the first of a nine-well program on the CPO-6, CPO-7, and CPO-13 blocks. NCT Energy Group Colombia hit an oil find with the Mani-1 well on Llanos 27 block.
- Cobalt International Energy said its Cameia presalt oil discovery in Block 21 offshore Angola flowed at an unstimulated, sustained rate of 5,010 barrels per day.
- Domino-1, a deepwater wildcat in the western Black Sea offshore Romania, turned up 1.5-3.0 Tcf of potential gas accumulation on a block held by ExxonMobil Exploration & Production Romania and OMV Petrom.
- Statoil called its Zafarani discovery in Block 2 offshore Tanzania a "high impact discovery" with as much as 5 Tcf of gas in place. ExxonMobil is a partner in the well.
- In the Levant Basin of the Eastern Mediterranean, Noble Energy chalked up a sixth consecutive field discovery with its Tanin find, bringing total discovered (gross) mean resources to approximately 35 Tcf.

Photo courtesy of Harald Pettersen / Statoil

The year got off to a solid start when a Statoil-led group announced a second giant oil and gas discovery in the Barents Sea off Norway at Havis, close to the group's 2011 Skrugard discovery.

March

- Offshore Nigeria, Afren and Amni International Petroleum Development of Nigeria tested a light oil discovery on OML 112. Afren also said future horizontal wells at its Okoro East oil discovery, offshore southeast Nigeria, should yield 4,500-7,000 barrels of oil per day per well.
- OMV completed the K-30 exploratory well on the Kadanwari block in the Middle Indus basin in Pakistan, which tested at 52 million standard cubic feet per day on choke, said interest holder Premier Oil.
- In the North Celtic Sea Basin, the 48/24-10z Barryroe appraisal was stable at 3,514 b/d of oil from the Lower Cretaceous basal Wealden sand at 7,400 feet, with 2.93 million cubic feet/day of gas. Providence Resources PLC, Dublin, called it the first commercial oil offshore Ireland.
- The Mamba Northeast-1 exploratory well offshore Mozambique lifts the resource base of Offshore Area 4 by at least 10 Tcf, an ENI-led group announced.

April

- Drilling in Cluster 6 of the Southwest Soldado field onshore Trinidad has confirmed a minimum of 48 million barrels of oil, Petrotrin reported.
- CESPA and Gran Tierra Energy, Calgary, tested oil from Mirador at a restricted rate of 2,525 barrels per day at the Ramiriqui-1 discovery well in the Llanos basin in Colombia.
- In a Santos Basin discovery, Petrobras said a Lula field well found good-quality oil in presalt carbonate reservoirs below at about 18,500 feet.
- Wintershall Norge reported that a Skarfjell prospect wildcat in PL 418 offshore Norway found light crude.
- Eni said an Anadarko Petroleum-operated sidetrack of the Heidelberg appraisal well in the deepwater Gulf of Mexico confirmed oil pay, found an oil-water contact, and greatly increased the field's known areal extent.
- Oil & Natural Gas Corp. reported four discoveries in India, including oil finds from the Phulani-1 exploration well in the Assam and Assam Arakan Basin and the Koravaka-1 in the onshore Krishna-Godavari Basin. New pool discoveries were the North Kovilkalappal-3 in the onshore Cauvery Basin and C-39-14 in the Western Offshore Basin.

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May

Onshore Kenya, Tullow Oil's Ngamia-1 well found more than 328 feet of oil pay over a gross oil-bearing interval of 2,130 feet in multiple zones.

Anadarko Petroleum added seven to 20-plus Tcf of recoverable gas offshore Mozambique at an exploration strike about 20 miles northwest of its Prosperidade complex.

In an exploratory well on the Ebok North Fault Block offshore southeast Nigeria, Afren and Oriental Energy Resources identified 370 feet true vertical thickness of net oil pay in "excellent quality reservoir sands."

BG Group reported a fifth gas discovery offshore Tanzania with the Mzia-1 exploratory well on Block 1 – a first success in the deeper Cretaceous section.

Agiba, a joint operating company, operated the Emry Deep 1X well about 180 miles southwest of Alexandria in Egypt, which found 250 feet of net pay in multiple sandstones of the Lower Cretaceous Alam El Bueib Formation and flowed 3,500 barrels/day during testing.

CNOOC said its Luda 21-2 oil discovery in southern Liaodong Bay tested at 608 barrels/day from the "thickest oil layers found in the exploration of Bohai clastic rocks in recent years."

Offshore Mozambique, an Anadarko Petroleum partnership hit more than 300 net feet of natural gas pay in two high-quality Oligocene fan systems with the Atum discovery well in Offshore Area 1 in the Rovuma basin.

June

Tullow Oil's Paon-1X deepwater exploration well, a light oil discovery in a Turonian fan system in the CI-103 license offshore Cote d'Ivoire, extended a proven oil play westward from previous discoveries offshore Ghana.

July

Deep Gulf Energy and partners reported a deepwater oil discovery at Garden Banks Block 506, Gulf of Mexico about 145 miles southeast of Galveston.

Tullow Oil and Africa Oil discovered thick oil pay at the Ngamia-1 wildcat in the South Lokichar Basin in northern Kenya.

Simrit-2 in the Kurdistan Region of Iraq tested at a combined flow rate of 13,584 barrels/day from three zones with nine more zones to be drillstem tested, for a group led by Hunt Oil Middle East.

In the Llanos Basin of Colombia, Tecpetrol got a heavy oil discovery with the Pendare-1 exploratory well on the CPO-13 block.

August

In Offshore Area 4, Mozambique, ENI's Mamba North East-2 giant gas discovery encountered more than 650 feet of pay in stacked, multiple, high-quality zones, adding at least 10 Tcf to the play's potential.

The Papa-1 deepwater wildcat on Block 3 offshore Tanzania became the first Cretaceous gas discovery outboard of the Rufiji Delta, according to partners Ophir Energy and BG.

Petrobras claimed a deepwater oil discovery in the Ceara Basin offshore northeastern Brazil with the Pecem/1-BRSA-1080-CES well. It found oil in siliciclastics of the Cretaceous Paracuru formation and drilling was extended 18,000 feet. BP Energy do Brasil is a 40 percent partner in the concession.

Petrobras and partners announced their Carcara discovery well encountered more than 1,300 feet of continuous oil pay on the BM-S-8 block in the Santos basin offshore Brazil.

Following up on Luda 21-2, CNOOC reported more oil discoveries offshore China. The Luda 6-2-4 and Luda 6-2-5 wells in the Liaodong Bay extension of Bohai Gulf tested at an average rate of 850 barrels/day, CNOOC said. In the Pearl River Mouth Basin, Lufeng 15-1-2 tested at about 800 b/d.

Pemex made its first oil discovery in Mexican deepwater in the Gulf of Mexico with its Trion-1 well in the Perdido area. It planned to deepen the 16,115-foot well to evaluate the Paleocene Wilcox.

San Leon Energy announced an oil discovery with the Lelechow-SL1 well in southwestern Poland. Core and logs indicated the Zechstein Main dolomite was highly fractured and oil-bearing.

September

The Atrush-2 appraisal well in the Kurdistan Region of Iraq tested at the combined rate of 42,212 barrels of oil per day in drillstem tests in three formations for a group led by General Exploration partners.

October

Petrominerales Ltd., Calgary made a potentially commercial two-zone light oil discovery in the southern Ucayali Basin in Peru.

Pemex expected to book new 3P oil reserves of up to 125 million barrels from its Supremo discovery in 9,500 feet of water, officials said. Supremo is about 130 miles south of the maritime U.S. border.

November

Bengal Energy announced that its Tookoonooka drilling campaign found oil with Caracal-1 in ATP731 on the southeast flank of the Cooper Basin, Australia. Caracal-1 closure was estimated to cover an area of 5.5 square miles.

Tullow Oil said Twiga South-1 in Block 13T, onshore Kenya, found 98 feet of net oil pay with further potential to be assessed.

The Pemex Navegante 1 well onshore Mexico in the southern state of Tabasco appeared to hold a potential 500 million barrels of light crude, officials said.

Noble Energy announced a deepwater Gulf of Mexico discovery at the Big Bend prospect. The 15,989-foot well, in 7,200 feet of water on Mississippi Canyon Block 698, was drilled to a total depth of 15,989 feet. Open-hole logging showed about 150 feet of net oil pay in two high-quality Miocene reservoirs.

See **Results**, page 16

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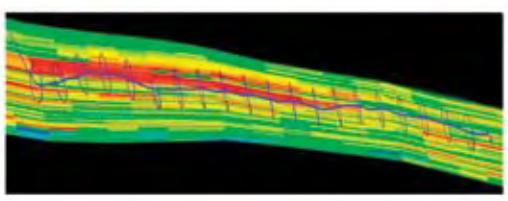

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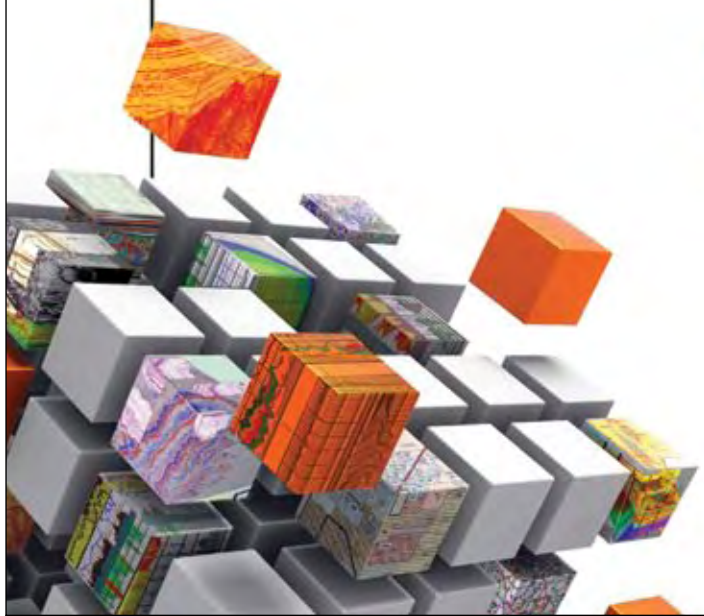

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Results
from page 14

▸ Petronas noted that two offshore Sarawak gas discoveries, at the Kuang North and Tukau Timar fields, could contain combined reserves of more than four Tcf. The Tukau Timur Deep-1 well was drilled to 15,847 feet and found 12 gas-bearing reservoirs with total net gas sand of 600 feet.

December

▸ Wintershall's F17-10 well found oil in a Late Cretaceous Chalk reservoir in exploration license F17a in the Dutch North Sea about 75 miles north of Den Helder. The well went to TD of 4,889 feet into the top of a salt dome.

▸ Total reported a significant oil discovery at the North Platte prospect on Garden Banks Block 959 in the deepwater Gulf of Mexico. The 34,500-foot well is the first Lower Tertiary Wilcox well drilled by a Total-Cobalt International alliance.

▸ The Mamba South 2 and Coral 2 delineation wells in Area 4, Mozambique, added about six Tcf potential in the Mamba complex for ENI and partners.

▸ Petrobras discovered light oil with the Muriu well drilled off Sergipe state in northern Brazil, a fourth discovery in the ultra-deep waters of the Sergipe-Alagoas Basin in 2012.

▸ ENI said the Badhra B North-1 exploratory well made a significant gas discovery in the Khirtar Fold Belt region onshore Pakistan. The well found 177 feet of net gas pay in two thick Cretaceous sandstones of the Mughal Kot Formation.

Sahara Desert Shows Potential for Shale Gas

By LOUISE S. DURHAM, EXPLORER Correspondent

Do the Sahara desert and the state of Pennsylvania have anything in common?

Yes, they do.

It's shale gas.

An abundance of shale gas.

The International Energy Agency (IEA) has estimated that Algeria harbors 231 Tcf of recoverable shale gas, with a value close to $2.6 trillion at current UK prices. The resource is sufficient to supply the entire European Union for a decade.

This is good news given that shale gas action in Europe has had its share of fits and starts, owing mainly to regulatory issues and disappointing drill tests.

France flat-out outlawed hydraulic fracturing, and the UK ceased shale gas exploration temporarily, only last month lifting the ban on hydraulic fracturing.

Then there's the tempering of expectations in Poland, which initially was considered as the place to be for shale gas E&P in Europe.

The U.S. Geological Survey recently completed an assessment dubbed "The Potential for Technically Recoverable Unconventional Gas and Oil Resources in the Polish-Ukrainian Foredeep, Poland 2012."

"The Silurian trend across Poland has been regarded as the most prospective thing in all of Europe for unconventional resources," said USGS assessment team participant and AAPG member Don Gautier. "In our view, there's essentially nothing there."

In contrast, an EIA-funded study on world shale gas recoverable resources estimated 187 Tcf of gas for the trend.

At the end of the day, actions are telling – and ExxonMobil exited Poland fairly recently after drilling a couple of non-commercial wells. Meanwhile, some other companies, big and small, continue to operate their licenses. (At press time, Poland announced it would ignore European Parliament objections on shale gas drilling.)

The overriding issue in this whole endeavor centers on the fact that significant new gas discoveries are needed to enhance security for Poland and its neighbors.

The country currently acquires two-thirds of its natural gas via imports of Russian gas from OAO Gazprom, which reportedly links gas prices to oil and charges its customers about three times more than the U.S. price.

Pieces Are In Place

Algeria's estimated vast oil and gas potential is considered to be underexploited. Adding to the allure for operators and others, pipelines already are in place beneath the Mediterranean to Spain and Italy. These lines link Africa's largest gas exporter to the European grid.

In contrast to certain other countries, Algeria is eager to utilize tax breaks to encourage shale gas exploration. Parliamentary approval of the proposed tax incentives was nigh at press time.

The country's relative stability is appealing to operators and investors. Adding to the appeal, the vast stretch of the near-empty desert offers the advantage of fewer drilling risks.

Italian multi-national oil and gas company ENI already has kicked off a program in the Sahara, and Talisman and Shell are said to have plans to drill exploratory wells near-future.

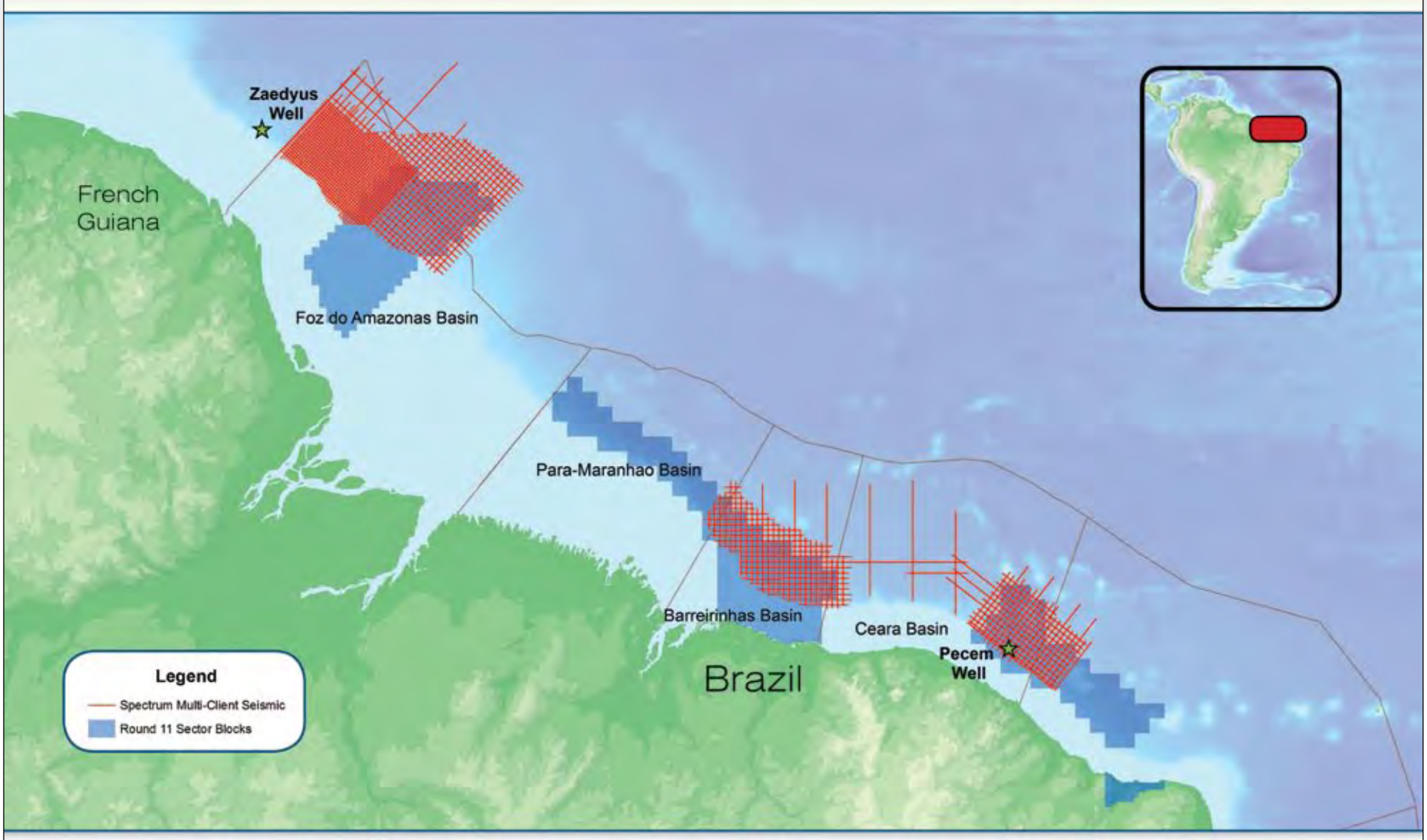
Meanwhile, Algeria and ExxonMobil are conversing.

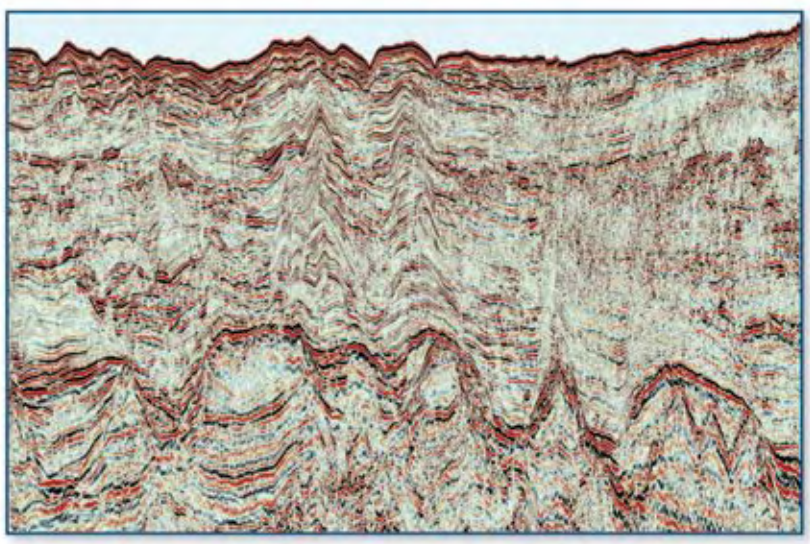
But the oil business by nature is not fast moving, given the plethora of varied obstacles it encounters on a routine basis. It is anticipated that any commercial unconventional gas production in Algeria is not in the cards until 2020 at the earliest.

It's likely that a few hundred test wells will be needed to determine if the hydrocarbons can be made to flow out of the source rock and be produced profitably.

Equatorial Margins Brazil

Multi-Client Seismic - Amazonas, Ceara and Barreirinhas Basins





Canyon Features from Foz do Amazonas Survey (Phase I)

Spectrum is active in three basins along the Equatorial Margins of Brazil. Our PSTM data is now available for each of the Ceara, Barreirinhas and Foz do Amazonas phase 1 surveys.

Spectrum has also commenced the next phase of its Foz do Amazonas program, which will acquire an additional 6,000 km over this basin.

Following completion of this new survey Spectrum will have collected over 34,000 km of new, long offset data over these highly perspective areas.

All of these surveys have been acquired with 10,000m offsets and 13 second record lengths. Companies participating in Spectrum's new seismic programs will have a competitive advantage in the upcoming Round 11 in 2013.

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Arctic Challenges Get Multi-Faceted Response

By LOUISE S. DURHAM, EXPLORER Correspondent


BLAAUW

The area above the Arctic Circle encompasses about 12 million square miles, or roughly 6 percent of the earth's land mass.

The U.S. Geological Survey estimates that this environment contains close to 90 billion barrels of technically recoverable oil, with nearly a third of this resource located under the American Continental Shelf.

It's no surprise, then, exploration/drilling interest in the Arctic region is intense.

The highest profile action currently is Royal Dutch Shell's activity offshore Alaska in the Beaufort and Chukchi seas.

The firm has spent more than $5 billion over the past six years on permits, leasing, regulatory meetings/issues, meetings with the indigenous populace, etc., in preparation to drill these locales – with no hydrocarbons yet to show for this effort.

Shell's experience in the Arctic was an integral component of the program at the recent Arctic Technology Conference (ATC) in Houston, which attracted 1,243 attendees from 26 countries.

"Shell is in the hot seat," said Robert Blaauw, senior adviser-global Arctic theme at Shell, one of the speakers at the recent ATC. "Every day there are stories that are good and also bad."


Photo courtesy of Shell

The oil spill response vessel Nanuq on call in Dutch Harbor, Alaska, providing containment, recovery and storage support for Chukchi Sea operations.

"Our Facebook site has two million people on it, exchanging notes, opinions on operating – the physical and social challenges, setbacks and logistics," Blaauw noted.

It just goes with the territory, so to speak, even though Shell and other companies have drilled in the region in earlier times.

"Many are surprised to learn there's a 100-year science record in the Arctic," Pete Slaiby, vice president Shell Alaska, said during a much-anticipated ATC luncheon presentation that chronicled Shell's recent, often challenging Arctic experiences.

"A great deal of that science," he said, "comes from industry."

The Year That Was

In the Arctic, the targeted resources are conventional.

The environment is way unconventional.

Slaiby reminded the luncheon crowd that heading the list of unconventional challenges is the remoteness of this region.

First you hop onto a plane and fly to the end of the earth, he said. Forgetting your toothbrush is the least of your concerns when you board a "chopper" to fly for an hour over open frigid waters, often shrouded in fog, to reach the drill site – and pray that the so-called Jesus bolt does its expected job of keeping the main rotor attached.

Once in the Arctic, it's not uncommon for some of the approximately 1,000 workers employed on the Shell program to be stranded at sea or onshore when fog settles in.

Moving multiple vessels, helicopters, fixed wing aircraft, icebreakers and other equipment to the drilling locations while avoiding the low-hanging fog and floating sea ice is a whole other problem.

Despite the years of time and the billions of dollars invested, problems began early on in Shell's 2012 drilling program.

For starters, the sea ice hung around longer than anticipated. Once the action kicked off, the drillship *Noble Discoverer* dragged anchor and bobbed along out of control at nearby Dutch Harbor, Alaska. Dutch Harbor is the closest deep-water port for extra supplies that may be needed at the Shell drill sites more than 1,000 miles away.

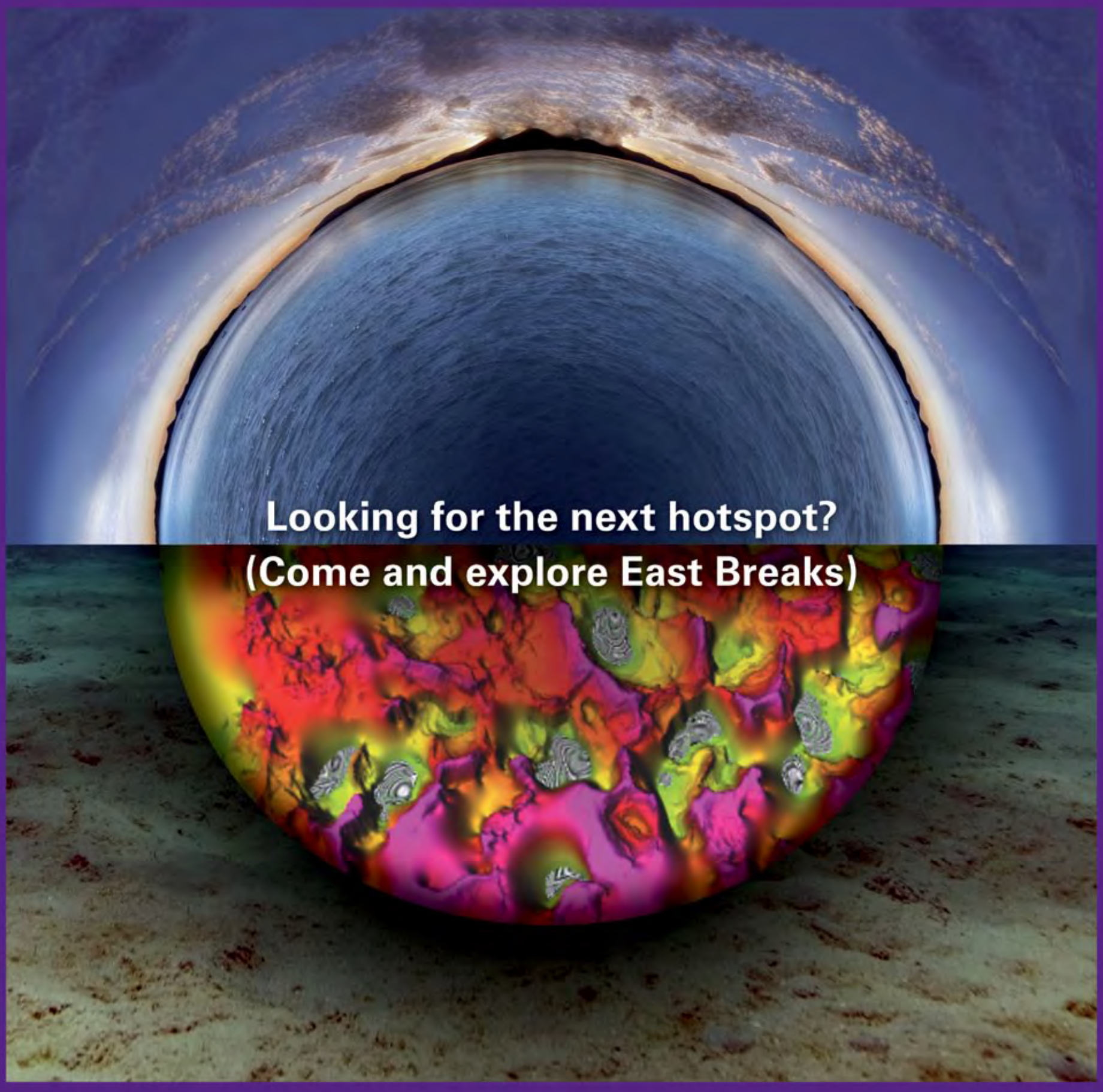
Even the whaling season, which curtails activity, was twice as long as usual in 2012, according to Blaauw.

A final blow to the year 2012 plans occurred when Shell's unique oil spill containment barge was damaged during certification testing.

With the cloud of the infamous Macondo debacle still hanging heavy over the offshore industry, it became time to re-group.

Regulators made it clear that no oil containing zones would be penetrated prior to onsite location of a certified

See **Arctic**, page 20



Pete Slaiby of Shell, speaking at the recent Arctic Technology Conference in Houston: "Stakeholders in the Arctic have important views of offshore exploration. They have much to say on how, when and who should ultimately have the opportunity to search for oil and gas reserves, reserves that are believed to be rivaled by very few places on earth."

Arctic
from page 18

containment system to capture flowing liquid hydrocarbons in the event of a loss of well control.

With time running short to accomplish any major drilling activity before the mandatory close of the drilling window, the company managed to get a head start on 2013 by drilling the top hole sections of two wells in the Beaufort and Chukchi target areas. The top holes are above any hydrocarbon-bearing zones.

The company reportedly commented that a top hole accounts for more than half the drilling time for the kind of well it intends to drill in its Alaska program.

The presence of dynamic, multi-year sea ice is a prominent and obvious challenge in the Arctic.

"Fortunately, by way of automated underwater vehicles and shallow hazard seismic surveys, we have an excellent and historic picture of what's happening on the sea floor in terms of ice scouring and ice gouging," Slaiby said. "The images we are left with – ice interacting with the seafloor – could impact a potential pipeline or platform, and that's something we need to account for."

Social Responsibilities

Social issues also loom large in this environment, and Shell has expended countless hours meeting with the stakeholders who populate the region.

"Our program is changed for the better as a result of all that dialogue," Slaiby said.

"Stakeholders in the Arctic have important views of offshore exploration," he noted. "They have much to say on how, when and who should ultimately have the opportunity to search for oil and gas reserves, reserves that are believed to be rivaled by very few places on earth.

"And why shouldn't they?" he commented. "After all, Alaska's Inupiat have found their ocean bounty for centuries on the surface of the water, not what lies beneath.

"They have no intention of trading one resource, i.e subsistence hunting, for another," he emphasized. "That's why we spend so much time talking to local stakeholders about ways we can mitigate our footprint on the environment and, more to the point, our impact on the lives of the people we work around.

"I'm proud to say that a large number of the men and women who work on our oil spill response vessels are local stakeholders," Slaiby said. "Many of them are whalers."

He noted also that Alaska Native corporations and private businesses are pursuing and winning contracts for work on Shell projects.

Wanted: Integrated Solutions

With so much at stake for so many, information – and its origin – is crucial to ensure everyone is on the same page.

"As an industry, we must speak with a single voice," Blaauw said. "We need to be on point with our message and communicate, communicate, communicate.

"And we must work together to reduce risk, cost, footprint and exposure of people to the Arctic environment," he noted. "Let's look at drilling slimmer wells, faster wells with fewer people.

"Logistics makes up a huge part of our cost of development – let's look at integrated solutions.

"We shouldn't hype this as a race," Blaauw cautioned. "If there's a race, it's a joint race to do it right."

Slaiby added, "If perfection is not your aspiration, the Arctic is not for you."

"I have a list of important learnings from this past season that will keep me, and the people who work for me, fully engaged until we start again next year," he added.

For now, some companies are watching and waiting in the proverbial wings.

Statoil supposedly will wait until 2015 at the earliest to drill on its leases in the Chukchi Sea after witnessing the setbacks Shell has experienced.

It's generally understood that not many companies can fork over billions of dollars on plays that likely need technology that has yet to be developed. An industry analyst was quoted recently as saying that Shell views itself as a sort of leading technology company.

You CAN go home again

'Feeder Schools' Benefit from Donors' Gifts

By BARRY FRIEDMAN, EXPLORER Correspondent

When Midwestern State University in Wichita Falls, Texas, received a $1.1-million dollar donation, it was notable for many reasons – not the least of which was because it didn't go elsewhere.

Million dollar donations are more often than not destined for larger schools with larger geosciences programs – and there is no state larger in that respect than Texas.

Which just happens to be where you'll find Midwestern State University.

MSU has about 6,200 students, which is about how many students may show up for a pre-season football scrimmage at some of the larger state schools.


DODGE

AAPG member Rebecca Dodge, assistant professor of geosciences at MSU, says that smaller institutions, which are sometimes referred to as "feeder schools," are at a disadvantage when it comes to attracting such donations – especially those with undergraduate-only programs.

> **"I hope publicizing this generous donation ... will encourage others to consider a sizable donation to their undergraduate home."**

Schools like MSU are thought of as "teaching institutions" only, where there is little or no research being done.

Dodge, recipient of the AAPG Distinguished Service Award and a past president of the Energy Minerals Division, bristles at such a suggestion.

In fact, she says, not only is there undergraduate research being done, it is often leading the way, making "feeder" programs like MSU even more important to the overall health of the industry.

"Hundreds of students graduate every year from smaller state schools," she says, "and if they don't have a firm ground in basic geology, they certainly won't enter the petroleum industry immediately – and may not even consider graduate program at all."

An Encouraging Example?

Specifically, MSU has its own unique challenges in attracting donations.

"We are Texas' only state-funded liberal arts institution, and scientific research isn't the first thing that comes to peoples' minds when they hear liberal arts," she said. "However, our geoscience students have been going into the oil business for decades, and it's donations like this one that recognize our place in feeding well-prepared students into graduate programs and even directly into industry."

And it's not like this latest gift, given by Beverly Bolin on behalf of her late husband, Robert, was the first of its kind to the program – either by the Bolin family or others.

Just recently the school received a significant donation from two MSU alumni involved in the local oil industry that will allow the department to outfit a state-of-the art computer laboratory.

To be clear: Dodge does not begrudge the bigger schools' place in line.

"Often the donors … went to these schools for their graduate degrees and then into industry," she said.

What Dodge wants to add, though, is that where these students end their collegiate careers is not where they started.

"In many cases the UT, LSU, OU graduate students got their start at a smaller state-funded school," she said.

A school like Midwestern State.

It might be noteworthy to point out that the Bolin family's involvement in MSU is set in stone – literally. The school's science building is named Bolin Science Hall.

(Mrs. Bolin declined to comment on the donation.)

The latest gift will allow MSU to hire a full-time professor who will teach petroleum exploration and other petroleum-related topics, including the support of the Trans-Pecos Desert Research Station near Big Bend State Park in west Texas, and support of the Robert L. and Beverly Bolin Petroleum Geology Laboratory.

"The gift will benefit Midwestern State and generations of students and strengthen the geology program in a region with a rich tradition of oil and gas development," said Jesse Rogers, MSU president.

Dodge hopes this is the start of a trend – call it money-attracting-money.

"I hope publicizing this generous donation from the Bolin family," Dodge said, "will encourage others to consider a sizable donation to their undergraduate 'home.'"

Water, water everywhere – but is it usable?

Water Sourcing Concerns Rise for Geologists

By KEN MILAM, EXPLORER Correspondent

With almost three-quarters of the earth's surface covered in water, finding enough for drilling procedures seems simple.

But not so.


ARTHUR

"Water can be a huge issue," according to AAPG member Dan Arthur of Tulsa-based ALL Consulting, which works on strategic issues in developing conventional and unconventional resources.

For the past two decades, Arthur said, water has been the main focus.

With hydraulic fracturing becoming increasingly integral to production, water issues well up at every step of the process, he said.

In some plays, finding a suitable source is key. In other plays, disposal, treatment, storage, transportation or quality may be driving issues.

Water sourcing varies depending on the character of plays worldwide, Arthur said.

"Look at China – a lot of shale resources are in areas with little water," he said. "It may take 5-10 million gallons of water per well, but China is in desertification."

In Canada, meanwhile, there is a lot of pressure not to impact surface water protected by First Nations' (native populations) rights.


Photos courtesy of Dan Arthur

Water issues are becoming an increasingly large concern throughout the industry – and geologists are becoming an increasingly important part of cautionary concerns.

There, companies like Apache and Encana strip souring acids from ground water, use it in hydraulic fracturing, then dispose of it in the formation of origin, Arthur said.

In the Marcellus and Pennsylvania shales, "There is a lot of rain, but a lot of demands on the water, and it is tightly controlled. There is limited disposal," Arthur said.

"In the Utica (in Ohio), instead of disposal wells, companies look at treatment and 100 percent reuse of the water," he said.

"We started using models in the late '90s – how much is needed to drill the well versus water costs versus production plus disposal – what the drivers are depending on what play you're in," he said.

"It's not just a matter of, 'I have this water. Do I use it?' You can't just get water from the creek or a ground well. You may need a large impoundment and time to permit it. There are a lot of choices involved.

"If Company A is in the Eagle Ford with 11 or 12 wells running, they want a lot of things done fast," he said. "Company B may have 30 or more – a lot of planning has to fall into place."

Having an Effective Plan

People tend to think "water is just water," Arthur said, "but quality before and after use are other complicating issues."

Source water may contain chemicals, contaminants or bacteria that may affect its efficiency in hydraulic fracturing, he said.

Some sources may require more pre-treatment of the water.

In some cases, "If we 'engineer,' or blend a water, using what's already there, we may need to add fewer chemicals for fracing. By modeling this in advance, we may save hundreds of thousands of dollars per job," he said.

"You need an effective plan – a water life-cycle management planning process. Sourcing, storage, transport, distance all figure in," he said.

"If you reduce water costs in the Eagle Ford from, say, $8 to $3 a barrel, you might save a half-million dollars per well. It's not something you can ignore.

"People say we have enough oil and gas for another 100 years. You're talking one-to-three three million wells over time in the U.S., if that's true.

"It means a lot for the business," he added. "There are a lot of big problems to be solved and a key component is water. No water, no development."

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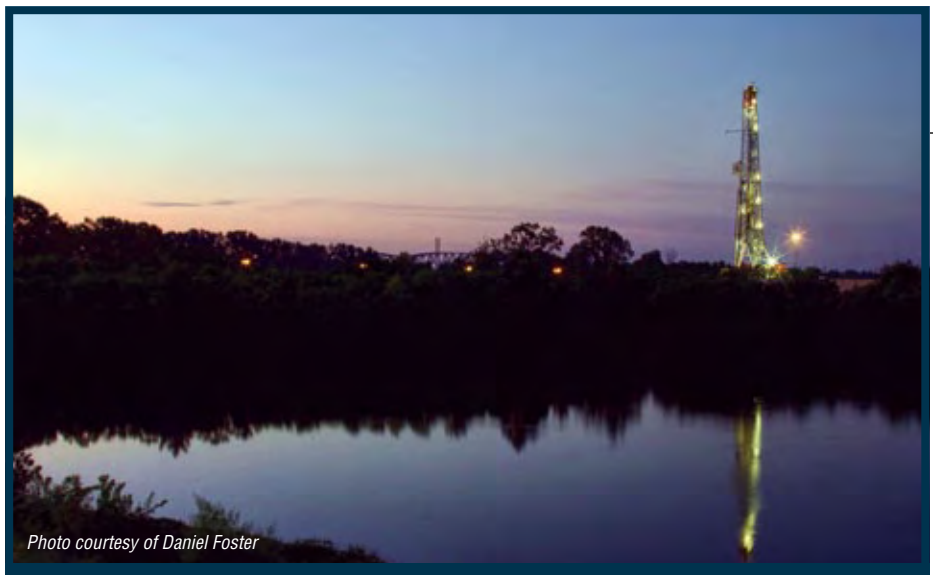

Photo courtesy of Daniel Foster

For the first time, water issues will be the subject of an AAPG Geosciences Technology Workshop in February. Above, an idyllic pond flanks a natural gas site near Shreveport, La.

This time, H_2O rises to the top

GTW Tackles Water Issues

By KEN MILAM, EXPLORER Correspondent

A Geosciences Technology Workshop (GTW) coming in February marks a fresh direction for AAPG.

This time, the liquid it deals with *won't* be oil.

The program, "Solving Water Problems in Oil and Gas Production: New Technologies for Cost Saving and New Revenue Flows," is scheduled Feb. 26-27 in Fort Worth, Texas. The workshop is co-sponsored by the Division of Environmental Geoscientists and the Energy Minerals Division.

"This is the first time an AAPG Geosciences Technology Workshop has focused on water, and we're doing so because it has become a 'make or break' issue in many operations, especially those involving hydraulic fracturing, and also production from unconventional reservoirs," said Susan Nash, AAPG director of education and professional development.

The GTW also is the first of the program to focus on environmental and resource play issues, Nash said.

And it also will have a community relations component, another first, as Nash will speak on building alliances and trust at the grassroots level of community and industry relationships.

"With the shale boom, all kinds of people are looking for new opportunities," said AAPG member Dan Arthur, who has helped in planning the conference and will be among the presenters in Fort Worth (see related story, page 28).

Companies with water treatment technologies used for local governments or other industries may find attractive opportunities to apply their knowledge in exploration, he said.

"With all the issues involved, we have no choice except strategically thinking and planning. That's what the conference is about."

Some of the "make or break" issues to be explored during the meeting include:

- Is there sufficient water for adequate well stimulation, especially with multi-stage, multi-lateral hydraulic fracturing?
- How can we minimize water usage during drilling, stimulation and production?
- Where is the water obtained? Does getting the water cause a problem during droughts (ponds, streams, rivers, aquifers)?
- What do we do with the hydraulic fracturing fluid flowback? Can we economically treat it? Reuse it?
- What do we do with the produced water? Can we economically treat it? Reuse it? Treat it to the point of discharging it into the environment?
- How can we avoid injecting so much produced water? What kinds of technology are available right now?

The GTW also will look at emerging opportunities and new regulations.

"We will have discussions by regulators about new directions and the reasons for new regulations, especially in those states with active shale plays," Nash said.

"With all the issues involved, we have no choice except strategically thinking and planning," Arthur added. "That's what the conference is about, and all those things are key to what AAPG is."

To register or for more information go to www.aapg.org/gtw/fortworth2013/index.cfm.

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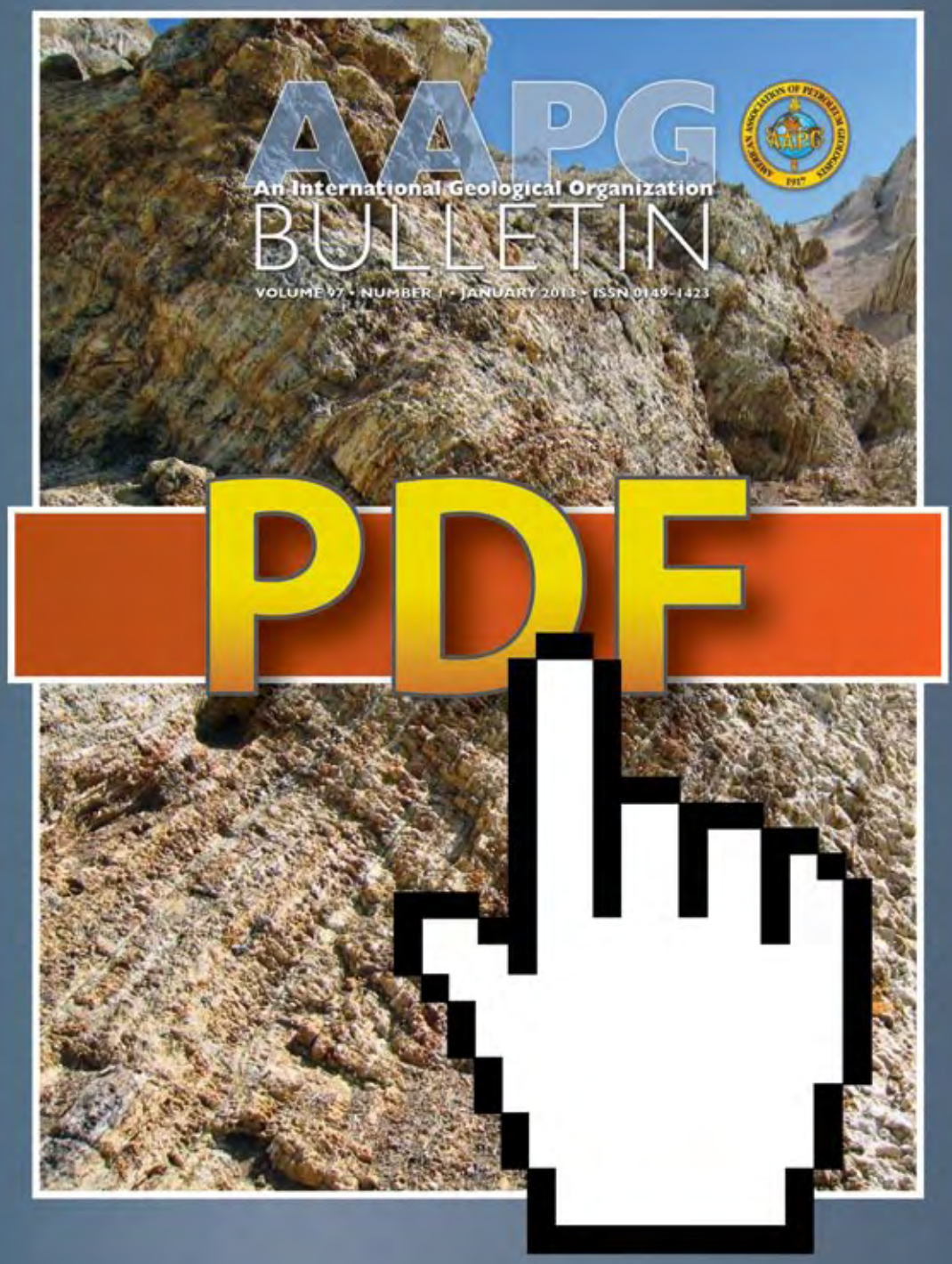

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Article highlights include:

A review of rifts and carbonates

Paul M. (Mitch) Harris, James Ellis, and Samuel J. Purkis

This paper presents a review of carbonate deposition in lacustrine and marine rift settings. These examples can be used to improve our understanding of the spatial distribution of lacustrine and restricted marine carbonate deposits in early rift settings at a variety of scales.

A modern analog

Andrew G. Sparks and Eugene C. Rankey

The geomorphic evolution of a Holocene ooid sand shoal, Bahamas, provides insight to ancient reservoirs. The authors test the hypotheses that different geomorphic forms and different positions on individual geomorphic forms include distinct and diagnostic shallow sedimentologic and stratigraphic patterns.

Volumetric restoration

Pauline Durand-Riard, Chris Guzofski, Guillaume Caumon, and Marc-Olivier Titeux

Restoration is a fundamental tool in basin analysis. However, a major limitation is the need to include complex architectures and realistic mechanics such as flexural slip. The authors use an implicit approach that allows for unconformities and thin or pinched-out layers.

Geochemical correlation

Kenneth E. Peters, Delphine Coutrot, Xavier Nouvelle, L. Scott Ramos, Brian G. Rohrback, Leslie

Chemometric analyses (multivariate statistics applied to chemical results) of crude oil samples from the San Joaquin basin are used to identify genetically distinct oil families. They provide insight into migration pathways, reservoir compartments, and filling histories

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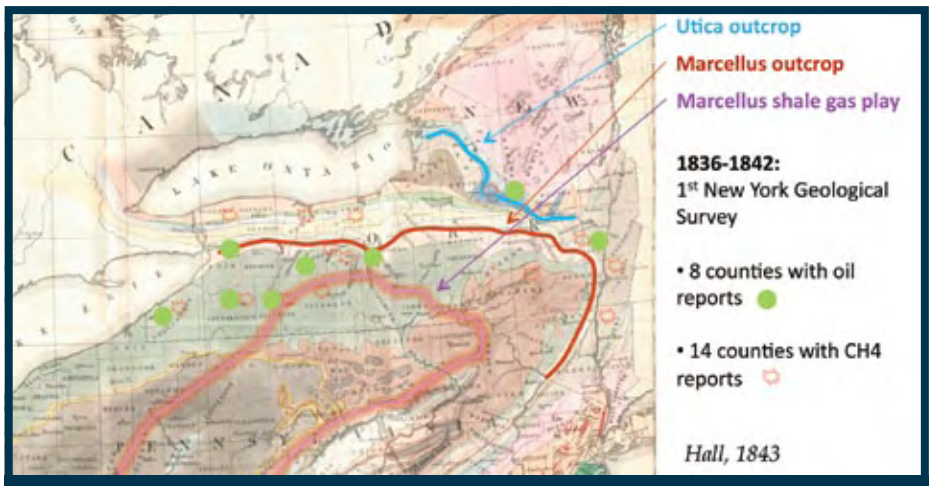
Historical Highlights is an ongoing EXPLORER series that celebrates the "eureka" moments of petroleum geology, the rise of key concepts, the discoveries that made a difference, the perseverance and ingenuity of our colleagues – and/or their luck! – through stories that emphasize the anecdotes, the good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



Petroleum research by the First New York Geological Survey (1836-1843).

Historic New York Survey Set High Geologic Standards

By RAYMOND P. SORENSON

SORENSON

When New York began its first state geological survey in 1836, seep petroleum was used in small quantities primarily for medicinal purposes.

It would be almost two decades before manufactured coal oil began to replace whale oil for lighting and lubrication.

It would be 23 years before the Drake well in Pennsylvania demonstrated the existence of a much cheaper and more abundant feedstock for a rapidly expanding coal oil refining business.

Manufactured coal gas for municipal lighting was a major growth industry, with New York City having had an operating system for more than a decade. Gas from shallow wells along the Lake Erie shoreline was used in a similar manner in Fredonia, N.Y., and the nearby Barcelona lighthouse.

Indeed, the New York Natural History Survey (1836-1843) is commonly recognized as the premier state geological survey of the pre-Civil War era – but its role in conducting the first systematic governmental study of petroleum in North America has been neglected.

In the absence of an established oil and gas industry, the search for seeps was inspired not by petroleum exploration but to facilitate the health spa and salt manufacturing industries – and to assess the possible extension of Pennsylvania's vast coal resources across the state line.

Watch Out for the Seeps

The Survey actively documented seeps of all compositions, not just hydrocarbons.

Mineral springs at Saratoga were well known and actively exploited for health spas, and identification of springs with similar commercial potential was highly desired.

In addition to mineralized waters, seeps with Seneca oil (petroleum) or concentrations of carbonic acid gas (CO_2) and sulphuretted hydrogen (H_2S) were highly valued for their medicinal properties. Today the presence of H_2S would be looked upon as negative due to its toxic properties, but prior to the development of modern antibiotics that toxicity was used to advantage to combat infections.

The presence of carburetted hydrogen (CH_4) was not considered of importance for this market.

Rapid expansion of Pennsylvania's coal industry had put many New York industries, which relied on wood for fuel, at a competitive disadvantage, and so assessment of coal resources became the Survey's most important assignment.

Numerous coal exploratory pits had been dug without success during the 1830s, spurred on by two influential publications:

- Amos Eaton, the best-known New York geologist of the time, had stated in an 1830 paper that gas seeps found near Seneca and Cayuga Lakes were associated with the same bituminous shales as those found above coal seams in Pennsylvania.
- Three years later, Yale's Benjamin Silliman published a description of the oil spring at Cuba, N.Y., stating that the oil "… "rises from beds of bituminous coal below."

The Survey investigated these claims on a priority basis and quickly demonstrated through paleontological research that the bituminous shales in New York were too old to be associated with commercial coal beds, and made a point of disseminating information to show that digging more exploratory pits would be a waste of money.

Defining Reality

Salt manufacturing was New York's largest mineral industry in 1836-1843, with activity concentrated on the Onondaga salt springs near Syracuse.

New York's big advantage over competing salt works in the Ohio River valley was accessibility to eastern markets – but the Ohio River region had better fuels available for the evaporation process, with local coal mining plus gas flows that accompanied brine production from wells.

Documentation of oil and gas seeps provided hope (in vain) that coal would be found to lower fuel costs, but also exploration potential for new salt reserves.

Lewis Beck in 1838 speculated that the salt industry might expand to far western New York, arguing that, "From the frequent occurrence of gas springs in Chautauque County, it is not improbable that brine will be found associated with them, as it is in various parts of the state of Ohio."

Over the time period 1836-1843, the New York Geological Survey published

See **New York Survey**, page 33

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The Geophysical Corner is a regular column in the EXPLORER, edited by Satinder Chopra, chief geophysicist for Arcis Seismic Solutions, Calgary, Canada, and a past AAPG-SEG Joint Distinguished Lecturer. This month's column deals with overcoming "seismophopia" – a geologist picking velocities.

Time to Pick? No Need to Fear 'Seismophobia'

By SUPRATIK SARKAR

While seismic processing shops usually are the "professionals" when it comes to velocity analysis, the interpreter may have greater insight into the cause of the poor data quality.


SARKAR

In such cases, re-picking the velocities on a tight grid with a better knowledge of the geology can provide significant improvement.

* * *

The following example (figure 1) is from a tight turbidite formation in Mexico's Chicontepec Basin, where the data are often handicapped by interbed multiples from overlying shallow volcanic sills.

While the deeper, non-targeted Cretaceous horizons were well resolved – appearing as coherent, broad-band reflectors – the shallower Eocene/Paleocene Chicontepec Formation reflectors of interest were "wormy" and narrow-band.

The original data were prestack time-migrated using a Kirchhoff algorithm, resulting in 50-meter offset bins ranging between 50 and 3,000 meters. The preliminary interpretation of the stacked data showed significant reduction of data quality below the volcanics.

Maps of the volcanics were made to highlight the problem areas.

The original migration velocities were then removed (figure 1b) using simple reverse normal moveout, followed by a velocity analysis on a dense 375-meter x 375-meter grid.

Seismic processors will recognize this workflow as comprising the key steps within a typical processing sequence – using simple software tools to generate a residual velocity analysis of the previously migrated data.

The key step was to take care beneath the volcanics to pick the slower Chicontepec reflectors rather than the strong, slightly faster interbed multiples (figure 1a), resulting in the flattened gathers like the one shown in figure 1c.

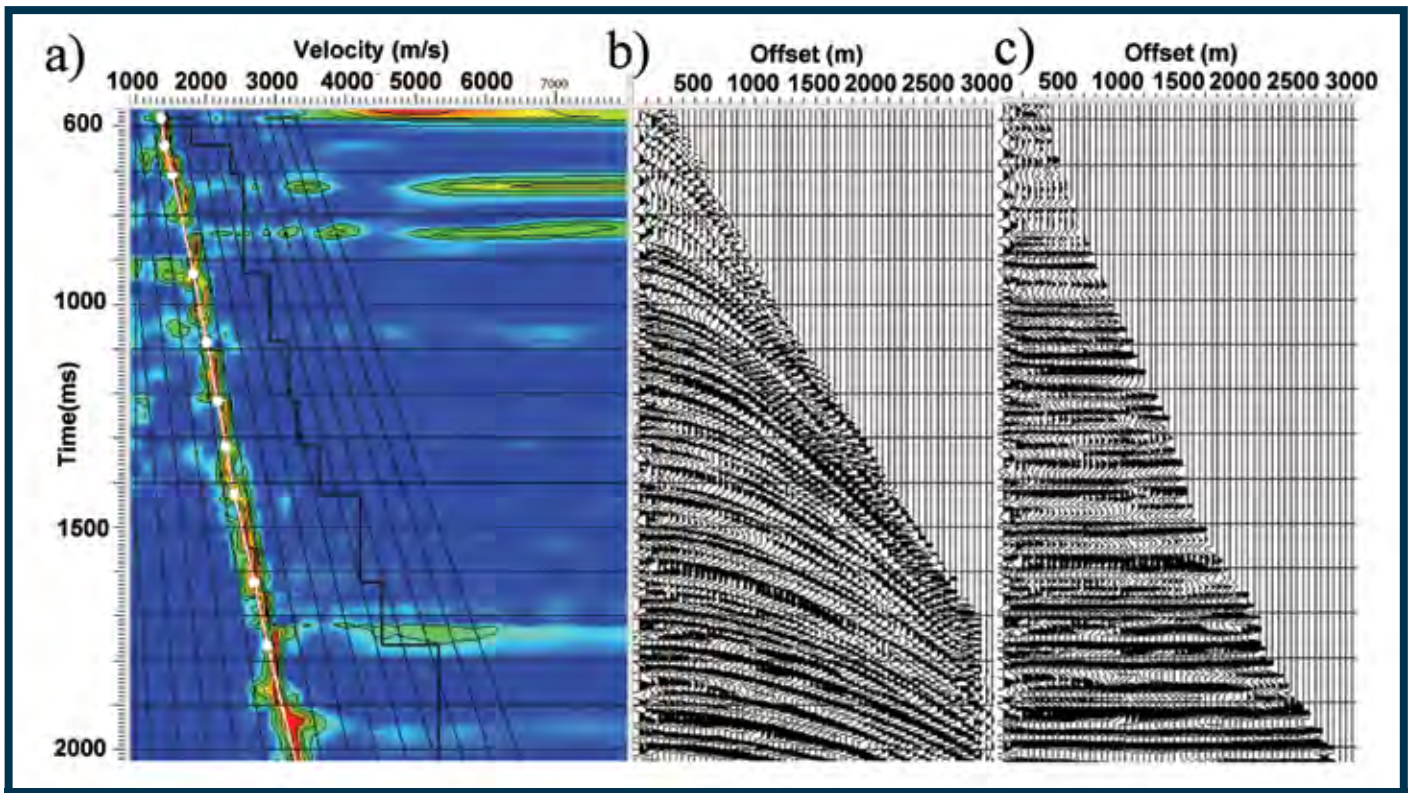

Figure 1 – A representative common reflection point gather illustrating (a) velocity analysis of a CMP gather (b) before and (c) after the NMO correction. A 30 percent stretch mute is applied to the flattened gathers.

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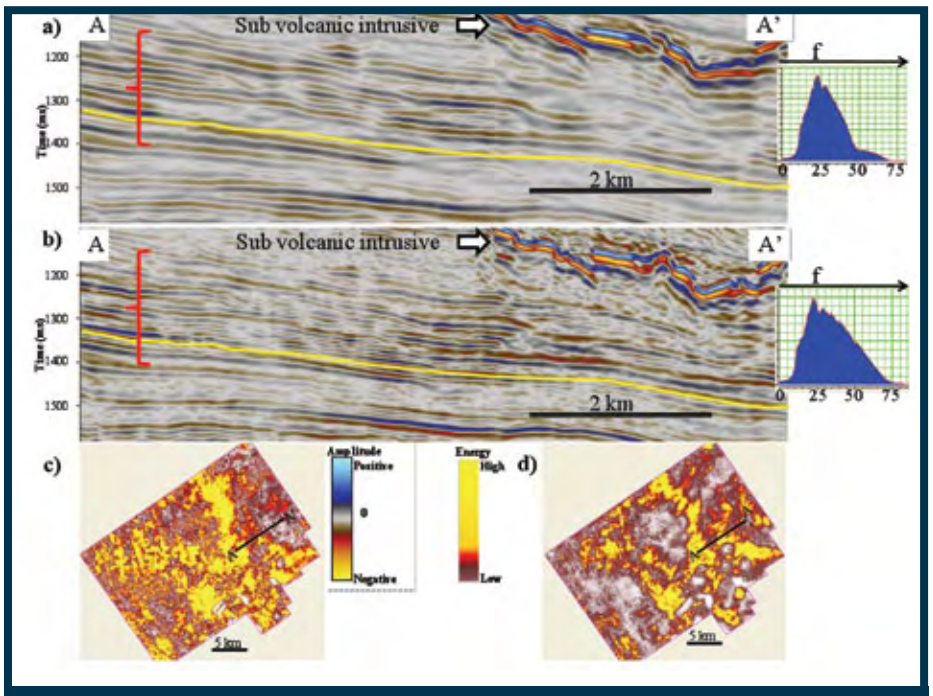

Figure 2 – Example of (a) original prestack time migrated vertical seismic amplitude section and (b) the same section after performing residual velocity analysis. Note the improved stratal definition within the Chicontepec interval demarcated by the red bracket and also below the shallow volcanic body. The frequency spectra corresponding to each volume indicates significant frequency enhancement; (c) and (d) represent equivalent coherent energy slices along the yellow horizon in (a) and (b).

Continued from previous page

* * *

After the residual velocity analysis, the frequency content and the signal-to-noise ratio of the dataset improved in many places within the Chicontepec interval compared to the original prestack time-migrated data.

This residual velocity analysis resulted in better vertical and lateral definition of stratal units as seen by seismic amplitude as well as computed attributes (figure 2).

This velocity analysis also helped enormously to delineate turbidite channels, internal stratal geometries and the distribution of potential reservoir element.

* * *

Several volcanic activities in east-central Mexico from the Late Cretaceous to Miocene have been published. The burial history chart from the adjacent Veracruz Basin – where petroleum generation occurred from Upper Jurassic source rocks similar to those in the Chicontepec play – shows that oil generation and migration started around 20 Ma and continued through the Miocene.

Since most of the oil migrated after the major volcanic activities, improving the imaging below the volcanics also provided us ideas how the volcanic bodies enhanced fracture porosities in reservoirs in some areas – specially through enhanced seismic attribute images.

* * *

I wish to thank my adviser, AAPG member Kurt J. Marfurt from the University of Oklahoma, for his constant persistence and encouragement (to a geologist) to complete the work, part of which is reflected in this article.

I also would like to thank Pemex, as well as Sergio Chavez Perez from IMP, who provided the data for working this project. I am thankful to AASPI consortium at OU for all the support.

(Editor's note: AAPG member Supratik Sarkar is an exploration geologist in the Deepwater/Frontier New Ventures Business Development group with Shell in Houston.)

New York Survey

from page 30

six annual reports, four regional final reports and a final mineralogical report. Within these publications were almost 200 descriptions of hydrocarbon occurrence, the vast majority from the pens of either Lewis Beck or James Hall.

Oil was documented at seeps or quarries from at least 17 different locations in eight different counties. Carburetted hydrogen gas was noted from at least 38 seeps in 14 counties and from nine wells in five of those counties (figure 1).

For the Record

Despite the presence of hydrocarbons across a broad area, New York has been a minor participant in the historical petroleum industry.

During the 1870s and 1880s, exploration along the New York-Pennsylvania border resulted in development of the Bradford field – the first giant oil field in the United States – but the regional prospective area was limited due to northward termination of the Devonian sandstone reservoirs.

Many hydrocarbon occurrences described by the New York Natural History Survey originated in bituminous shales of Ordovician through Devonian age. Although not of major economic significance at the time, they documented the bituminous character of shale formations such as Marcellus, Utica and Rhinestreet.

They also foretold the potential for modern programs to develop these resource plays.

Editor's note: AAPG member Raymond P. Sorenson holds a bachelor's in geology from Michigan State University and a master's in geology from the University of Texas at Austin. He retired in 2006 from Anadarko Petroleum in Houston after 30 years of service, and now works as a Tulsa-based consulting geologist.

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

POLICYWATCH

Industry Keenly Watches Canadian Energy Policy

By EDITH ALLISON, GEO-DC Director

U.S. and Canadian energy markets have been closely linked for many years as excess Canadian oil and natural gas production supplied U.S. demand. Now, however, increasing oil and natural gas production as well as delays in regulatory approvals for Keystone XL pipeline are pushing Canadian companies to seek overseas exports.


ALLISON

The issues as seen from Canada include:

- Canadian pipelines are at or near capacity while oil and natural gas production is growing.
- Canadian oil and gas exports now go almost exclusively to the United States.
- Growing U.S. oil and natural gas production could significantly reduce demand for Canadian energy.

The International Energy Agency (IEA) 2012 World Energy Outlook predicted the United States would become the world's largest oil producer, overtaking Saudi Arabia by 2020. The U.S. Energy Information Administration (EIA), although less enthusiastic, is predicting that U.S. imports will decline and U.S. oil production will meet 62 percent of domestic demand in 2020.

- The Keystone XL pipeline that will transport Alberta oil-sand production to the United States is suffering permitting delays and environmental protests.
- Canadian oil sold to the United States receives significantly lower prices than would apply to Asian exports, reflecting the spread between West Texas Intermediate and Brent benchmark prices.
- Also fueling the interest in exports is Asia's continuing demand for oil and the region's growing demand for natural gas. IEA projects Asian natural gas consumption will grow over 200 percent between now and 2035.

As the world's largest oil importer and the largest customer for Canadian energy, U.S. consumers also are concerned about Canadian exports. Despite rosy IEA projections, the United States is likely to depend on Canadian imports as a secure, low-cost source of oil for many years.

The stories for oil and natural gas are different but the options for both resources are rapidly changing and controversial.

❒ Canadian oil exports

Currently, Canada produces over 3.3 million barrels of oil per day (bopd) – including upgraded bitumen, heavy oil, light oil and condensate. About 2.5 million bopd are exported to the United States.

Canadian oil production, already sixth largest in the world, should grow significantly; Alberta oil sand production is projected to grow from the 1.5 million bopd currently produced to 3.7 million bopd in 2025.

This volume, obviously, will require markets outside Alberta.

However, the two dominant pipeline options, Keystone XL and Northern Gateway, are both facing potentially serious delays.

The Keystone XL pipeline is awaiting U.S. State Department approval or rejection of the TransCanada Corp. May 2012 application. This new application provides alternatives to routes through the Nebraska Sand Hills that contributed to the rejection of the 2011 application.

The Nebraska Department of Environmental Quality has released its draft evaluation report, which notes the revised pipeline route addresses the major concerns about the original route. The Nebraska evaluation is considered a strong indicator of U.S. approval, although pipeline advocates are still unsure the pipeline will be built.

A State Department decision is expected in the first quarter of 2013.

Canadian oil exports to Asia are primarily tied to the approval and construction of the Northern Gateway pipeline, a 1,177 kilometer (731 mile) west-flowing, 525,000 bopd heavy-oil pipeline paralleled by an east-flowing condensate pipeline that will be the source of diluent to thin the heavy oil for transport. The pipeline system runs between Alberta and Kitimat, British Columbia.

In recognition of the fact that energy policy does not stop at national borders and that AAPG members live and work around the globe, "Washington Watch" is changing its name.

Starting this month with an article about Canada, "Policy Watch" will look at energy policy issues around the globe, although our focus may commonly be on issues of interest to Washington, D.C., decision makers.

Environmental groups and British Columbia First Nations oppose the pipeline. Alberta and British Columbia premiers also are arguing about how pipeline revenues will be split.

As controversies slow both the Keystone XL and Northern Gateway pipelines, smaller-volume alternatives are being proposed, including:

✓ Reversing and reconfiguring a natural gas pipeline to ship oil east to Ontario and Quebec.

✓ An expansion of the 300,000-barrel per day Trans Mountain pipeline system that moves Alberta oil to refineries near Vancouver, British Columbia, Washington and California.

✓ Rail transport of oil.

❒ Canadian natural gas exports

Canada is the third largest natural gas producer in the world, producing 5,218 billion cubic feet (bcf) in 2011. Canada's net natural gas exports in 2011 were 2,168 bcf.

As both U.S. and Canadian unconventional natural gas production grows and the United States imports less natural gas, Canada will need Pacific coast liquefaction plants and export terminals.

Canada currently has one operating liquefied natural gas (LNG) import facility, the Canaport terminal in Saint John, New Brunswick, which brought in 107 bcf in

Continued on next page

Editor's note: "In Memory" listings are based on information received from the AAPG membership department. Age at time of death, when known, is listed. When the member's date of death is unavailable, the person's membership anniversary date is listed. Asterisk denotes AAPG Honorary Member.

Continued from previous page

2011, about 30 percent of its capacity. There are no active LNG export facilities in Canada.

Kitimat LNG and LNG Canada have proposed LNG export facilities totaling a maximum of 34 million metric tons per year of gas at the Port of Kitimat, B.C. An LNG export facility also is proposed at Prince Rupert, B.C., and additional LNG export proposals are expected.

One proposed U.S. LNG export terminal, Oregon LNG, would export Canadian natural gas from Oregon.

Paralleling Canada, U.S. companies are proposing LNG export projects.

❒ Price impacts of U.S. and Canadian natural gas exports

While natural gas export revenue appeals to producers, U.S. and Canadian consumers dread higher prices that could result from reduced domestic supply.

Industry could be especially hard hit by rising energy prices. Canadian industry – including pulp and paper, chemical and fertilizer, iron, metals, and petroleum production and refining – represent almost 50 percent of Canadian energy consumption. U.S. industrial energy consumption is lower – about 26 percent in 2012 – but is rapidly growing in response to production-driven low energy prices. Reduced energy supply and higher energy prices could constrain industrial growth in both countries.

Controversy over constructing export facilities is expected to slow pipelines, liquefaction and port facilities over the next few years – and may defeat many proposals. Over the past two decades some energy-transport proposals have failed – the Mackenzie Delta and Alaska North Slope natural gas pipelines, for example, plus dozens of proposed LNG import terminals in Canada and the United States.

Therefore, it seems safe to predict that some of the proposed facilities will not be constructed, even if it is impossible to predict which will be built and which will not.

Ross Clark, the president of AAPG's Canada Region, has made recommendations to this article and provides the following conclusions:

"So, at the time of this writing it appears that there is a tremendous amount of corporate and regulatory effort being expended on optimizing market conditions for oil and gas in an attempt to minimize the differences in commodity prices around the world and capture some of this price upside for North American producers, including the U.S. and Canada.

"Global arbitrage pricing differences of 20 to 30 percent for oil and 300 to 500 percent for natural gas have spurred the effort to open the very competitive North American market to world markets – especially the fast growing Southeast Asia natural gas market.

"The increased revenue received for North American oil and gas in a global competitive market place will lead to further investment in the search for energy worldwide. However, the effort to expand markets by developing infrastructure will need to be balanced with concern for the environment and the rights of stakeholders being directly affected by this development.

"It is an especially exciting time in the midstream portion of our industry and in the government regulatory agencies dealing with the proposed expansion."

Stay tuned!

IN MEMORY


MANKIN

Charles J. Mankin, an AAPG award winner, past officer and Honorary Member, died Nov. 13 in Norman, Okla. He was 80.

Mankin was a longtime professor at and head of the University of Oklahoma School of Geology and Geophysics, and he was director of the Oklahoma Geological Survey for 40 years, during which time he helped found the National Geologic Mapping Act. He also was director of the Sarkeys Center at the University of Oklahoma. He retired in 2007, and is believed to have been the longest-serving director of any state survey in the United States.

He also was an officer and award winner for multiple national geologic organizations. For AAPG, he was elected secretary in 2001-03; received the Public Service Award in 1988; and was awarded Honorary membership in 2000.

Mankin also was a member of the AAPG Foundation Trustee Associates.

* * *

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Huburt Hunt, 88
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Richard Oppel, 81
Edmond, Okla., Dec. 9, 2011
Richard Paull, 82
Littleton, Colo., Oct. 13, 2012
George Schmitt, 91
Hamilton, Ohio, Oct. 15, 2012

SPOTLIGHTON

On the Rocks: Geologist Makes Business Pleasure

By BARRY FRIEDMAN, EXPLORER Correspondent

Patricio Desjardins studied in Saskatchewan, works in Houston and in 2011 received the Canadian Society of Petroleum Geologists' "Best Ph.D. Thesis Award."

He's thinking at the moment, though, about his home in Argentina – and a particular summer a long time ago.

It was after his first Historical Geology class.

"A famous Argentine geologist, friend of Gabriela Mangano and Luis Buatois, Eduardo Olivero, offered me an opportunity to be the field assistant of one of his Ph.D. students, Juan Jose Ponce, in Tierra del Fuego (the most southern point of the continent). During 20 days of camping by a cliff, looking at the ocean, away from everything, Juan taught me everything that needs to be known about field geology, and I just learned!"

And did he ever.

Desjardins, an AAPG member, was honored for his graduate work at the University of Saskatchewan, which focused on shallow-marine sandstone of the Early Cambrian Gog Group in the southern Canadian Rocky Mountains. The rocks are part of the vast terrace of similar deposits that can be found almost contiguously around North America.

His main objective was to further discover the ancient continental margin – to essentially see what other chapters may have been written about the history of the North American continent.

"These 510 million years old rocks," Desjardins said, "have received very little attention in the past, maybe because they seem monotonous from the distance, but also because they are a daunting big pile of sediment, over 1,000 meters, that need some serious hiking for their study."

That serious hiking translated into three years of fieldwork, which ultimately resulted in detailed mapping and descriptions that have been published in four prestigious geologic journals.

"I believe that by studying the Gog Group I have 'awakened a giant,' as it were, and these rocks will play a major role in our understanding of tide-dominated shallow-marine systems."

An Emotional Connection

For Desjardins, the endeavor wasn't just business.

"I love the mountains, being outdoors, camping," he said. "The best thing is that by walking all over those mountains, I was able to find places where the rocks were just perfect to collect the data I wanted.

"Also, walking and finding outcrops, I felt truly like an explorer, reaching places where no geologist searching for these rocks had

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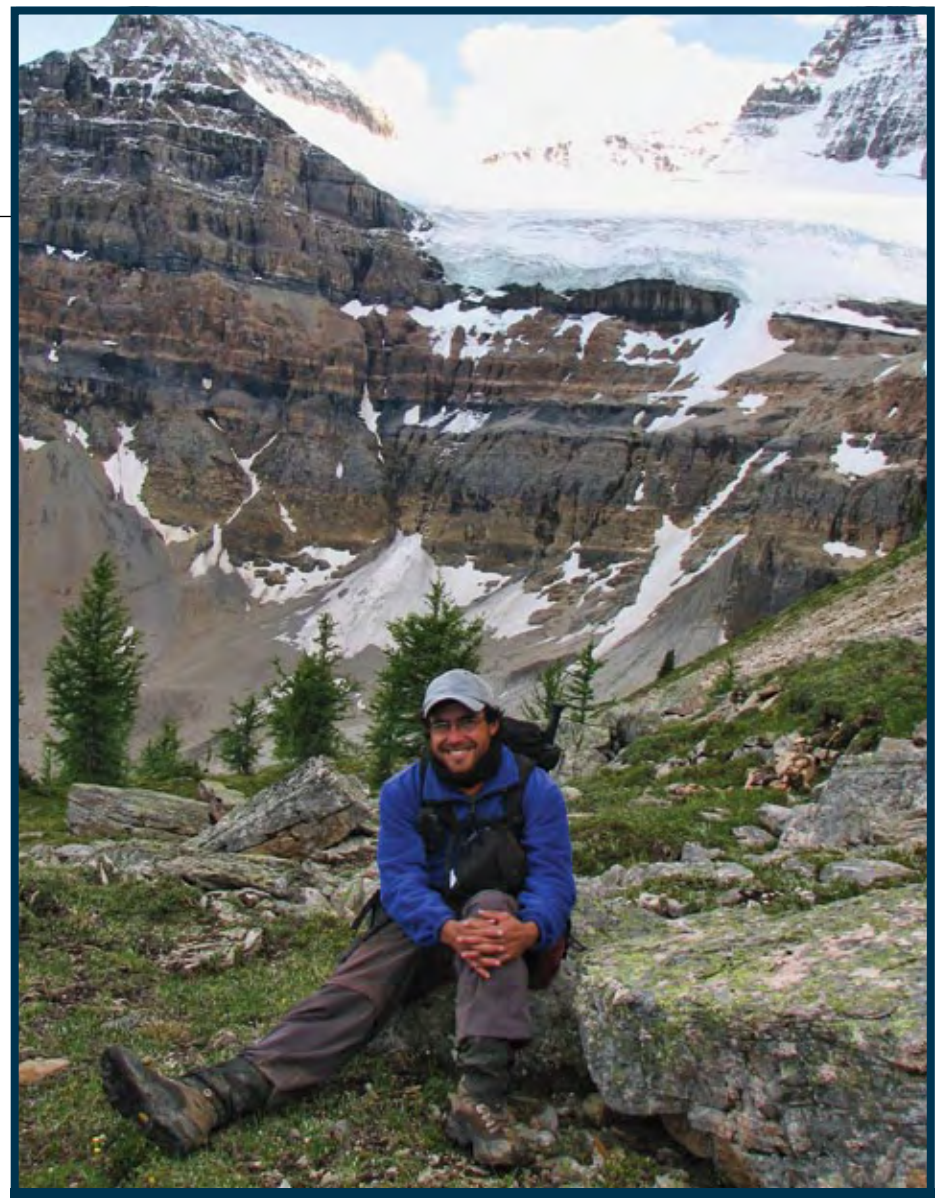


Desjardins, and his beloved Canadian Rockies: "The best thing is that by walking all over those mountains, I was able to find places where the rocks were just perfect to collect the data I wanted."

"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 website, www.aapg.org/explorer/pnb_forms.cfm.

PROFESSIONAL newsBRIEFS

Dale Fritz, to business unit vice president-Rockies business unit, Devon Energy, Oklahoma City. Previously vice president-exploration, Mid-Continent division, Devon Energy, Oklahoma City.

Geoff Galvan, to technical skills manager-geosciences, Lower 48, ConocoPhillips, Houston. Previously principal geophysicist-E&P Nigeria, ConocoPhillips, Houston.

Michael Grammer, to professor and Chesapeake Energy Chair of Petroleum Geology, Boone Pickens School of Geology, Oklahoma State University, Stillwater, Okla. Previously director, Michigan Geological Repository for Research and Education, Western Michigan University, Kalamazoo, Mich.

Jim Lowe, has retired as consulting geologist for Noble Energy, Houston. He resides in Spring, Texas.

Jennifer R. Poole, to petroleum systems analyst/geochemist, BP, Houston. Previously consultant, Houston.

Fred Ribeiro, to new ventures exploration manager-Latin America, Apache Corp., Houston. Previously new ventures geologist senior staff, Apache Corp., Cairo, Egypt.

Brad Ritts, to team leader-Asia Pacific new ventures, Chevron, Singapore. Previously exploration adviser, Chevron, Singapore.

Marty R. Smithey, to vice president-geoscience, Greenshale Energy, Houston. Previously senior geological adviser, Apache Corp., Houston.

Charles D. "Chuck" Ward, to vice president-sales and operations, Geoseismos, Houston. Previously general manager-program development, Geokinetics, Houston.

Geir Ytreland, to principal adviser, Gaffney, Cline and Associates, Bentley, England. Previously senior adviser, Norad, Oslo, Norway.

Continued from previous page

been before," he continued. "It was really fun. However, you have to deal with the rain, snow, bears, backpacks full of rocks, angry field assistants. Sometimes it was really painful."

Clearly, it's not just science for Desjardins; he describes the work, the earth and the connection more emotionally.

"In Argentina I grew up in a place called Tucumán, at the foothills of the Andes. There is no doubt that by living by the mountains you built a relationship with them and you become passionate about them."

He then came to Canada when he was 17 as an exchange student.

"I really wanted to go back to Canada at some point, but never thought that was going to be as a geology Ph.D. student."

He did, though.

Finding the Right Path

And then when he got there, he realized how much he wanted to study and, ultimately, give back to both his adopted home and his native one.

In Argentina, he founded the "El Mirador Group" (The Lookout) in 2003, and its goal, he says, was to inspire creativity through geology.

"We are a team of many and we focus in the Aboriginal community of Amaicha del Valle in Tucumán," he said. "I was the one running the geology workshop, while a friend of mine who is a photographer coordinated the photography workshops."

His main workshop, Tierra Viva (Living Earth), was designed to teach basic geology concepts to locals – specifically teenagers – with a rudimentary knowledge of what had literally happened beneath their feet.

"Once the trail was designed, the goal was to set it as a tourist attraction so that the members of the workshops could serve as guides and generate an income." He says he is most proud, though, of the book that came out of that period "Journey to the Depths of Time" – a textbook and a story that incorporates an Aboriginal perspective.

In Saskatchewan, he was an active member of the graduate student-run group called "Let's Talk Science," which gives class presentations in many elementary and high schools throughout western Canada. In recognition of that, he was awarded the 2006 University of Saskatchewan Appel Global Citizenship Award.

Desjardins now works for Shell in Houston in its international exploration division – but he still keeps an eye on his outreach work in both Canada and Argentina.

"My love for geology, it's the same – I always carry the same passion," he said. "However the perspective changes, for me it's constant learning.

"In Saskatchewan, my goal was to publish papers," he said. "Here in Houston it is to find and develop oil fields."

He then says something both profound and simple.

"Rocks are rocks. It's the same earth."

He says his goal, then, is to see more of them, explore more. In short, to become a better geologist, he adds, "enjoying every second of that path."

ICE Abstract Deadline Arriving

The call for papers remains open for the next AAPG International Conference and Exhibition, which will be held Sept. 8-11 in Cartagena, Colombia – but the deadline arrives this month.

The meeting theme is "Energy for Integration and Prosperity." Victor Vega, with Equion Energia Ltd., in Bogota, D.C., Colombia, is the general chair.

The technical program will feature six main themes. They are:

- Latin American Basins and Petroleum Systems.
- Unconventional Resources.
- Challenges in Heavy Oil.
- Mature Fields.
- Deep Water Exploration and Production.
- Environmental Geology.

In addition to these will be a "special session" on the History of Petroleum Geology.

The deadline for abstract submittal is Jan. 18.

To submit an abstract, or for more information on ICE 2013, go to aapg.org/cartagena2013.

Regions and Sections is a regular column in the EXPLORER offering news for and about AAPG's six international Regions and six domestic Sections. Contact: Carol McGowen, AAPG's Regions and Sections development manager, at 1-918-560-9403; or e-mail to cmcgowen@aapg.org.

Argentina's Vaca Muerta Draws GTW Spotlight

BY CAROL CAIN McGOWEN

"Vaca Muerta," once a little-known term outside of Argentina, is now part of nearly everyone's vocabulary across Latin America and much of North America.

The enormous unconventional resource potential of the Vaca Muerta in Neuquén Province emerged only in the past few years. Until YPF's Vaca Muerta discovery wells in 2010, the Neuquén Basin was considered over-produced and nearly depleted. Now, the Vaca Muerta is understood industry wide to reference the leading shale play in Latin America.

In fact, industry experts at the AAPG GTW Argentina held in Buenos Aires in early December favorably compared the Vaca Muerta with U.S. shale plays like the Haynesville, Utica and Eagle Ford. Cautious optimism pervaded the remarkably open discussion among 150 workshop participants from nine countries in Latin America and North America.

> **"The thickness and variability of the Vaca Muerta, both vertically and laterally, calls for an interdisciplinary survey of the region."**

Geoscience professionals from 54 companies considered the following question: With proper development of the Vaca Muerta formation, could Latin American success rival the North American unconventional resource boom?

According to a February 2012 audit report by Ryder Scott for Repsol-YPF, gross prospective resources of 21.167 billion barrels of oil equivalent from the Vaca Muerta shale oil and shale gas were assessed in an area of 8,071 square kilometers. Of that, 12.351 billion barrels of oil equivalent are net YPF.

Beginning in 2007, YPF began looking for other energy sources. By looking at legacy data from over 130 wells with tests or cores in the Vaca Muerta, YPF found data indicating an underbalanced system and positive initial production rates.

Motivated by this promising data, the company drilled and completed a shale gas discovery in July 2010 in the Loma La Lata area. Shortly thereafter in November 2010, a shale oil discovery was made in the Loma Compana area of Neuquén Province.

Then between 2010 and 2011, according to YPF sources, YPF drilled or worked over a total of 12 wells in the Loma La Lata-Loma Campana area blocks in order to delineate the Vaca Muerta play. The company tested the play in 2011 by drilling the first horizontal well.

All the wells tested oil and gas from the Vaca Muerta marls in an area of more than 300 square kilometers.

As of last October, YPF and 10 partner companies completed 31 Vaca Muerta producing wells, seven of which produce gas. Nearly 20 more await completion or re-entry. Gas production rates exceed 7,000 kscf/d and oil production rates exceed 3,500 bbl/d.

Many of the reservoir characteristics used by North American operators to define the "sweet spot" for optimum hydrocarbon generation and producibility are known. GTW participants discussed and debated at the end of each session, then reported out the best ideas from their table. Operators and service companies with North American experience, like Shell, ExxonMobil, Weatherford and Schlumberger, shared key factors for identifying sweet spots.

That included:

- The right paleogeography – the Neuquén embayment is Cretaceous in age (Tithonian, 150 mya).
- The right depositional environment – resulting in Type I Kerogen, carbonate dominated, low clastic input.
- The right rock type and geomechanical properties – Silica/carbonate-rich, brittle rocks result in greater natural fractures and more easily induced fractures.
- The right petrophysics – high gamma ray, high resistivity, low density, slow compressional velocity, TOC cutoff 2 percent.
- Thick and laterally extensive – over 400 meters thick, basin wide.

Session chair Jeff Ottmann, an AAPG member, offered a straightforward, practical definition of "sweet spot" as the presence of producible hydrocarbons.

"In areas where clay content is reduced, the rock is brittle," Ottmann pointed out. "In many of these source rocks, most if not all porosity is filled with hydrocarbons."

Continued on next page

Visits to outcrops in Argentina's Vaca Muerta were a popular activity during the recent AAPG Geosciences Technology Workshop in Buenos Aires.

Continued from previous page

Data, Data, Data

Throughout the GTW, a common theme was repeated: Data acquisition will be essential to understand the Vaca Muerta reservoir; data sharing will escalate the learning curve; regional data integration contributes to finding the sweet spot trends, which reduces risk, saving time and money.

Among the GTW Argentina presenters was professor Héctor A. Leanza, Departamento de Geología, Museo Argentino de Ciencias Naturales – CONICET. Revered among Argentina geoscientists, Leanza is known locally for mapping the Vaca Muerta from top to bottom. His expertise is so valued that he frequently is invited to accompany industry for its fieldwork.

"The thickness and variability of the Vaca Muerta, both vertically and laterally, calls for an interdisciplinary survey of the region," Leanza said.

There was consensus among the workshop attendees that comprehensive data from the Neuquén Basin existed among the industry players. The missing piece, acknowledged by operators, service companies and academia alike, was regional data sharing and integration through joint ventures and partnerships.

Industry Consortia

Rarely do students attend GTWs – they are designed for seasoned professionals and academics, which explains why AAPG member Henry Kernan was the lone student attending GTW Argentina.

But the justification for Kernan's presence at the workshop was indisputable. A master's student at Colorado School of Mines and former ExxonMobil geoscientist, Kernan had carefully planned his trip to Argentina. Following participation in GTW Argentina, his itinerary included seven to 10 days of fieldwork along the western portion of the Neuquén Basin.

Focusing on the outer ramp of the Vaca Muerta, Kernan would soon conduct mapping and gather samples alongside a team from Pluspetrol Argentina.

"Following our field work," Kernan said, "we'll be conducting source rock analysis with X-ray diffraction and scanning electron microscopy to determine the geomechanical properties and sequence stratigraphy."

Kernan is a member of the Colorado School of Mines, Vaca Muerta Consortium, and Pluspetrol is the founding member of the Consortium. Pluspetrol is the leading enterprise member, having contributed seismic and well data.

In addition to Pluspetrol, other consortia members include Chevron, Halliburton, Shell and Weatherford.

The idea of an industry-university consortium is a proven concept with past AAPG president and Honorary Member Steve Sonnenberg, who spearheads two other research consortia focused on the Bakken and Niobrara.

"The idea for the consortium occurred as a result of Carlos Portela and me visiting about my other research consortiums," Sonnenberg said. "These research projects are focused on what we consider to be important (world class) petroleum systems.

"Portela and I decided the Vaca Muerta would be a potential consortium project, and thus it started," he added.

It turns out that Portela, now corporate operations vice president for Pluspetrol Argentina, holds a master's in petroleum engineering from Colorado School of Mines.

The Vaca Muerta Consortium will address many issues companies want to analyze but may not have the time to do themselves, including regional source rock characterization, regional stratigraphy, the role of natural fractures in production, the geomechanics of the unit, 3-D seismic attribute analysis and petrophysical analysis.

"This consortium is different from other consortiums because it is all about student- based research supervised by principal investigators," Sonnenberg said, "with the areas of research suggested by participating companies."

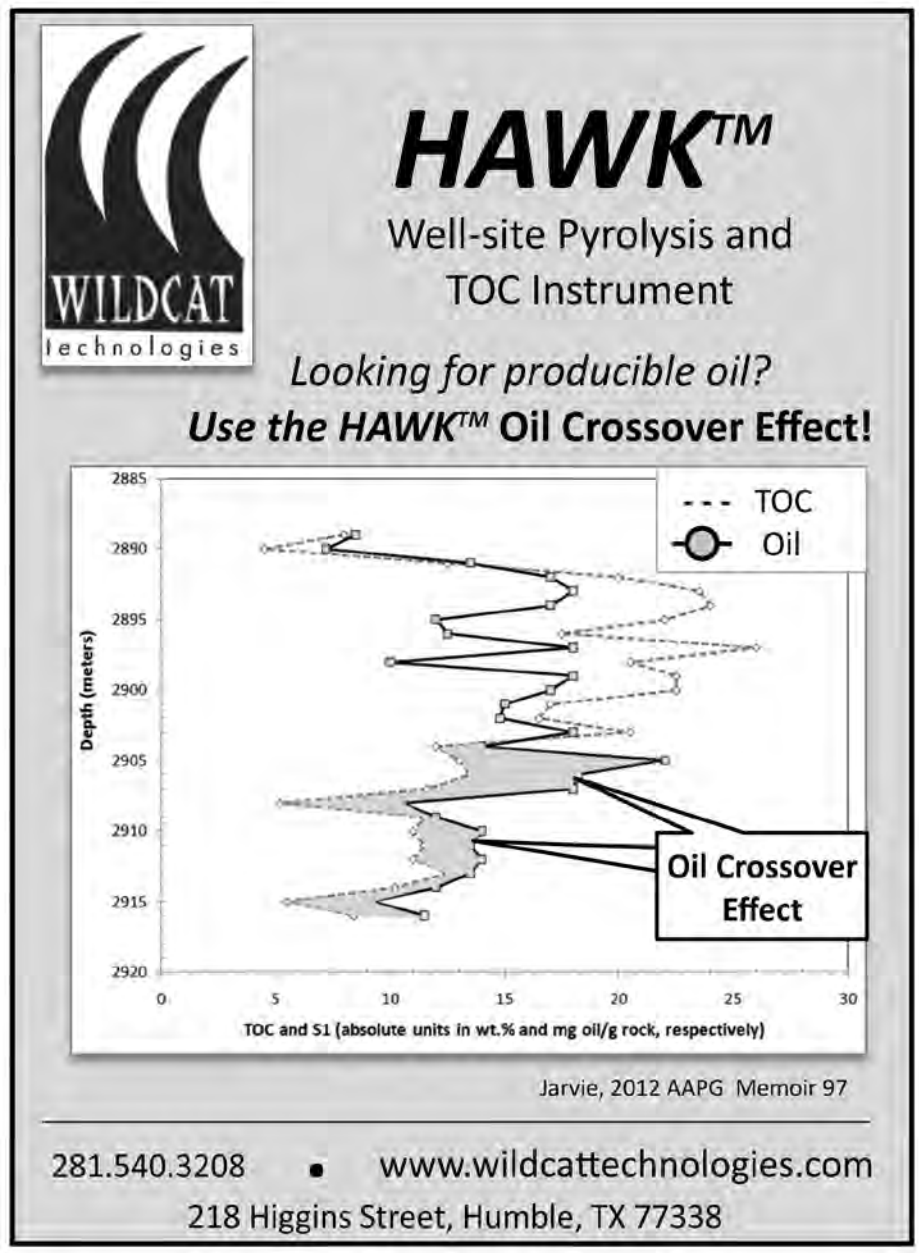
The Unconventional Learning Curve

In North America, lessons learned from one unconventional play often are applied to the next play.

"The learning curve in the Marcellus took 17 years, (and) in the Eagle Ford it was two years," said session chair Ottmann, who is technical team lead of Argentina operations for ExxonMobil.

"In Argentina, the question is learning about the *efficient* development of unconventional resources," said fellow session chair Güimar Vaca Coca, managing director, Americas Petrogas. "We need an honest data exchange to shorten the learning curve."

GTW Argentina presenters and participants alike were eager to share ideas and expertise during the workshop. By the end, it seemed that everyone recognized they had more to gain and less to lose by pooling their experiences, lessons learned and even their data.



AAPG FOUNDATION

GUNN AND BAILE TO RECEIVE TOP FOUNDATION HONORS

The AAPG Foundation is pleased to announce that the Trustees recognize Robert (Bob) Gunn as the 2013 L. Austin Weeks Memorial Medal Recipient and Richard Baile as the 2013 Chairman's Award Recipient.

The L. Austin Weeks Memorial Medal is given in recognition for extraordinary philanthropy and service directed to advance the mission of the AAPG Foundation. Gunn joined the Trustee Associates in 1978, contributing even before the organization was officially established. Bob and his wife, Carol, live in Graford, Texas. Gunn will receive his medal at the ACE opening session in Pittsburg, PA in May.

The Chairman's Award is given to recognize persons who have made extraordinary contributions to the AAPG Foundation, whether monetary or service. Baile has been a faithful supporter and regular attendee of Trustee Associates Annual Meetings since he joined in 1980. He and his wife, Fran, live in Houston, Texas. Baile will receive his award at the 2013 Trustee Associates Annual Meeting in Cle Elum, Washington in September.

To give to the AAPG Foundation, go online to http://foundation.aapg.org/donate.cfm or mail to P.O. Box 979, Tulsa, OK 74101. Questions? Call 1-888-945-2274 Ext. 2644.

FOUNDATION UPDATE

Gunn, Baile Take Top Awards

By NATALIE ADAMS, AAPG Foundation Manager

The AAPG Foundation has announced the recipients of its two highest awards for 2013.

They are:

▸ The L. Austin Weeks Memorial Medal, given in recognition of extraordinary philanthropy and service in advancing the mission of the AAPG Foundation, goes to AAPG Honorary Member **Robert "Bob" Gunn**, of Wichita Falls, Texas.

▸ The Chairman's Award, given to recognize those who have made "extraordinary contributions" to the Foundation, goes to **Richard Baile**, of Houston.

Gunn, who recently gave a $1 million gift to the Foundation's General Fund (see December EXPLORER), is one of the founding Trustee Associates, having joined in 1976, and he has supported many of the Foundation's programs over his entire career.

Gunn, a nationally noted petroleum geologist, was AAPG president in 1978. He also is one of AAPG's most honored members – awards include the Sidney Powers Memorial Award, AAPG's highest honor, plus the Public Service Award and the DPA Heritage Award.

Gunn will receive his award at the opening session of the AAPG Annual Convention and Exhibition, which will be held May 19-22 in Pittsburgh.

Baile, also a Foundation Trustee Associate and a longtime supporter of Foundation activities, heads Photo Gravity Corp. He will receive his award at this year's Trustee Associates annual meeting, to be held Sept. 22-25 at the Suncadia Resort, Cle Elum, Wash.

* * *

The Foundation Trustees approved three major funding requests when the group met in late November:

▸ For the **E.F. Reid Scouting Fund**, which supports programs that teach geology to the Boy Scouts, Girl Scouts and other youth organizations as determined by the Trustees of the Foundation, the Trustees approved $5,600 for the second year of funding for the 2013 Boy Scouts National Jamboree.

The Jamboree is held every four years, showcasing the Boy Scouts' program to more than 40,000 scouts and adults. Teenage boys are exposed to career opportunities and alternative hobbies through the BSA Merit Badge Program.

The Foundation has been the national sponsor of the geology merit badge since the 1997 Jamboree (AAPG has been a sponsor since the 1950s).

▸ For the **Charles H. Taylor Fellowship**, designated last February as a special AAPG committee chaired by the Elected Editor, the Foundation approved $5,000 for course development for future student and young professional authors.

The Taylor Fellowship, comprising all former and current members of the Association's editorial boards, helps ensure the AAPG BULLETIN remains the premier scientific journal of energy geoscience by providing advice on BULLETIN strategy.

The group also will assist with the annual awards review process; develop best practices on editorial review; and to develop a workshop for aspiring student and young professional authors; to eventually create a self-sustaining public forum for education of young authors and recognition of scientific writing at all levels.

(See related story, page 4.)

▸ **Paul Weimer**, past AAPG president and current professor at the University of Colorado, received approval for continued funding of an interactive geology project consisting of 12 five-to-eight-minute "vignettes" summarizing the geology of Colorado for various periods/epochs from Precambrian to today.

Each video reviews the paleo-geographic setting; the major life forms (floral and fauna); where the general public can see the rocks; and unique aspects of each period/epoch in Colorado's geologic history.

These animations will be used to educate the public via various venues, including classrooms.

Foundation (General)
Chevron Humankind
Matching gifts/ Leon Gerlich and Douglas Hall
Mohammed Sedki
Ali Abu Gabal
Adebayo Oladele Akinpelu
Estate of Karl H. Arleth
Jose Geratdo Balli
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David Gerald Bryant
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In memory of Jim Hooks
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Awards Fund
A.I. Levorsen Memorial Award
Lawrence W. Funkhouser
In memory of Robert I. Levorsen

Digital Products Fund
Kansas State University
Amanda L. Cashman

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Distinguished Lecture Fund
Allan P. Bennison Distinguished Lecture Fund
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Harry and Joy Jamison Named Grant
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In memory of Charles J. Mankin

Jean G. Funkhouser Memorial Grant
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Clifford C. Clark

Robert K. Goldhammer Memorial Grant
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Roger W. Stoneburner Memorial Grant
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Weimer Family Named Grant
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James A. Hartman Student Chapter Leadership Summit
Chevron Humankind
Matching gift/Stephanie Thomas

Imperial Barrel Award Fund
Chevron USA Inc.

Named Public Service Fund
The Gibbs Family Endowment Fund
James A. Gibbs
In memory of Charles Mankin

E.F. Reid Scouting Fund
Jeffrey M. Rayner
Christopher E. Slagle

Visiting Geoscientist Fund
Susan M. Landon

L. Austin Weeks Undergraduate Grant Fund
William Casey Armstrong

PROTRACKS

YPSS offers support

YPs' Profile Grows in ME

By ANWAR AL-BEAIJI

A few years ago, the AAPG Middle East Region's Council (AAPG-MER) – realizing the growing importance and numbers of Young Professionals' (YPs) involvement in the Region's activities – established the Young Professionals and Student Support team (YPSS) to oversee the Region's YP and student activities.


AL-BEAIJI

The YPSS' role is to strengthen the links among YPs, students and the AAPG-MER Council by promoting the Council's vision of an integrated communication network.

Through the YPSS chairperson, the Council ensures that YPs and students receive the benefits and opportunities afforded by AAPG, companies and educational institutes.

The YPSS team, under the supervision and guidance of the AAPG-MER, manages many Regional activities, including the Imperial Barrel Award Competition, YP Meet-N-Greets, short courses and workshops, the Student Chapter liaisons and the YP and Student Conference.

The YPSS team has successfully established new Student Chapters and reactivated existing chapters by organizing university visits to encourage students to apply for membership and take advantage of the services provided by AAPG. These efforts resulted in a significant increase in student membership and a greater number of Student Chapters organizing social activities, field trips and fundraising events for their respective universities.

In addition, the YPSS has organized and coordinated three successful Imperial Barrel Award Regional Competitions.

Since 2010, the Imperial Barrel Award – Middle East Region Competition has become an important annual event in the Region – two MER teams received third place awards in the IBA finals competition held during the 2010 and 2011 AAPG Annual Convention and Exhibition.

Following these successes, the number of universities participating in the IBA competition has doubled from three teams in 2010 and 2011 to six teams in 2012. These teams are often aided by YPs who participated in the IBA as students.

The YPSS team activities, including the IBA-MER Competition, were recently showcased at the tenth Middle East Geosciences Conference and Exhibition (GEO 2012-Bahrain). The YPSS produced an exciting program that included:

- The third Imperial Barrel Award – Middle East Region Competition.
- Short Courses, which included:
  - ✓ Fundamentals of Oil and Gas.
  - ✓ The Petroleum Industry in the Next Decade: An Overview to the Science, Technology and AAPG.
- Meet-N-Greet events.
- Soft skills workshops, which included:
  - ✓ Presentation Skills.
  - ✓ Business Writing.
  - ✓ C.V. Writing.

Since joining the AAPG-MER Council, the YPSS team has been able to continue playing a vital role in establishing links and strengthening relationships among YPs and students, companies, universities and the AAPG.

Through its networking events, technical short courses, workshops and leadership opportunities, the YPSS team has demonstrated that continued participation from students and YPs is a bridge to a brighter future and a proven strategy for success.

(Editor's note: Anwar Al-Beaiji is the chairperson of the AAPG Young Professionals and Students Support Team, Middle East Region.)

GIA Deadline Arrives Jan. 13

The application deadline for AAPG Foundation Grants-in-Aid graduate grants is fast approaching.

The deadline is Jan. 13.

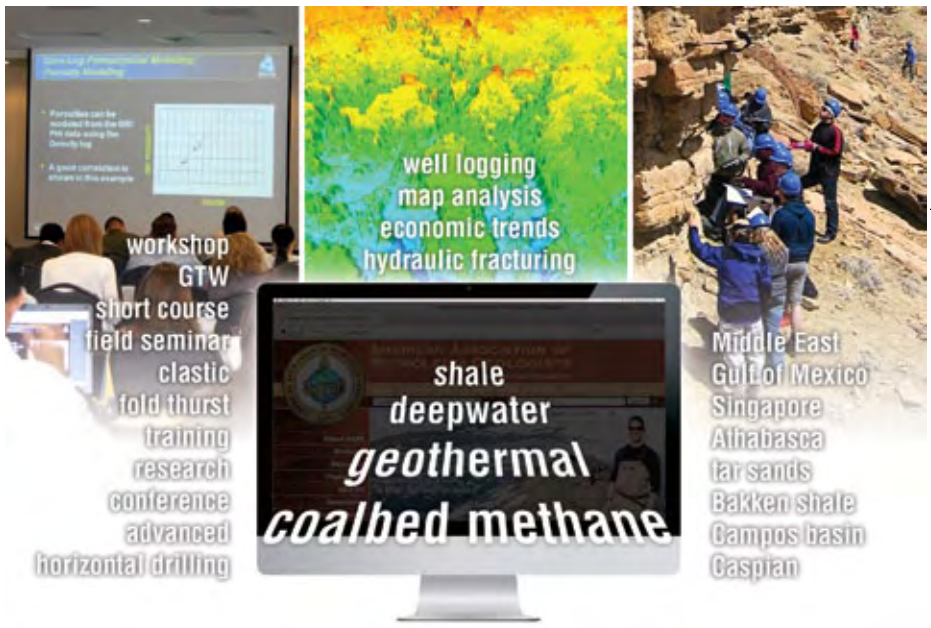
GIA grants provide financial assistance to graduate students (currently enrolled in master's or doctorate programs) whose thesis research has application to the search for and development of petroleum and energy mineral resources, and/or to related environmental geology issues.

There are 84 grants available, ranging in value from $500 to $3,000.

New graduate grants this year include:

- ✓ John and Erika Lockridge Named Grant – $3,000 for a student at the Colorado School of Mines.
- ✓ M. Ray Thomasson Named Grant – $1,000 each for a student at the University of Wisconsin and the University of Missouri.
- ✓ Martin D. Hewitt Named Grant – $1,000 for a student at McMasters University, Canada.
- ✓ Grants-in-Aid Committee Named Grant – $500 for the "Chairman's Choice."

In all cases, the application form and other information on the grants that are available can be found online at foundation.aapg.org/index.cfm.



WWW UPDATE

We Want to Know: What Words Help Your Search?

By JANET BRISTER, AAPG Web Site Editor

What are the keywords you use when searching AAPG's websites?

We want to know. Really.

Because as we work toward the goal of making the AAPG website more science- and user-centric, your feedback would help.

Taxonomy is going to be a core part of the AAPG website future. Tagging and categorizing information into large enough buckets to empower the user to find the information they need will be the result.

It also is the challenge.

The best illustration I know for this concept is my experience at one of my favorite sites: Amazon.com. Their use of taxonomy has created a search-based experience that guides me to the products I desire. When I'm shopping, I always start there.

The goal for the AAPG website is a similar experience – but focused on the science, services and products of the AAPG. The result being a website vital to the geoscience community. The first place to come for the industry.

Tag, You're It!

According to our research, folksonomy and taxonomy are two ways to approach building your site's vocabulary.

"Folksonomy" is what comes from bloggers, commenters and other contributors to a conversation. They have decided their own keywords, or tags, for the information they wrote.

Folksonomy is great for emerging terms, but the end result is unreliable. This is because one person might label something "hydraulic fracturing" and someone else might label it "hydrofrac, fracking, fracturing, fracing" – well, you know that debate.

As you can see, the tagging could be so varied that should you want to look for hydraulic fracturing information you may only get the one item labeled, while missing out on the many others provided in the diversity of tags used.

Who has that kind of crystal ball?

Taxonomy is the Thing

Imagine this.

You come to the AAPG website and are looking for information on unconventional exploration. Your objective is to simply learn more about emerging practices. Your experience is somewhere in the early stages of this discipline.

You hope to find a paper or news article that adds to your knowledge.

You enter "shale unconventional" for your search and the result gives you a combination of several articles that ran in the AAPG Bulletin, *Search and Discovery* and the AAPG EXPLORER.

But then you scroll down a little bit and see:

- Two courses (one on shales and another on unconventionals), one field trip to the Marcellus shale and a GTW available for training and growing your skills.
- Three books are available for purchase as a continued resource.
- A discussion area devoted to this topic is available immediately where you can ask questions or offer your own thoughts.
- A dozen or more names of AAPG members are available as consultants or for contract work.

All of this is organized and clearly labeled as opportunities to read, download, attend, connect or purchase.

Pipe Dream?

I don't think so.

We are developing a list of tags and categories that provide a large enough

Continued on next page

COMMENTARY

Settled Science – Not!

By JOHN McLEOD


McLEOD

Sex, politics and religion – three topics guaranteed to start an argument at a dinner party.

To these we can now add science, an enterprise no longer dominated by nerdy geeks who would rather play chess than watch a football game.

To thank for this we have public alarm/fascination about anthropogenic global warming, a subject almost everyone has an opinion about and about which precious few of us command the intricacies.

New semantic constructions have arisen to frame this scientific argument in a public dialogue: *Global warming is a fact. Global warming is settled science. If you do not believe in global warming, you are a denier*.

Most of us spent many years in school studying science subjects as preparation for professional careers. We pursued these subjects because we liked them, we (mostly) did well at them and they satisfied our inherent intellectual curiosity.

What some of us failed to understand until well after our education is what science is and is not. Science is the process of trying to prove how things work. It is the near-opposite of engineering, which is about designing and building things (even though our mathematics and science backgrounds are similar).

To "do" science, we collect data and use it to develop a hypothesis (and its big brother, the theory). This process is called the empirical method. Multiple hypotheses are proposed and tested to determine the most plausible explanation.

Factors that are important but not known are sometimes assumed, and we may be selective about the data that we use. We rely on the integrity and professional judgment of scientists to use representative data and make valid or reasonable assumptions.

Nonetheless, there frequently are elements of subjectivity in scientific arguments.

The advantage we scientists now have – that say, Galileo or Charles Darwin did not have – is that powerful computers allow us to develop an iterative model. Data organization, analysis, hypothesizing and forecasting are all processed at lightning speed. The end product is an explanation of how things work – or a forecast of how they might.

Given that science is at its core about data, hypotheses, theories and forecasting, where did these other ideas come from? Most likely the intersection of science, law, religion and popular culture.

A "fact" is a true statement, and as any first year legal student can tell you, a legal conclusion. It is, however, frequently difficult to state a fact that is truly conclusive. "The sky is blue" is a fact – except at night, or if you are color blind, or if you're on Mars, or if it is not overcast, and so on. The foundation of science is data, not facts.

"Settled science" is an oxymoron.

Imagine if you will, Albert Einstein telling his colleagues in his 1921 Nobel Prize address to stop their work on quantum mechanics because it was now "settled science." Science by its very nature is a continuous and somewhat contentious debate over sometimes competing hypotheses and theories, each with their own data, method of analysis and assumptions.

Calling skeptics of the global warming hypothesis "deniers" is blatantly designed to push inflammatory subliminal buttons. Prior to this debate, the term "denier" was used most often to describe individuals who denied the existence of the 20th century European Holocaust, a matter of historic certainty and legal fact – as proven at the Nuremberg trials.

Scientists who "believe" their hypotheses and theories have crossed the dividing line between science and religion. Religion requires no facts, data or hypotheses, merely beliefs. This has not stopped some faithful from trying to apply the scientific method to religious beliefs (creation science for example). Scientists conclude – but once they believe, they have left the program.

Scientists are not perfect – we can be narcissistic, greedy, corrupt, dogmatic and incompetent, just like the rest of the human race. Scientists can spend entire careers devoted to group-think conjecture and can ostracize their own who develop minority viewpoints.

We geologists have skeletons in this closet. Alfred Wegener's 1912 continental drift theory was widely rejected and sometimes derided by the geological establishment. AAPG itself organized a 1926 symposium featuring Wegener himself and many critics. It had the perhaps unintended consequence of squelching a now widely accepted theory for the next four decades.

Because so much of the public trusts us (at least compared to politicians), we have a responsibility to try to live up to higher standards. We could start by better explaining our methods and our limitations.

* * *

Thanks to Ted Beaumont, David Jacobi and John Mitchell for their ideas and feedback.

(Editor's note: John McLeod is an AAPG member in Tulsa.)

Continued from previous page

spectrum of terms to make all information servable in this manner. The purpose of these terms is to tag every item within AAPG's information so cross-referencing of science, people, places, events and services can now surface for the user.

Getting it right so it is meaningful to the industry is critical to bringing this in as a reality.

Thus the question: What are some of your favorite search terms? Is there slang or shorthand you've found within the folksonomy that might be wise to incorporate into such a system? What have you seen? What do you use?

Find this article on the AAPG web EXPLORER and send us your thoughts. Or look for the wwwUpdate blog and comment there.

Good browsing!

DPA
from page 46

It's all about networking.

DPA networking, online and at AAPG meetings, offers opportunities to learn from the best oil finders in the business and to participate in world-class programs. We hear stories about how DPA has kindled friendships that "sealed the deal," provided insights that led to new plays or inspired personal missions.

These stories, DPA's "lore," are DPA's best recruiting tools.

Every DPA member could tell such stories, of course, and you are encouraged to share yours with Chandler Wilhelm, editor of our DPA "Correlator" newsletter at Chandler.Wilhelm@shell.com.

* * *

Here's one of my stories about how a DPA event changed my life:

I attended a "Legends in Wildcatting" DPA luncheon organized by Jim Gibbs, a past president of both AAPG and DPA, at the 1997 AAPG annual convention in Dallas – and it featured a series of talks that profoundly transformed my professional life.

That day, Tom Jordan, Mike Halbouty, Bernard Duval, John Masters and Roy Huffington shared their thoughts on oil finding. I sat in the front row and took 10 pages of notes (which I still review today)! This panel told how great oil explorers combine science and business to consistently achieve spectacular results.

Powerful stuff!

These experiences made me want to create more forums like that one. When I became president of the Houston Geological Society in 1999, my top goal was to create a "Legends in Wildcatting" program. Over the last 13 years, HGS has continued to host Legends panels – number eight will be held Jan. 14.

Building on the success of Legends, in 2008 we launched a new program on the international stage, Discovery Thinking Forums, as an AAPG/DPA event at AAPG annual conventions. Since then we have held seven such panels – typically for standing-room-only crowds – with many more forums planned as we look toward 2017, AAPG's 100th anniversary.

Each of these programs started as a "wildcat" idea, and this Playmaker program is such an idea for DPA and AAPG. For me, many thematic roads and friendships lead back to that pivotal DPA event 15 years ago. It was my personal tipping point.

I hope our Playmaker Forum this month will be as valuable an event for you – and a tipping point for many experienced and young professionals.

Empowering geologists to find oil and succeed in business is a worthy New Year's goal for us all.

A DPA "Town Hall" meeting will be held Jan. 17 in Tulsa, featuring Edie Allison, the director of the GEO-DC office in Washington, D.C.

Allison will discuss GEO-DC activities and those impacts on AAPG members. All DPA members are encouraged to attend and to invite prospective DPA members to the meeting.

The meeting is free but space is limited; contact Norma Newby at nnewby@aapg.org for information and to make reservations.

Pacific Section Seeking Papers

Abstracts are still being sought for this year's AAPG Pacific Section annual meeting, which will be held April 19-25 at the Portola Hotel and Spa in Monterey, Calif. – but abstracts must be submitted by Jan. 15.

The meeting's theme will be "Energy and the Environment – Working Together for the Future." Joining the Pacific Section as sponsors are SPE and the Pacific Section SEPM.

Proposed sessions include:

- Reviving Old Giants and Recognizing New Potential Mature Basins.
- New and Overlooked Opportunities in Unconventional Reservoirs.
- Sedimentary and Biogeochemistry of the Monterey Formation and Upwelling Sediments (Dedicated to Bob Garrison).
- Geology of the Sacramento Valley.
- Arctic Energy Opportunities.
- Geothermal Development in a Changing Energy Landscape.
- Energy and the Environment.
- Fluvial and Shallow-Marine Depositional Systems: Insights from Outcrops and Subsurface Prediction.
- Faults, Folds, Transforms and Terranes of Western North America.
- Tectonics and Sedimentation on the Pacific Margin of North America.
- Analysis and Modeling of the Dynamics of Coupled Seascapes and Landscapes.
- Undergraduate Research (poster session).

To submit an abstract, or for more information, go to psaapgabs@gmail.com.

CLASSIFIEDADS

POSITION AVAILABLE

Professor of Petroleum Geology - Chevron
Department of Applied Geology
$250, 000 salary package
Advertising Reference: 2698

Curtin University is situated in the heart of Western Australia's booming resources sector in Perth, one of the most liveable cities in the world. An emerging focal point for major developments in world-class hydrocarbon resources, CO2 sequestration and geothermal energy, Perth is also a centre for exploration activity in the broader South-East Asian region. Curtin University hosts world-class analytical and computing infrastructure on campus and in co-located partner organisations such as CSIRO, and is ranked by the Australian Government at the highest level for excellence in geoscience research.

Lead an academic team driving research in petroleum geology.

Under the banner of the Western Australian School of Mines, the Department of Applied Geology is one of the largest standalone geology departments in Australia offering undergraduate and post-graduate programs known for their highly practical and applied nature. In a newly-established, formal partnership with Chevron Energy Technology Pty Ltd the department is seeking a highly-qualified Professor to establish a tenure-track Chair in petroleum geology.

As the Chevron Professor of Petroleum Geology you will build a research program supported by a post-doctoral research fellow and two PhD scholarship students in close collaboration with industry, and will spearhead the development and delivery of allied post-graduate and masters teaching programs.

You will need to possess a PhD or equivalent high-level geoscience qualification and have a track record of conducting high-impact, pure and applied research. You will also require a demonstrated ability to integrate geological, geophysical and geochemical data to advance knowledge of petroleum systems development and basin analysis. Demonstrated success in obtaining research funding and managing projects for timely completion is essential.

For more information please visit the Curtin University website: http://futurestaff.curtin.edu.au/job-vacancies/ or contact Associate Professor Peter Kinny, P.Kinny@curtin.edu.au

Applications close: 5pm Friday, 25 January 2013

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Houston, Texas USA

Ellington & Associates, Inc. seeks experienced biostratigraphers with backgrounds in geology, stratigraphy, and paleontology to support oil and gas projects in the Gulf of Mexico and worldwide. These full-time positions require sample analysis and interpretation for offshore-wellsite and office-based projects. Requirements: MS degree or higher in Geology or Paleontology, 3+ years experience, willingness to work offshore at least 100 days/year (with bonus for wellsite work). Reply to Ellington & Associates, 1414 Lumpkin Road, Houston, TX 77043 or email info@ellingtongeologic.com.

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Petroleum Geochemist – Houston

ExxonMobil Upstream Research Company has an immediate opening for a Petroleum Geochemist at its Upstream Research Laboratory located in Houston, Texas.

The successful candidate will conduct research and research applications in organic geochemistry. Our investigations focus on developing broad understanding and predictive models of geological processes involved in hydrocarbon systems ranging from deposition and evolution of source rocks, generation, expulsion and retention of oil and gas, and migration, accumulation, and alteration of hydrocarbons. Our research goals are tied to addressing both immediate concerns and emerging trends in exploration, development, and production.

Candidates should have the following qualifications:

- A Ph.D. in petroleum geochemistry, analytical chemistry, organic geochemistry or related field.
- Experience in one or more areas pertinent to petroleum geochemistry including but not limited to molecular geochemistry, stable isotope geochemistry, fluid inclusion analysis, and/or organic petrography.
- Experience in one or more analytical techniques including but not limited to chromatography, mass spectrometry, isotopic analysis, solid-state characterization, and/or organic petrography.
- Creative, adept at team work, and able to drive projects to completion.
- Strong communication, organization, and interpersonal skills.
- Industry or post-graduate experience in petroleum geochemistry and/or experience in integrated hydrocarbon systems analysis including basin modeling would be a plus.

The candidate filling this position will be expected to immediately contribute to on-going projects as well as formulate and direct future endeavors. Collaboration is required with corporation geoscientists and engineers with a broad range of disciplines, including organic geochemistry, stratigraphy, structural and regional geology, hydrocarbon-system integration, analytical chemistry, reservoir engineering, and production engineering.

Please submit your application and resume to our website: www.exxonmobil.com\ex. Please apply to Job No. 16211.

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Faculty Positions University of Houston
The Department of Earth and Atmospheric Sciences of the University of Houston invites applicants for the following tenure track faculty positions. Candidates must have completed their PhD at the time of appointment. Successful candidates will be expected to build a vigorous externally-funded research program, and should be able to demonstrate productivity in peer-reviewed publication. Candidates will also be expected to teach at both the undergraduate and graduate levels and will be expected to mentor MS and PhD students. We expect to fill the positions by August, 2013. Candidate evaluation will begin January 20, 2013 and continue until the position is filled

Exploration Geophysics
Assistant to Full Professor level in the field of Exploration Geophysics, specializing in reflection seismic processing, imaging, and interpretation. We seek candidates of outstanding ability in signal processing, algorithm development, and seismic data analysis. Strength in subjects such as elastic-wave propagation, tomography, migration, and inversion will be especially valued. The successful candidate should have the ability to use high-performance computing to image, visualize, and interpret seismic data and will have use of our wide variety of seismic software packages, hardware systems, and geophysical data. The successful candidate will participate with an enthusiastic team of geophysics faculty and students in one of the leading energy communities in the world. Preference will be given to candidates with related industry experience.

Organic Geochemistry
Assistant to Full Professor level in the broad field of organic geochemistry. Applicants should have experience in the application of chemical principles to the study of the origin, migration, accumulation, and alteration of hydrocarbons and organic contaminants using a range of petroleum geochemical techniques, such as stable isotope geochemistry, hydrocarbon analysis of organic compounds and biomarkers with GC and GC-MS, vitrinite reflectance or other maturity indicators, laboratory pyrolysis, and/or kerogen typing. The successful candidate will also enjoy access to new major and sophisticated organic geochemical research equipment being delivered in the Fall of 2012 to the Department, including an Agilent GC-QQQ 7000, an Agilent GC-Q-TOF 7200, an Agilent GC-MS 5975, an Agilent GC 7890, a Finigan Delta 5 Gas Stable Isotope Mass Spectrometer coupled with a GC-C-IRMS, and a Rock Eval VI Pyrolisis Instrument. Research analytical expertise in these instruments and/or experience in related environmental organic fluid and rock geochemistry, especially aligned with studies of water quality, identifying natural water and rock contaminants and toxicity levels, carrying out epidemiologic environmental forensics studies, environmental remediation monitoring, and/or ground water quality studies in gas and oil shale fracking regions, is considered advantageous to the broad areas of research in the Department.

Sedimentary Geology
Assistant Professor level in the general field of Sedimentary Geology and Stratigraphy. Candidates may conduct research on ancient or modern systems and may have expertise in areas such as facies and stratigraphic architecture, sedimentary petrology, experimental or numerical modeling, and/or reservoir characterization. Ideally the candidate will have experience with field-based research to solve fundamental geological problems. This position is linked to the UH Energy initiative, and we encourage applications from candidates with some industry experience.

Information for Applicants
Candidates for each position should submit: 1) a letter of application including statements of teaching and research interests, 2) a curriculum vitae, and 3) three letters of reference (letters must be received before the applications will be considered) to:

Dr. Janok P. Bhattacharya, Chair,
Department of Earth and Atmospheric Sciences
College of Natural Sciences and Mathematics
Room 312 Science Research 1
University of Houston
4800 Calhoun Rd.
Houston, Texas 77204-5503.

Signed reference letters may be submitted by referees as attached files via email to Penny Maher: plmaher@uh.edu. Further information can be obtained by viewing the departmental web page at http://www.geosc.uh.edu/ or by calling the Department at (713) 743-3399.

The University of Houston is an Equal Opportunity/Affirmative Action Employer. Minorities, women, veterans, and persons with disabilities are encouraged to apply.

DIRECTOR'S CORNER

Professionalism In the Public Arena

By DAVID K. CURTISS, AAPG Executive Director

AAPG is a scientific and professional association. This fact is articulated in Article II of our constitution, where two of the seven purposes of our Association are:

✓ To inspire and maintain a high standard of professional conduct on the part of its members.

✓ To provide the public with means to recognize adequately trained and professionally responsible geologists.

We spend a lot of time talking about professionalism at AAPG. But as I sit and listen to these conversations, I find myself wondering what the term actually means. It's easy to talk about professionalism in the abstract. And there are behaviors that are unprofessional according to anyone's standards. But what does professionalism look like on a day-to-day basis?

Two separate incidents late last year have put this on my mind.


CURTISS

It is our words and actions, moment-by-moment, that determine whether we are meeting the standards we've set for ourselves as AAPG members.

▸ In October a judge in Italy convicted a group of six prominent seismologists and a government official of manslaughter. Manslaughter is defined as the "unlawful killing of a human being without express or implied malice."

The population of the Italian city of L'Aquila was concerned in 2009 about the swarms of tremors they were feeling. According to news reports, public concern was being fueled by predictions of a citizen who claimed the tremors were precursor to a major earthquake. In fact, he allegedly provided a precise prediction of when and where the earthquake was to occur.

In response, a group of experts, accompanied by government officials, came to L'Aquila on March 31, 2009, to assuage public concern.

Nature reports that Bernardo De Bernardinis, then deputy director of the Civil Protection Department, went on television and said, "the scientific community tells me there is no danger because there is an ongoing discharge of energy."

One week later, on April 6, 2009, a 6.3 magnitude earthquake hit L'Aquila and 309 people lost their lives.

▸ The second incident was the November announcement by the U.S. Department of Justice that three men who worked for BP at the time of the Macondo blowout faced criminal indictments.

Two of the men each face 11 counts of seaman's manslaughter, 11 counts of involuntary manslaughter and one count of a Clean Water Act violation. The allegation is that they misread the safety information they received aboard the Deepwater Horizon, which ultimately resulted in the blowout.

The third was indicted for obstructing Congress and lying to law enforcement officials for statements made about the volumes of oil being discharged into the Gulf of Mexico from the blowout.

Here we have two recent incidents where geoscience or energy professionals now face uncertain and potentially devastated futures as a result of their professional practice.

I am not trying here to evaluate or opine on the merits of these cases. Rather, I see them as a wake up call to each of us as we engage on a daily basis as professional geoscientists.

* * *

I'm concerned about this, because practicing our profession, engaging with the public and connecting our science to societal needs is vitally important. Being involved in public engagement is something that I have spent a good part of my career doing and it is something that I have encouraged you to do.

But there are three realities that we need to bear in mind:

✓ Finding and producing oil and natural gas is serious business. This is why safety is emphasized throughout our industry. Whether on the rig floor or in the boardroom, acting as a professional means consistently being at our best.

But think about what that means for you on a daily basis: Are you focused? Are you prepared? Are you rested?

✓ People have a poor understanding of risk. We all fall into that category to an extent. But as scientists we've at least had some training in statistics and risk analysis. This is knowledge that most people do not have. But they do have the capacity to understand given the proper explanation.

Beware of the temptation to gravitate to the sound-bite explanations loved by pundits and headline writers.

✓ We must manage the risk in our professional lives. It's there. But we still have to drill wells; we still have to make business decisions; we still have to engage with our co-workers and the public.

In terms of how you engage with your world, are you making conscious choices to manage the risks you face?

The Black Swans are out there – those events and circumstances you and I cannot foresee that could dramatically impact our lives. But we can be as equipped as possible to deal with them by being at our best, giving complete and thorough answers and avoiding sound bites, and managing our own professional risks.

It is our words and actions, moment-by-moment, that determine whether we are meeting the standards we've set for ourselves as AAPG members.

DIVISIONS REPORT

Playmaker Forum Debuts This Month

By CHARLES STERNBACH, DPA President

My vision for DPA this year: Empowering geologists to find oil and succeed in business.

Toward that goal, DPA will partner with the AAPG education department to present "The Playmaker Forum," planned for Thursday, Jan. 24, at the Norris Conference Center in Houston (next to the Hotel Sorella, near Beltway 8 and I-10).

You'll learn from world-class oil finders and bold marquee playmakers – and you'll enjoy accessible networking opportunities with industry leaders. All AAPG members can benefit and should know that registration is filling fast.

This program's topics can be applied right away and will make both experienced and young professionals more valuable to their current employers. Playmaker topics will get you thinking about adding value to upcoming prospect expos, such as NAPE, and to other meetings around the globe.

▸ Attendees will receive course notes, the free DPA book, "Heritage of the Petroleum Geologist," and continuing education credit.

▸ The one-day program includes a luncheon, two networking breaks and a "Wildcatter Corner" reception.

Speaking of the luncheon, it will feature our keynote speaker, Continental Resources CEO Harold Hamm, who will describe how the Bakken and Woodford plays became game changers for our industry; his success in growing Continental Resources; and his vision for transformation of our national energy resource mix.

(DPA also will honor Hamm for his dedication to our industry with the presentation of its Heritage Award.)


STERNBACH

Please join us, bring a colleague and/or invite your energy industry friends. This program can be a career booster to young professionals via interaction with experienced mentors and exposure to advanced prospecting and presentation skills.

Sign up online at aapg.org/forum/playmaker/index.cfm.

* * *

What's the real value of membership in AAPG's Division of Professional Affairs?

Rick Fritz (DPA membership chair), Valary Schulz (DPA president-elect), David Curtiss (AAPG executive director) and I recently discussed the reasons AAPG members join DPA. It was easy for us to list DPA's "deliverables," such as peer-reviewed global certification, great education events, representation in Washington, D.C., by GEO-DC, and its web resources.

We believe, however, that a singular advantage to membership in the DPA is, well, the incredible people who are involved.

See DPA, page 44

Playmaker Forum Agenda

▸ The Art of Exploration

✓ Charles Sternbach, DPA president, Playmaker program.

✓ Dan Tearpock ("10 Habits of Highly Successful Oil Finders")

✓ Ted Beaumont, AAPG president ("Exploration Creativity")

✓ Bill Maloney, executive vice president, Statoil DPNA ("From Ideas to Profits: Creative Entry Into Successful Plays")

▸ Perfecting Prospecting Workflows

✓ Robert Pledger ("Marketing Your Prospect at Expos")

✓ Steve Bachman ("Assembling and Presenting Conventional Prospects")

✓ Richard Stoneburner, AAPG Distinguished Lecturer ("Unconventional Play Fundamentals")

▸ Playmaker Networking Luncheon

✓ Harold Hamm, CEO of Continental Resources ("Changing the Game in the Bakken/Woodford") to be followed by the presentation of AAPG/DPA Heritage Award.

✓ Bill Zagorski, AAPG Norman H. Foster Outstanding Explorer awardee ("New Insights on the Liquid-Rich Marcellus Shale")

✓ Charles Cusack, Jana Beeson, Dick Stoneburner and Gregg Robertson: Eagle Ford Discoveries (2010 GCAGS best paper award)

▸ Emerging Plays

✓ Shane Matson ("Mississippian Lime: Kinematics of a Play")

✓ Ken Mariani, CEO of Enervest ("Utica Shale")

✓ Tom Bowman ("Eaglebine Activity")

✓ Rick Fritz ("Leveraging AAPG and DPA to Improve Professionalism")

▸ Wildcatter Corner reception and social event (5:30-7 p.m.)