AAPG EXPLORER

JUNE 2016

Shaping the Future

Geologists head to Canada for ACE.

Vol. 37, No. 6
June 2016

PRESIDENT'S COLUMN

Downturn, Restructure Made For Transformative Year

BY JOHN HOGG

This is my last column as your president.

It has been an honor to have the membership elect me and put your trust in my abilities to run our organization in our 99th year.

History may show my presidency to have been during the worst downturn in the industry in a hundred years, but for me, I would not have changed anything. We had many challenges as an Executive Committee and the Directors and I have made significant changes to the Association, which included the departures of many staff – members of the AAPG family who had served the Association with distinction. Now we have a new business model at headquarters that will reduce the cost of our operations in the difficult times still ahead.


HOGG

> **AAPG members are part of a clan, a family. AAPG as a clan is strong and enduring; we have a history of members helping members in difficult times.**

Mind the Gap

I traveled to most of the Regions and Sections and met with many members, students and young professionals during my presidential year.

The students and young professionals are scared. This is their first downturn, there are too few jobs for too many recent graduates, and they are watching young professionals being laid off at the same time they are trying to join the workforce.

The commodity prices are affecting our members around the world. No one is immune to low prices and associations like AAPG – who rely on providing products and services to our members by connecting the industry professionals and vendors to our members through conferences – are still facing difficult times.

In Barcelona at the spring 2016 International Conference and Exhibition (ICE), my presidential address was directed to students and young professionals and included the slogan "Mind the Gap" – the "gap" being the lack of professionals in our industry from Generation X (35-50 year old professionals). We have the gap because of the same circumstances we're seeing today: from 1986 to 1995, very few geoscientists and engineers came into the industry. It was a difficult time, no one was hired and good people left the industry.

On the bright side, this gap will afford a long future for millennials who are looking to join the workforce in the next three to five years as the Baby Boomers are being early-retired; many won't come back, and when prices stabilize the only place for industry to look for new employees will be from the millennials.

Looking Ahead

I would very much like to thank my Executive Committee. They worked hard, were collegial and professional and, at the same time, understood the gravity of the situation this year with an unprecedented budget deficit.

No one panicked. We deliberated many options and we have transformed the Association into a business, which I hope will enable the 100th Executive Committee to move forward with less trepidation as they prepare a centennial budget.

I also want to thank the AAPG staff.

This has been the most difficult year AAPG has faced in at least 30 years. Reorganization is never easy, and with the combination of retirements and layoffs, we lost some great AAPG staff, all of whom were doing a good job.

It's always most difficult for the staff that remain and I want to personally say "thank you" to all of you – you're critical to our members and we greatly appreciate everything you do for AAPG!

There are still challenges ahead for AAPG. Conferences are our lifeblood for revenue generation and the Directors and staff are working hard to find innovative ways to reduce costs without changing the look and feel of our flagship ACE and ICE programs, nor increasing the cost of attendance for the membership.

The Calgary Annual Convention and Exhibition in June will have a smaller exhibition footprint, but we are confident that the Canadian geoscientists who have waited 11 years for ACE to return will come out to support this event, and our numbers are trending toward a marginally profitable event.

The September Cancun ICE will be great. General Chair Jose Antonio Escalera, director of exploration for PEMEX, Victor Vega, president of the Latin American and Caribbean Region and exploration business development manager for Shell in Latin America, and their AAPG/SEG joint conference committee have done a great job of pulling together a wonderful technical program and, again, I think we will return to profitability for this convention.

* * *

Very few members are afforded the opportunity to be a member of the Executive Committee, even fewer to be president.

It's truly been a great experience. My journey through AAPG's leadership has been an adventure with many turns and a great many friends made along the way. Like many other past presidents, I don't plan to end my volunteering; there are always more roles to fill in the Association and I hope to see many of you again in the future.

To paraphrase what Past President Pat Gratton said many years ago: AAPG members are part of a clan, a family. AAPG as a clan is strong and enduring; we have a history of members helping members in difficult times. We, as an Association and as members of the clan, will get through the tough times and look back and tell stories about the "difficult teens" of this century, with less pain then we feel today.

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ON THE COVER:

Marble Canyon in Kootenay National park near Calgary. This area was shaped by fire, erosion and mountain building, and is the location of just one of the field trips offered at this year's Annual Convention. Photo by Santosh Surneni.

Left: Paul Potter at Joulter Cays. These small uninhabited islands are north of Andros island in the Bahamas. Photo courtesy of Potter.

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AAPG Officer Election Results

Independent geologist **Charles Sternbach**, president of Houston-based Star Creek Energy, has been voted president-elect by the AAPG membership for the 2016-17 term.

Sternbach, an AAPG Honorary member, will serve as AAPG president in 2017-18.

Also elected to the incoming AAPG Executive Committee were:

❒ Vice president-Sections – **Daniel E. Schwartz**, manager of strategic business development, new ventures and innovation for Aera Energy, Bakersfield, Calif.

❒ Treasurer – **Martin "Marty" Hewitt**, retired, Calgary, Canada; an AAPG Honorary member, he is former exploration manager-Gulf of Mexico for Nexen Petroleum USA, Houston.


STERNBACH


SCHWARTZ


HEWITT


KATZ


McGHAY

❒ Editor – **Barry J. Katz**, senior research consultant, Chevron, Houston, and an AAPG Honorary member.

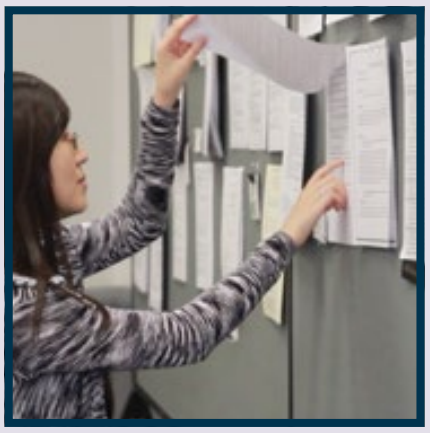
Both the vice president-Sections and treasurer serve two-year terms; the editor term is three years.

The newly elected officers will begin their duties on July 1, serving on an Executive Committee headed by **Paul Britt**, president of Houston-based Texplore, who assumes the AAPG presidency on that date.

Also new on the committee will be AAPG Honorary member **Jim McGhay**, with Tulsa-based Mid-Con Energy, who will assume the chair of the AAPG House of Delegates.

All will be joining current EC members who will be completing their two-year terms – Vice president-Regions **Peter Lloyd**, honorary professor, Asia Pacific Training Ltd., Falicon, France; and Secretary **Heather L. LaReau**, senior geologist, Noble Energy, Denver.

Voting results indicated that nearly 32 percent of the 14,545 eligible voters cast ballots in this year's election, and nearly 64 percent of the voting was done online.



Career Center Set for ACE

This month's Annual Convention and Exhibition (ACE) in Calgary, will once again include a Career Center to help match job seekers with potential employers.

It's hoped that the Center will spark new opportunities for attendees while providing a gathering place for conversation, networking and interviews.

A large bulletin board will be the focal point of the Center. Job seekers are encouraged to bring their resumes to add to the board and employers are asked to post current job openings.

An online space is also available to Members who would like to add their resume and information, and employers will have access to the listings.

The space will be filled with tables, which employers will have the option to reserve in order to share information about their company, job openings and other opportunities that are available.

Companies may reserve the tables for a half day, full day or all three days of ACE at no cost.

Located near the entrance of the exhibition hall, the Center is available to the public. Registration for ACE is not necessary to utilize the resource.

The Center will be open the following days and times:

Monday, June 20, 8:30 a.m.-5 p.m.
Tuesday, June 21, 8:30 a.m.-5 p.m.
Wednesday, June 22, 8:30 a.m.-2 p.m.

For more information about the Career Center, to post jobs online or to reserve a table, please contact Vern Stefanic at vstefanic@aapg.org.

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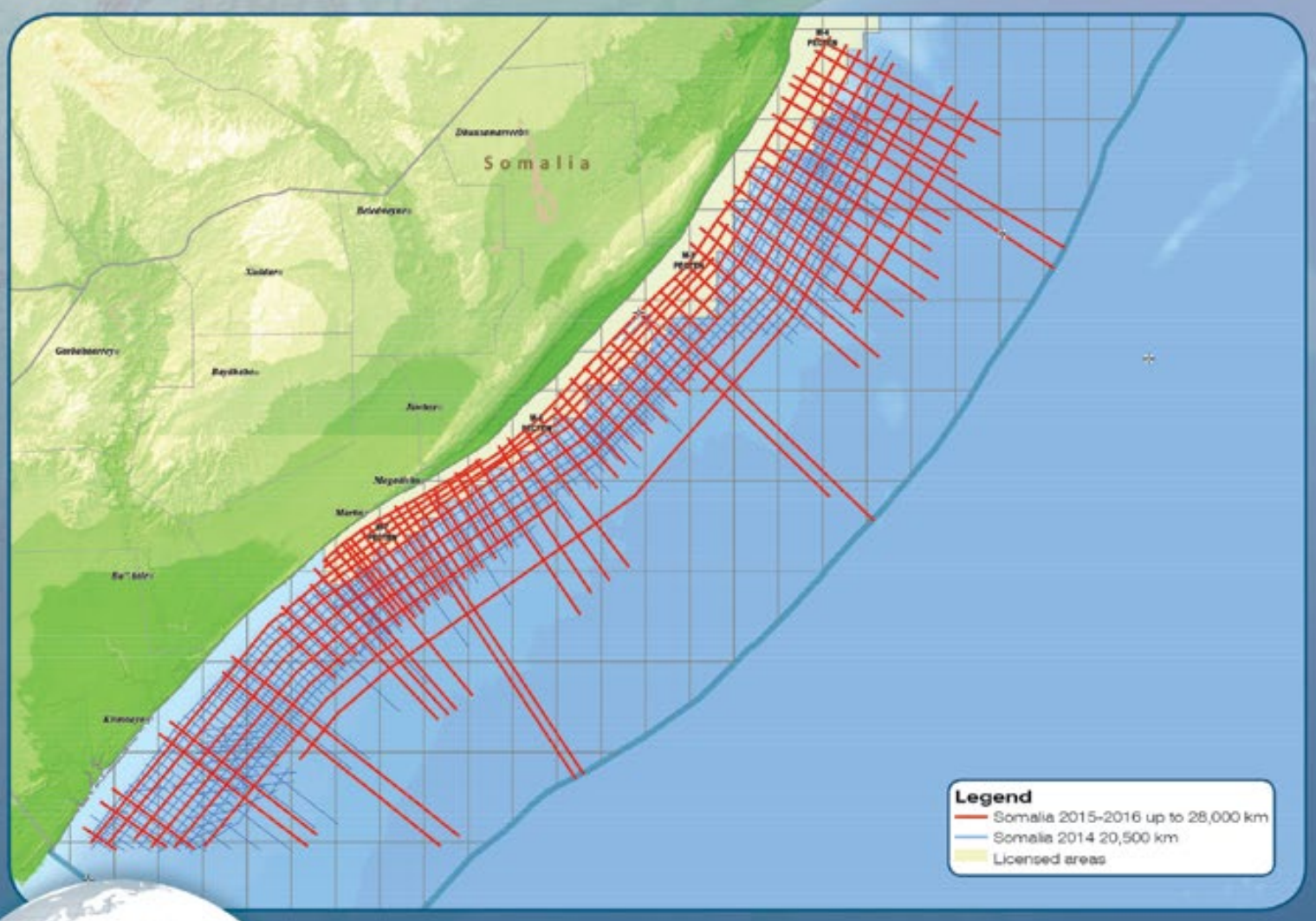

In preparation for future licensing rounds, Spectrum has now completed a majority of the unique 28,000 km 2D Multi-Client seismic acquisition program, offshore Somalia. This program complements 20,500 km of existing seismic data that was acquired in 2014.

The survey design, which covers water depths of 30 m to 4,000 m, has allowed for seismic coverage over the shelf, slope and basin floor with dip, strike and recording time intervals suitable for defining a range of leads and prospects. Streamer lengths of 10,050 m have been used in order to adequately record information at all offsets, further assisting imaging of the underlying syn-rift geometries.

Modern processing algorithms are being applied to the raw data to achieve optimal imaging of the steeply-dipping extensional and compressional features and illumination of subtle amplitude anomalies. Data is expected to be available from mid-2016.

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Spectrum

Salary Survey Points To Experience Gap

By BRIAN ERVIN, EXPLORER Managing Editor

"More of the same" is gist of the annual AAPG salary survey, which is to say, with a couple of notable exceptions, there have been few changes in salaries since last year's survey, owing to the ongoing downturn in the industry.


AYLING

But, there might be signs – however faint – that the job market is on the verge of some important, long-term changes.

"The 2015 salary survey shows very little change in salaries," said Mike Ayling of MLA Resources in Tulsa, who has conducted the annual salary survey for AAPG since 1981.

He pointed out that geoscientists with 3-19 years' experience saw a small drop in salaries, which might be a reflection of an adjustment from last year, when they saw little change.

However, Ayling cautioned to take those numbers with a grain of salt.

"I wouldn't put a lot of stock in them, because they're not based on enough data to be highly significant. It probably only represents a small drop," he said.

Ayling explained that the amount of data available for the survey is a function of how much hiring is going on, and 2015 didn't see much hiring, particularly among younger geoscientists.

"There's been so much turmoil. People that have jobs have not been looking for jobs; people that have lost their jobs, I think, have retired instead of looking for new jobs," he said.

2015 Geological Salary Survey

YEARS EXPER	HIGH	AVERAGE	LOW
0-2	$ 117,300	$ 103,900	$ 87,000
3-5	140,000	110,900	91,900
6-9	160,000	141,500	118,000
10-14	207,000	164,600	132,000
15-19	235,000	176,600	130,000
20-24	350,000	264,700	206,000
25+	425,000	230,600	180,000

Average Salary By Degree

YEARS EXPER	B.S.	M.S.	Ph.D.
0-2	$ 92,000	$ 104,400	$ 117,300
3-5	89,000	109,100	140,000
6-9	n/a	143,000	155,300
10-14	160,000	150,000	178,900
15-19	n/a	200,300	155,000
20-24	198,900	250,200	238,000
25+	209,000	221,600	248,000

Historical Averages Salary

YEARS EXPER	2007	2008	2009	2010	2011	2012	2013	2014
0-2	$ 82,800	$ 83,600	$ 87,600	$ 93,000	$ 98,700	$ 100,500	$ 103,400	$ 102,900
3-5	107,800	108,000	105,600	102,300	109,400	101,000	114,500	114,900
6- 9	121,100	118,400	121,700	127,800	137,300	127,800	145,400	148,300
10-14	119,800	121,900	123,500	139,100	153,400	147,000	147,500	165,600
15-19	151,600	139,400	150,800	151,000	193,600	190,300	179,200	189,000
20-24	167,400	176,800	180,300	191,000	199,200	211,600	219,500	234,300
25+	162,800	171,700	186,800	206,300	199,600	212,000	252,600	229,900

Experience Needed

Consequently, like a great many other industry watchers (see this month's President's Column), he sees a major skills gap resulting from current conditions.

"For a long time, there's been a demographic gap because of the downturn in the '70s, but now there's also an experience gap, because a lot of the younger people have been put to work, largely doing things like geosteering and so forth, as opposed to being trained as prospectors," he explained. "So it seems, for every prospector you lay off with 30 years' experience, you don't have a five or ten-year guy with some experience to step into those shoes when the industry picks back up."

That explains the other notable difference in this year's survey: 20-24 year geologists saw an average salary increase of $30,000.

"It's been obvious for a number of years that people who know what they're doing and are already well trained are highly prized. You can see that in the very high salaries for the experienced people," said Ayling.

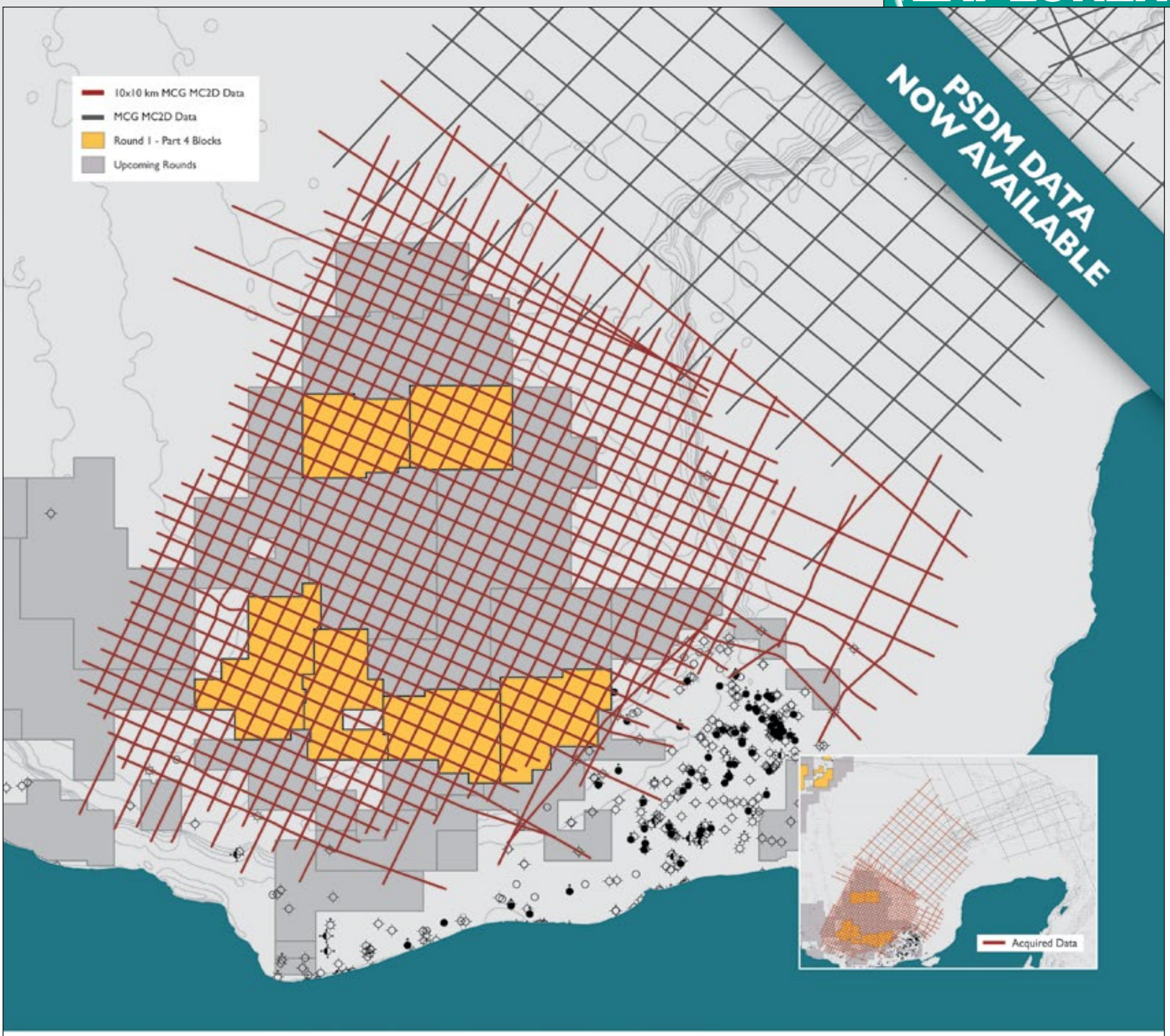
While that's good news for geologists within that 20-24 year range, it might not bode well for the industry at large, depending on how and if the industry picks back up.

"Will we just go back to large projects – drilling horizontal wells with geosteering, and not worry about working geology? The guys that I've talked to have said there have been a lot of mistakes made by doing that, by not working the geology on some of these horizontal plays well enough to understand what's going on in the play, and where to drill and where not to drill," he said.

"The question really becomes, 'What kind of experience are the people with less than 10 years experience gaining, and how valuable will they be in the next 10 years?'

In part it depends on which way the industry goes. If the industry goes back to doing a lot of horizontal drilling in large plays, then those guys are going to be seen as valuable, because they know how to geosteer wells," Ayling continued. "If the industry says, 'No, we need to really work a lot of geology to find highly economic, smaller plays, then those guys really haven't had the opportunity to train the way guys with 20-30 years' experience have trained."

"It seems to me that, regardless of what it does, the ability to do exploration geology has probably been harmed by the downturn," he added.



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Oil States Suffer Brunt of Downturn

By DAVID BROWN, EXPLORER Correspondent

The current downturn in the oil and gas industry slammed into parts of the United States like a locomotive.

For many oil and gas-producing states, the impact was immediate and substantial.

But for U.S. cities hit by the industry's troubles, it's been more of a slow-motion train wreck.

Severance taxes and other taxes on oil and gas production are typically collected at the state level, so falling oil and gas prices immediately impact energy-state budgets.

Alaska is heavily dependent on production prices and faces a budget deficit of $3-4 billion, depending on where oil prices go.

Oklahoma had a budget shortfall estimated at $1.3 billion. North Dakota projected a gap of more than $1 billion in its two-year budget cycle.

Even Wyoming, with a smaller budget and less dependence on oil and gas taxes, was planning to cut $300 million or more in spending.

U.S. cities, by contrast, draw their revenue from some combination of sales taxes, property taxes, income taxes, service charges and permit and use fees.

A severe oil and gas slump has an indirect effect on cities as tax revenues decline because of lower employment levels and reduced spending.

Houston has avoided much of the brunt of the downturn by having diversified its economy since the last major downturn in the 1980s.

Former Oil Capital of the World

In Tulsa, "you don't see a big impact yet because we are a much more diversified economy. We do have oil and gas companies, but not a big one," said Tom Seng, applied assistant professor of energy business in the Collins College of Business at the University of Tulsa.

Tulsa government is, however, concerned about the potential loss of Williams Companies Inc., a major pipeline firm involved in a merger with Dallas-based Energy Transfer Equity LP.

Williams is a significant local employer and community contributor.

"We're seeing oil and gas production cut back. That affects the midstream just in terms of throughput," Seng observed. "The fact that we're moving downstream (in economic effect) is not a good thing."

Brien Thorstenberg is senior vice president of economic development for the Tulsa Regional Chamber of Commerce. Its region encompasses 11 counties in northeastern Oklahoma.

He agrees with Seng that the economic impact on Tulsa from the energy downturn has not been substantial, so far.

"The energy industry certainly has lost some jobs. Since January 2015, the region has lost 2,570 jobs in the oil and gas industry," through the first quarter of 2016, he said.

But Thorstenberg compared that to 5,750 jobs added through the Chamber's economic development program, mostly in information technology, health care, professional business services and transportation and aerospace.

"Those are actually from projects that our economic development program played a part in," he said. "You're still looking at full employment. At times in this region, unemployment has been 4 percent or lower."

Houston

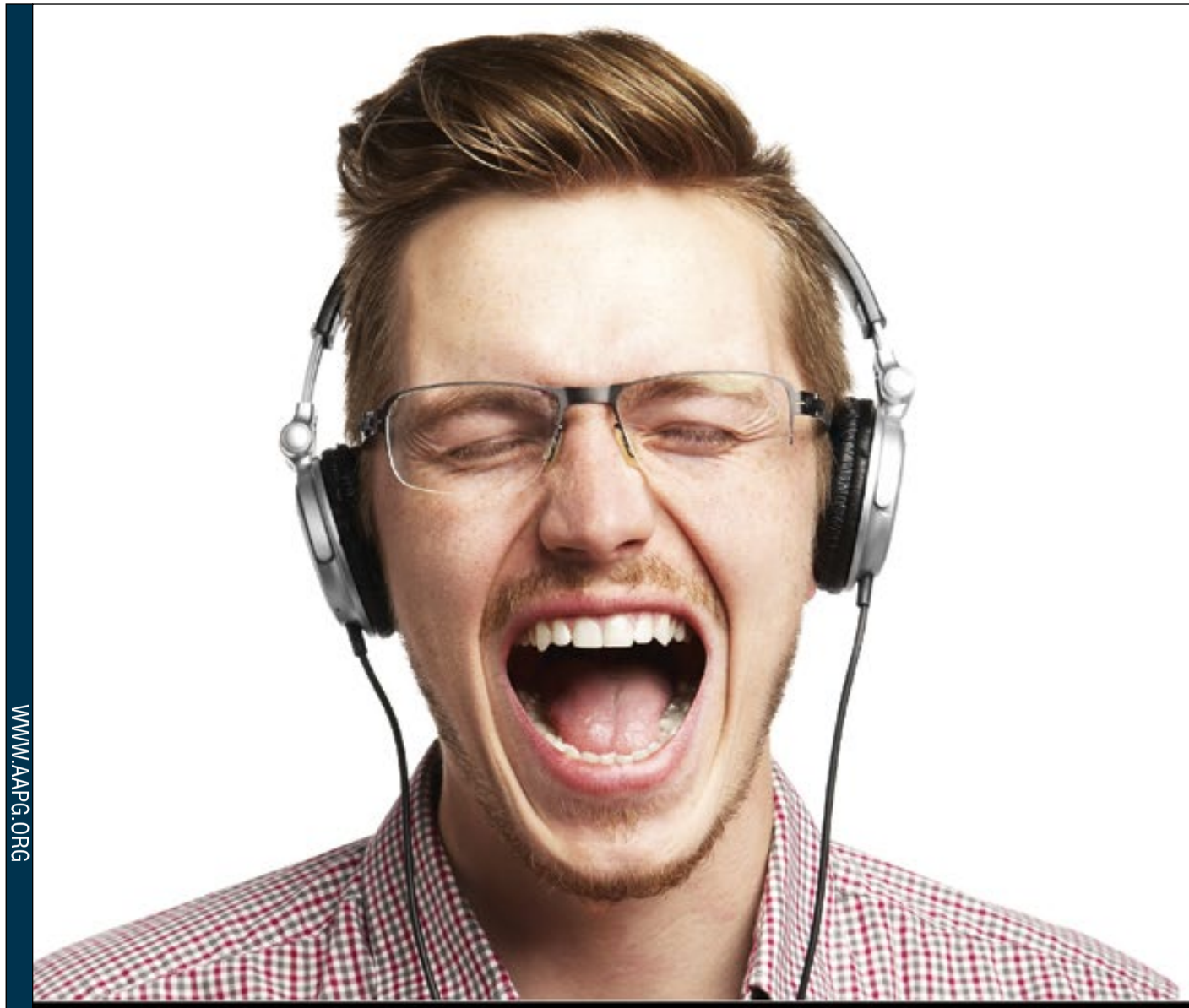
Unemployment rates in other energy-industry cities reflected the trend of moving higher, but only slightly so.

In March, according to the U.S. Bureau of Labor Statistics, the Houston region had an unemployment rate of 4.9 percent, Tulsa 4.6 percent, Oklahoma City 3.9 percent and Dallas-Ft. Worth 3.8 percent. Unemployment in the greater Denver area was only 3.3 percent.

All of those were below the national average of 5.1 percent.

Diversifying away from reliance on the energy industry has helped cities avoid serious problems in the current slump. In the 1980s, about 84 percent of Houston's economy was dependent on or affected

See **Diversification**, page 10



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Diversification

from page 8

by conditions in the energy sector. Today that number is 44 percent.

The Houston area had about 107,000 jobs in the "Mining and Logging" sector at the end of last year. The city probably doesn't need many lumberjacks, so those are primarily upstream oil and gas jobs.

That comprises only about 3.5 percent of total employment in Houston, although jobs in other sectors can be affected by a slower energy economy.

It's a mistake to consider Houston purely an oil-patch city, said Bill Gilmer, director of the Institute for Regional Forecasting in the C. T. Bauer College of Business at the University of Houston.

"Houston is different from Midland or Odessa in the sense that there's no oil production in Houston. Houston is an engineering center," he noted.

"The other thing that sets Houston apart is that it has a huge downstream component. We are a very large center for oil and gas processing," he said.

Lower production prices actually benefit the refining and petrochemical industries. Lower natural gas prices have had a significant effect in Houston, according to Gilmer.

"Those low gas prices kicked off an enormous boom in petrochemical activity, with between $50 billion and $60 billion in projects under construction," he said.

He described Houston's economy as a "witch's brew" of petrochemical expansion, strong medical and aerospace sectors and an upstream energy industry that's been all but flattened.

Tulsa is bracing for the potential loss of Williams Companies, but has otherwise been spared any substantial impact from the downturn.

"This was a brutal first quarter for American oil. It may have been the worst quarter we've ever seen in the American oil and gas industry," he said.

Houston does have a timing problem, though.

Gilmer said construction employment from the petrochemical expansion will begin to decline next year as projects are completed. The city needs a reasonably near-term rebound in oil and gas to replace those jobs.

Without that, "we're talking about, maybe, a mild recession in 2017," Gilmer said.

Apples and Oranges

One challenge for cities is that relatively well-paid oil industry jobs are being replaced in part by much lower-paying service industry jobs.

"When we lose jobs in the oil and gas industry we lose high-paying jobs. Obviously, the disposable income is going to be quite a bit less," Seng said.

Tulsa is well-positioned to ride out an energy industry downturn, Thorstenberg said, especially in quality of life. It is not an expensive place to live and it's attracting millennials who often "find out where they want to live, then they find a job later."

"We have a lot of high-growth industries. A lot of it is where information technology is embedded in an industry," he noted.

The city also supports business incubators to "nurture small business that can grow into significant corporate headquarters in the Tulsa region," he noted.

Thorstenberg said the best hope for Tulsa's future growth is still "number one, the oil and gas industry rebounding. Really, just continuing the momentum we've been having."

According to Bob Ball, economist for the Chamber, oil and gas prices remain below recovery levels that would help cities grow.

"With regard to oil prices, the perception is that they will need to be in the mid-$50s to completely stabilize things," he said.

That would mean an increase of 25 to 30 percent in Oklahoma crude pricing, something not forecasted to occur for some time.

State Level

Meanwhile, several oil and gas producing states continue to struggle. Oklahoma has cut spending for education, social services and government employment. The state seemed strangely unprepared for a serious downturn in an industry known for serious downturns.

"In E&P companies it looked like they had no Plan B. And the state had no Plan B. There were no contingency plans out there," said Seng.

Also, about that runaway oil-bust locomotive:

"Nothing's putting the brakes on yet, let's put it that way," Seng noted.

"The fundamental underpinnings of all this are still very bearish," he said. "The question will be, 'How many people have left the industry and are willing to come back?' And what's the cash position of these companies? Do they have the money to resume drilling?"

Michel T. Halbouty Outstanding Leadership Award

Few Words, Many Accomplishments

By BARRY FRIEDMAN, EXPLORER Correspondent

Scott W. Tinker, a man who has given lectures all over the world, in front of thousands, was remarkably taciturn when asked about being named the 2016 recipient of the Michel T. Halbouty Outstanding Leadership Award.

"I was stunned," he said.

And that was about all he said.

Yes, the Scott Tinker who was past president of this very organization, the Scott Tinker who has been invited to more than 50 countries to discuss energy concerns, the Scott Tinker who is director of the Bureau of Economic Geology at the University of Texas at Austin was stunned about receiving an award he richly deserves and most probably thought he already had.

"Yeah, I'm really not comfortable talking about myself. Can we talk about something else?"

In a word, no.

He then relents a little when asked to amplify his remarks.

"It is the highest honor of my career."

If he's surprised at this honor, which he truly seems to be, he is in the company of absolutely nobody, as he seems as tailor-made for the Halbouty as it does for him.

AAPG Past President Scott Tinker is this year's Michel T. Halbouty Outstanding Leadership Award recipient.

The Halbouty Award

The Michel T. Halbouty Outstanding Leadership Award, as many already know, is given in recognition of outstanding and exceptional leadership in the petroleum geosciences.

It is AAPG's second most distinguished award, second to the Sidney Powers Memorial Award, and it is only given to one recipient per year.

Past recipients include a list of all-stars in the profession, including Alfredo Eduardo Guzman (2015), Peter Robert Rose (2014), Stephen A. Sonnenberg (2013), Robbie Rice Gries (2012), Daniel Lester Smith (2011) and Patrick John F. Gratton (2010).

Look at those names, look at their individual accomplishments, look at the body of work of those who have it on their mantle and one wonders: who deserves to be in their company more than Tinker?

Well, if you ask him, he'll tell you.

"I think of those who have accomplished more than I have."

Easier said than done.

His bio and credentials, which run on for pages, touch on every facet of the profession.

Tinker is, in addition to being the director of BEG, the official state geologist, as well as a professor and acting associate dean of research in the Jackson School of Geosciences at the University of Texas, Austin.

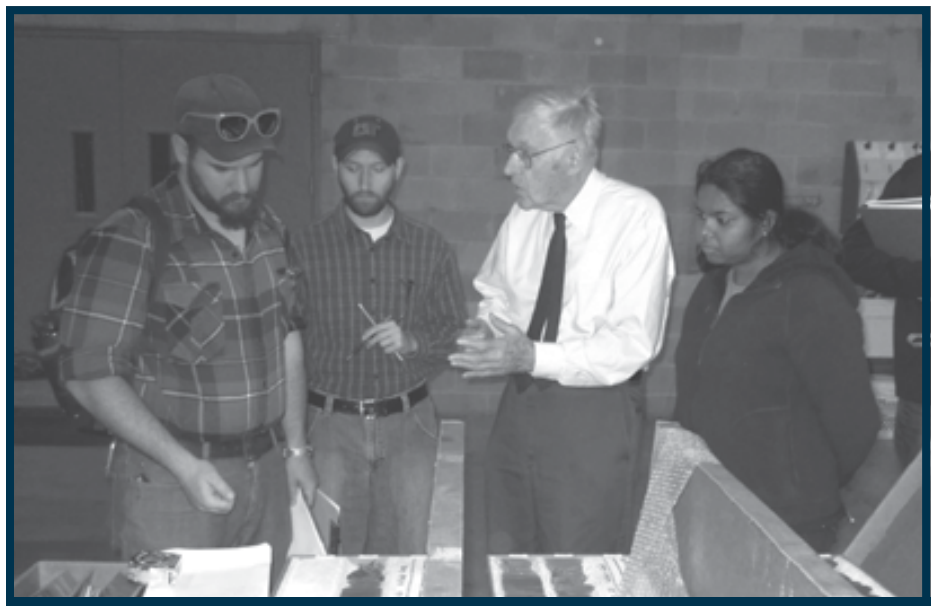
Under his leadership at BEG – along with, he is quick to point out, "a remarkable and dedicated staff" – the school has grown into a premier research organization with programs in energy, the environment and economics. Since 2000, the Bureau has tripled in size from a $10 million to a $30 million annual grant organization. Its staff has grown from 90 to 250 and its annual operating budget has grown from $8 million to $25 million.

Before becoming BEG's eighth director in 2000, Tinker worked in the oil and gas industry for 17 years in research, exploration and development before coming to the university. He has been a licensed professional geoscientist in Texas since 2003, and is the past president of AAPG, the Association of American State Geologists and the Gulf Coast Association of Geological Societies.

He holds appointments on the National Petroleum Council, the Interstate Oil and Gas Compact Commission, the Geology Foundation at Sandia National Lab, is a trustee associate at Southwest Research Institute and serves on several university, private and professional boards.

See **Switch**, page 16

Paul Potter (back) with some Petrobas personnel at the company's Abreu refinery in Lima in 1977.



Potter with students at the University of Cincinnati.

Sidney Powers Memorial Award

Defying Expectations

By DAVID BROWN, EXPLORER Correspondent

Not everyone can be an outstanding student of geology.

AAPG Honorary member Paul Potter said his undergraduate work was mostly mediocre.

"I got a lot of Cs, and a few As," he recalled.

And geology was Potter's second choice of majors after he decided his attempt to earn a degree in physics wasn't working out. As he tells it, some of his professors considered his geology work lackluster, and couldn't have expected him to go far in the profession.

Fast-forward to today: at the AAPG Annual Convention and Exhibition (ACE) in Calgary, Canada in June, Potter will receive the Sidney Powers Memorial Award, the Association's most distinguished honor.

It will be the latest of numerous awards for the famed geologist and educator, including the Pettijohn Award for Excellence in Sedimentology from the Society of Sedimentary Geologists, the Mather Medal for contributions to Ohio geology studies, the Lifetime Achievement Award from the Professional Geologists of Indiana and the AAPG Eastern Section's Outstanding Educator Award.

'Just About Everywhere'

Potter began his career as a geologist with the Illinois Geological Society in 1952. He then moved into academia, first as an assistant professor at Indiana University and then progressing to professor and eventually professor emeritus of geology – his current title – at the University of Cincinnati.

He also began consulting in the petroleum industry in the 1950s and has served as consultant or special instructor with Shell, Schlumberger, Total, Petrobras and several other companies.

His research activities have included work with the U.S. Department of Energy, the Gas Research Institute, the National Geographic Society and many other organizations.

Along the way, he's authored or co-authored a seemingly constant stream of papers and seven influential books.

The first two of those books were issued in the early 1960s, when Potter received a Guggenheim Fellowship and moved to Johns Hopkins University, where he began collaboration with Francis Pettijohn.

POTTER

> **"There's no end to science. Science is just like technology. M.K. Hubbard said we were going to run out of oil, but he forgot about technology."**

They produced "Paleocurrents and Basin Analysis" and "Atlas and Glossary of Sedimentary Structures," which became standards. A later collaboration with Pettijohn and Raymond Siever led to the publication of "Sand and Sandstone" in 1972.

Potter's area of geology fieldwork can be described as "just about everywhere" with a focus on 16 of the United States, Saskatchewan and Ontario in Canada, the Bahamas, Mexico, Spain, France, Italy, Algeria, Argentina, Brazil, Guayanas, Venezuela, Colombia, Chile and Peru.

In his peripatetic professional career he has constantly moved into new areas and bigger challenges.

"After about 10 years, I get bored with what I'm doing," said Potter.

His studies of the geology of the greater Cincinnati area provide an insight into the forces that have shaped the city and its landscape and infrastructure.

Potter related that when he first moved to Cincinnati, he thought it would be boring geologically.

"But there's a lot of interesting geology under every city," he said.

In the 1990s, Potter began a seven-year period serving as an assistant professor of geosciences at Brazilian universities. He cited his work in Brazil as an example of an experience outside North America that prolonged his career, "made me a much wiser person and kept me interested."

"I had worked in Paris when I was very young. And I had been to the Sahara Desert. I was interested in foreign languages," he said.

He'd already traveled to Europe 13 times "but it was nothing like stepping off into Brazil," he recalled.

"I went when I was 67 because if I'd had to put down my age as 70, I thought, 'No one would give a job to a 70-year-old man,'" he said.

Not everyone can take advantage of their youth at age 67 and start a new chapter in their career.

Potter in the field at Lagoa Salgada, Brazil.

"It's painful. When I sat on an airplane going to Brazil I thought, 'Should I be doing this?' And I said to myself, 'Paul Potter, if you don't have the guts to do this, you aren't going to do anything,'" he recalled.

Lessons Learned

Based on his extensive experience and background in geology, Potter suggested three major lessons a professional geologist should learn:

▸ Learn how to work with people.

"Everyone in modern science has to do that, almost. And working with people outside American culture – that's very important," he said.

He feels his work in other countries and his interest in languages other than English have given him a better perspective on the profession.

"It's made me more respectful of non-Americans," Potter noted.

"At various times I have given about D-minus talks in French, Spanish and Portuguese. That's a learning experience, to see how other people express ideas," he said.

▸ Learn other sciences.

Potter earned his doctorate in geology from the University of Chicago but also acquired a master's degree in statistics from the University of Illinois.

Geology today involves contributions from numerous other scientific disciplines, so the geologist needs a broader view, he said. While people often note the world's rapid change in technology, they sometimes overlook advances in science.

"There's no end to science," Potter said.

"Science is just like technology. M.K. Hubbard said we were going to run out of oil, but he forgot about technology," he observed.

▸ Learn how to write and communicate well.

"Learn to sell a subject in writing. Learn to convince people in words and text," Potter said.

Geologists should be able to write a scientific paper "with minimal jargon."

"That can be hard but that's what you

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Tinker has achieved some international renown for the acclaimed documentary "Switch."

Switch
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Voice of Reason

Tinker, who can be the smartest guy in almost every room he's in – and he's been in a lot of them throughout the globe – was also the guiding light in "Switch", directed by Harry Lynch. Together, they made a documentary about worldwide energy issues, which was palatable even to those without an appetite for the subject, while also disarming critics who expected an industry puff piece.

The Washington Post said, "'Switch' is refreshingly free of hot air. It's almost shocking in the way it sidesteps the kind of issue advocacy made commonplace by filmmakers Michael Moore, Davis Guggenheim and the like." Variety said the movie worked for "Sidestepping the usual eco-docu strategy, 'Switch' takes a far less hysterical route," and the Boston Globe said, specifically, about this year's Halbouty Award winner, "Tinker comes across as affable, reasonable, and unfailingly curious."

For a man so accomplished, Tinker genuinely seems uncomfortable putting himself above the profession or the industry – or even talking about himself. But he's not shy about the work he does, the gratitude toward those who have let him do it or the future work that needs to be done.

"I guess maybe leaders don't talk about leadership much," he said. "Too busy doing things!"

Service
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need to do," he added.

- Give back to society.

"I had never thought of that as a student until one day (when) I was out in the Adirondacks. I was with a European professor. He said to me, 'Paul, you know one thing every geologist should do is give back to the community.' That's lost now," Potter said.

Geologists can work on a landslide study, lead sixth-graders on field trips, write popular articles about geology, serve as advisers to politicians or boards and give back in many other ways, Potter noted.

"You have to give up something to do it. But it's so easy to do," he said. "Most of these things are not expensive, except in terms of time and gasoline."

What all the above ideas have in common is "getting outside your own envelope, and not just for a couple of weeks," he observed.

Better Than Expected

Potter's view of geology in contemporary higher education might help explain his own approach to academics and even his partial inattention as a young student.

"Too many departments today want to follow the National Science Foundation model, which is to do high science," he said.

Potter described high science as "science that wants to use not field work, not subsurface geology, but they want to support people who do theoretical work in geology."

Potter obviously is more interested in geology that actually exists in the real world.

His advice to beginning geologists is to always broaden your horizons.

"One thing that never fails is to do things better and better and wider and wider. A lot of people have had successful careers that way," he said.

What would he have done if geology hadn't worked out as a career?

Economics or banking, definitely, Potter stated.

"I would have liked to have been a banker. I think banking would have been interesting – I've always admired bankers," he said.

But geology did work out for him as a career, in a big way, and in a way others might not have guessed.

"I would say that I've turned out a lot better than some of my professors would have expected," he said.

Norman H. Foster Outstanding Explorer Award

Exploring Opportunities and Breaking Ground

By DAVID BROWN, EXPLORER Correspondent

Dick Stoneburner will forever be linked to two words.

You might think those two words are "exploration geologist" – which are appropriate, but not necessarily the two words that best honor his unique legacy.

This year, after a four-decade career as an exploration geologist, Stoneburner will receive AAPG's Norman H. Foster Outstanding Explorer Award.

The award is given in recognition of distinguished and outstanding achievement in exploration by AAPG members who have shown a "consistent pattern of exploratory success."

Through the years, Stoneburner has epitomized the exploration geologist who deciphers regional geology, generates oil and gas plays and works at all levels of the industry, from staff geologist to independent operator to company executive.

In reality, the two words Stoneburner's name will always be most associated with are "Eagle Ford."

He was instrumental in discovering the potential of the Eagle Ford shale in southwest Texas, one of the largest accumulations of petroleum in the United States.

The Front Line

Born in New Orleans, Stoneburner spent most of his early years in Houston. His father Roger also worked as an exploration geologist in the oil and gas industry.

"My father was a geologist, so that certainly had a bearing on my career. But he in no way, shape or fashion led me into the business," Stoneburner said.

After considering other academic options, he earned a degree in geology from the University of Texas in 1976. Geology was a natural interest for him, and the university had close ties to the petroleum industry.

"That program has a lot of opportunity to focus on petroleum geology, compared to some other programs," he noted.

After joining Texas Oil and Gas in Wichita, Kan., Stoneburner went on to get his master's degree from Wichita State University.

Texas Oil and Gas was not a random choice for the aspiring explorationist.

"It was common knowledge that if you went to work there, you'd be on the front line from day one, generating prospects," he said.

Shortly afterward, Stoneburner formed an association with investor and businessman Floyd Wilson, a relationship that would significantly affect his later career. Wilson bought small oil companies, developed them into larger companies, then sold them.

That selling habit also would affect Stoneburner, who had gone to work for Wilson as a staff geologist in the Kansas Oil Company.

"Floyd sold one of his private companies in October 1985. And that put me out of a job," Stoneburner recalled.

By the mid-'80s, the oil and gas industry was mired in a deep slump. Stoneburner started his own independent company and spent a decade bringing in revenue the best he could, including serving as a consultant to other companies.

"It was an interesting time, to say the least. I learned a lot. I learned a lot about perseverance," he said.

Despite the depth and duration of the current industry downturn, Stoneburner thinks the 1980s oil bust might have been worse, and definitely was different from today.

"In my opinion it was a totally different time. We weren't very effective at oil and gas exploration. Adding significant oil and gas reserves to our country just wasn't happening," he said. "That's why I think today is different, because we're very effective."

While the '80s were challenging, Stoneburner also considered them a productive time for professional development. He was exposed to operational challenges and learned about the importance of capital investment, landman activities and working with partners.

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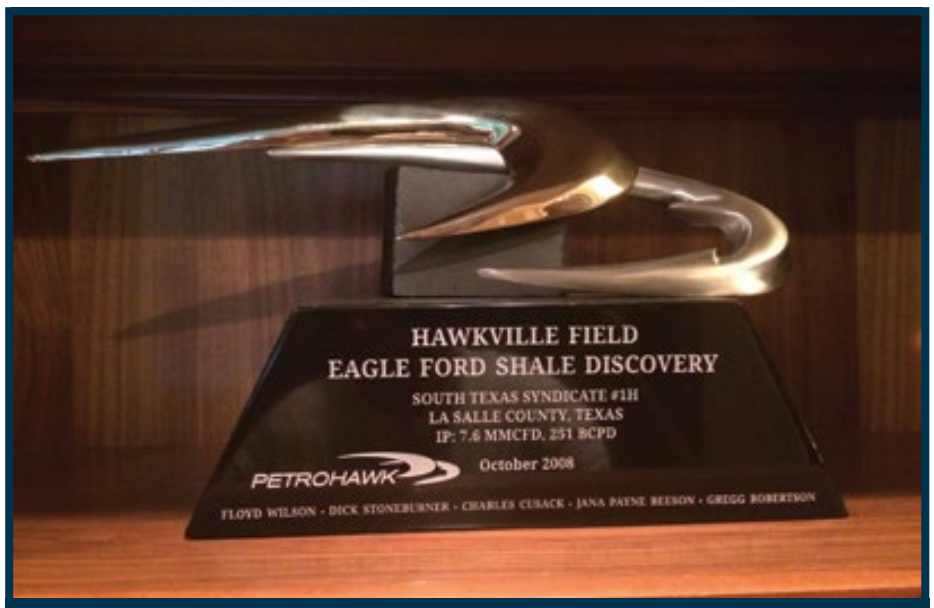

Stoneburner's trophy commemorating the discovery of the Eagle Ford shale.

Eagle Ford

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Stoneburner continued to work in the Midcontinent and Texas, building a deeper understanding of regional geology.

"The Midcontinent and East Texas is where I spent my career before I got into the public arena. I had not worked the Gulf Coast, so that was a new area for me," he said.

In 1996, Stoneburner rejoined Wilson. He began developing prospects and plays for a series of companies, which led to the formation of Petrohawk Energy Corp. in 2003.

Shale Explosion and the Eagle Ford

Unconventional plays soon began to dominate the attention of the American oil and gas industry.

"If you plot production from all the shale fields in the United States, 2006 is when it really exploded," he observed.

Attractive shale plays had begun to emerge beyond the Barnett shale in north Texas, the birthplace of horizontally drilled, hydraulically fractured shale production.

"Our company got into the Haynesville shale and the Fayetteville shale," he said. "The Fayetteville was discovered by Southwestern Energy. Our company was third to the party. Chesapeake (Energy Corp.) was second," Stoneburner said.

By the start of 2008, the company was convinced of the large potential of unconventional plays.

"That's when we were charged by our CEO, Floyd, to find another one," Stoneburner said.

Several clues pointed to a major opportunity in the Eagle Ford.

"There were really three things. First, we knew it was a regional source rock," he said.

Second was well data. Well logs showed that the formation had the right potential for shale production.

Then Stoneburner and his team were able to find a set of cuttings from a well drilled in 1952.

"We got those cuttings analyzed and that supported the belief that the Eagle Ford had the right thermogenic characteristics," he said.

Third, seismic indicated attractive drilling opportunities, including a Hawkville facies up to 300 feet in thickness.

At the time, the shale boom seemed to be unfolding at a leisurely pace. But looking back today, the principal players are amazed at how quickly events moved.

Petrohawk jumped into leasing in the Eagle Ford and immediately put together a 160,000-acre position, followed by an initial test well that produced 7.6 million cubic feet of gas and 251 barrels of oil per day.

"We did all that through the first six months of 2008. To actually have a well on production by October and also have 160,000 acres under lease is just an incredible thing. It's unheard of," Stoneburner marveled.

In 2011, Petrohawk received an unsolicited buyout offer from BHP Billiton Ltd., the Anglo-Australian mining and energy conglomerate, Stoneburner said. The deal ultimately was valued at more than $11 billion and closed by August that year, "which again is just an incredible timeline," he noted.

He stayed with the acquiring company for more than a year as president of its North American Shale Division, to assist in the transition and to help it acquire more knowledge about shale production.

"They had no experience in onshore operations, and they had just made a very substantial investment onshore," he said.

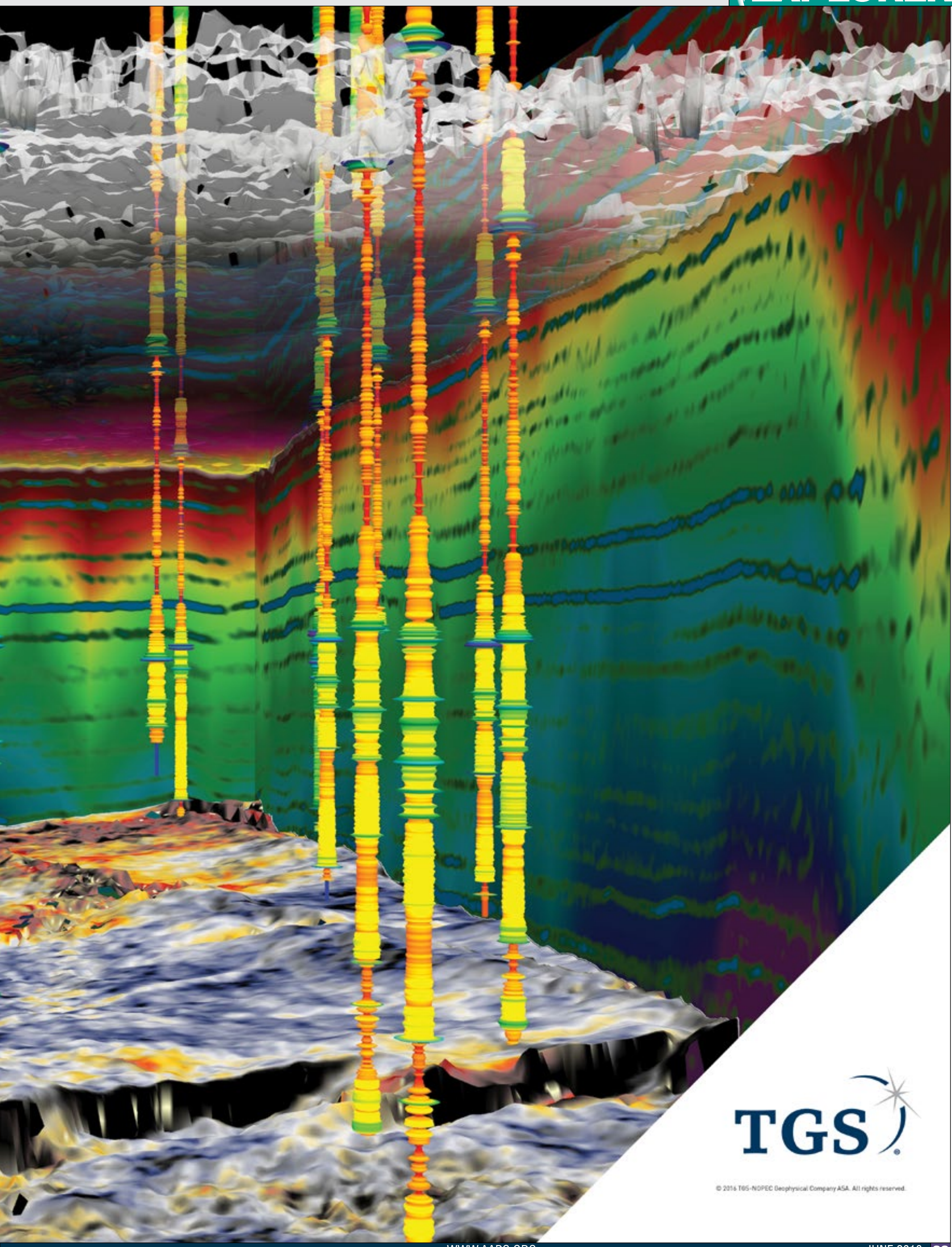
'Never Burn a Bridge'

Stoneburner is now managing director for the energy investment team of Pine Brook Partners. He joined the New York private equity company in 2013 and opened a Houston office for the firm in April that year.

He said his recipe for success is to have good people aligned with you and sufficient capital aligned with your effort.

"Relationships matter, so you can never accomplish what you want to accomplish without working with good people and a well-capitalized organization," Stoneburner said.

"Never burn a bridge – you never know what's going to happen," he added. "I never knew that Floyd Wilson would call me back in 1996 and say, 'Let's go to work again.'"



TGS

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.

Floods and Foibles in Calgary, Alberta

By JERRY OSBORN

Calgary, site of the 2016 AAPG Annual Convention and Exhibition, is characterized by sunny skies, mountain views and a few contradictions.

It's an oil and cowboy city (at least it likes to think so), which – despite its conservatism – elected the first Muslim mayor in North America and helped elect a left-wing provincial government. The younger demographic in the oil patch thinks anthropogenic warming is a serious issue, while a lot of the old-timer entrepreneurs think it's a hoax.

The city has the greatest concentration of geologists in North America outside of Houston, but now many of them are unemployed.

More germane to this piece, the city has been regarded to be generally free of natural hazards: tornadoes ravage Oklahoma, debris flows course through Los Angeles every time it rains, Vancouver and San Francisco (and even Ottawa) await their next earthquake… but Calgary sits comfortably on a rolling plain on a solidly-built part of the North American plate, north and east of hurricane belts and mostly north of tornado belts, without a volcano in sight. Even the formerly legendary cold winters have lost their punch.

It all seemed pretty safe… until the summer of 2013, that is.

The dark blue represents permanent bodies of water, while the light blue represents overflow during the Alberta floods of 2013. Graphic reproduced by permission from L'Espace au Service de la Terre, using data from the Pléiades satellite.

Forgotten Floods

When the Northwest Mounted Police (later to be known as the Royal Canadian Mounted Police) rode west in 1874 to bring law and order to the Northwest Territories, one of their tasks was to stamp out the illegal whiskey trade along the Bow River, which consisted mainly of Americans working out of Fort Benton, Mont.

In 1875, the Mounties' "F Troop" built a fort at the intersection of the Bow and Elbow rivers in what would later be known as Alberta. This was the first building in the future city of Calgary – the site would end up slightly east of downtown. The Mounties were more enlightened land-use planners than subsequent immigrants and city councils: they built their fort on a hill next to, but comfortably above, the confluence.

The site has probably never seen a flood any time in the late Holocene.

Not so the floodplain lowlands to the west and south, where the city expanded after the arrival of the Canadian Pacific Railroad in 1883. The two biggest known floods on the Bow River, and possibly the Elbow River, occurred four and 22 years, respectively, after the building of the fort. The Bow and Elbow rivers were in fine fettle back in those days; more big floods occurred in 1902, '15, '16, '23, '29 and '32. But these floods did not deter development in floodplains, which continued apace along both rivers.

The 1932 flood was very large, matched in the 20th century only by the 1902 flood, and would have inflicted great ruin upon the residential communities that sprang up along the Elbow River between 1902 and 1932. But the Glenmore Dam, built on the Elbow to provide a drinking-water reservoir, had just been finished. According to historian Harry Sanders, the reservoir went from empty to a few inches below crest in two days. This fluke blunted the impact of the Elbow flood on the communities, and if there was any impulse to think about floodplain regulation in the 1930s, that was also blunted.

There followed an amazing 70 years. Following the rash of floods around and after the turn of the century, seven decades passed without any discharge that could be labeled a "flood."

The old citizens died or moved out, and first-hand knowledge of the flood hazard gradually dimmed. And as it dimmed, houses were built in the most hazardous places, such as filled-in abandoned channels and meander bends. Many students at the University of Calgary, surveyed in the '80s and '90s, didn't know it was possible that the Bow and/or Elbow rivers could overtop their banks.

The city and the province knew, however, despite the city's ongoing approvals of floodplain developments.

In the late '60s the city started thinking about some kind of floodplain regulation – a fairly progressive thought for a western Canadian city at the time.

The Montreal Engineering Company was hired to conduct a flood hazard study. They picked the 70-year flood as the design flood, mapped inundation limits of it, recommended a floodplain management scheme in which hazard areas would be officially delineated on maps, and presented findings at a series of public hearings. Because most attendees at the hearings were floodplain residents, the outcome was predictable: the management scheme was vigorously opposed because property values were deemed to be at risk. The heat was such that the city backed off and Calgary's first attempt at land-use planning on floodplains was abandoned.

The city and the province got more serious 10 years later.

Alberta Environment, a government department, did another flood study, which came out in 1983. The city, illustrating the old adage "once bit, twice shy," held no public hearings and asked no community associations for input. Adoption of floodplain regulations seemed to be conducted as a stealth mission. The study defined an inner floodway in which built structures would have a significant backwater effect and an outer floodplain in which built structures would not have such an effect.

After the 2013 flood, the "floodplain" zone would be changed to "flood fringe."

The city enacted bylaws prohibiting new development in the floodway, but allowed existing residences to be maintained and even replaced. In the floodplain, new development, including residential subdivisions, would be allowed if first floors and all electrical and mechanical equipment were above flood level.

Ironically, there was little or no general communication about the flood hazard coming from the city or the province before 2005; it may be that the city wanted to keep the issue quiet to keep the floodplain residents quiet.

Wake-up Call

The two rivers continued their mild-mannered ways through 2004.

But in June 2005, a series of potent storms passed through southern Alberta. Although towns south of Calgary were flooded three times, only one distinct peak on the Bow River hydrograph occurred in Calgary, on June 19.

The Elbow also overtopped its banks.

Living Calgarians witnessed their first flood.

The city's 1,500 residents were evacuated, and flood-damage costs to the City of Calgary were estimated at $75 million.

At the time, it seemed like a big number, but the flood in Calgary was actually small, compared to what the rest of Alberta experienced. Although some small streams in the province experienced greater-than-100-year floods that month, the event in central Calgary was merely a 15-year flood.


OSBORN

Jerry Osborn is a professor of geology in the Geoscience Department at the University of Calgary. His interests are surficial and quaternary geology, with forays into geomorphology and engineering geology, and, on the side, interactions between science and society. His main line of research is Holocene climate change using glacial-history and lake-sediment proxies. Consulting activities have included aggregate searches, mass-movement hazards analysis, flood hazard analysis and studies of river migration as applied to boundary-law litigation. Included in the thousands of students who have passed through his introductory geology courses at the University of Calgary are many petroleum geologists working (or formerly working) in Calgary. When time allows he searches for the perfect pumpkin pie recipe and teaches his kids the value of listening to Bob Dylan.

But the total damage across southern Alberta was estimated at nearly half a billion dollars. So much damage was caused by floods (mainly outside of Calgary) that some provincial politicians were getting uncomfortable with the amount of relief being paid out by the province.

After the 2005 flood, the government commissioned a report, led by Highlands Member of the Legislative Assembly George Groeneveld, to recommend ways to better prepare for floods and cut down on damage relief.

The most progressive recommendation of the report was that the province should stop selling floodplain land for development: "Undeveloped flood plains are the natural and most effective form of flood mitigation, and this recommendation will protect those areas," said Groeneveld.

Another recommendation was that a note should be placed on the title of every property in a 100-year flood zone so that new buyers would be aware of the situation.

The ultimate fate of the Groeneveld report was not surprising: a Global News headline after the 2013 flood read "Alberta government failed to act on flood prevention report."

Although they had gotten off fairly easily, Calgarians now recognized that their two rivers could, well, maybe, flood. But nothing much changed at City Hall or in the provincial government. The province continued to sell Crown land on floodplains for development and many floodplain residents who were not affected by the 2005 flood assumed they were safe. Real estate transactions continued without discussion of flood risk.

The Great Flood

In late June of 2013, bolstered by saturated mountain snow packs, a stalled upslope low-pressure system and anomalous behavior of the jet stream, the great flood came.

It rained heavily for two days, with storm runoff augmented by high-elevation snow melting in the rainy onslaught. The bulk of the precipitation fell west and southwest of Calgary, right over the headwaters of the Bow and Elbow rivers.

In Calgary each of the two rivers carried the equivalent of three 2005 floods stacked together.

Calgary saw 75,000 people evacuate. The city's downtown core, home of Alberta's oil patch, was evacuated and had its power cut off, and the 350,000 who work downtown enjoyed a multi-day holiday. Parts of downtown and many residential districts ended up underwater. The Saddledome, which is the local professional hockey and entertainment venue, was filled up to the 10th row. The entire Calgary Stampede grounds were also flooded, less than two weeks before the 2013 fair and rodeo was scheduled to open. (The Stampede movers and shakers vowed that the show would go on, in time, and it did. The Saddledome reopened in October with an Eagles concert.)

Aftermath

When all was said and done, the 2013 Calgary flood (more properly, "the southern Alberta flood," but most of the damage was

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Halbouty Lecture

Bay du Nord Discovery: 'A Story of Belief'

By LOUISE S. DURHAM, EXPLORER Correspondent

It's no secret that the Halbouty Lecture at each AAPG Annual Convention and Exhibition is a big draw.

The lecture series is named for the late Michel T. Halbouty, renowned wildcatter extraordinaire.

Wildcatting today is far removed from this legendary oilman's heyday when prospectors would risk it all, continually chasing what they saw as the next big find.

When it worked, it worked. When it didn't… well, there was always the next one.

Now, it's all about teamwork among various experts on geology, engineering and related disciplines. Costs rarely, if ever, are the responsibility of a single player in this often daunting, always expensive game of exploration, which is evolving into an increasingly high-tech arena.


DODSON

> **"Continuous global exploration work is critical to the sustainability of the oil and gas industry."**

The 2016 Halbouty Lecture series presentation by Tim Dodson, executive vice president of Statoil ASA, will focus on Statoil's high impact Bay du Nord discovery in the deepwater Flemish Pass Basin in 2013.

Estimated to hold 300 to 600 million barrels of crude oil recoverable, Bay du Nord was hailed as the largest oil discovery worldwide in 2013 once it was announced by Statoil and joint venture partner Husky Energy. The discovery well tapped into light oil tallying 34 degrees on the API scale in high quality Jurassic-age reservoirs having high porosity and permeability.

The find represented Statoil's third – and largest – discovery in this largely unexplored Basin, which occurs about 300 miles east of St. John's, Newfoundland. The trio of discoveries, which includes Mizzen and Harpoon, each are in approximately 1,100 meters of water and on separate geological structures within relatively close proximity to one another.

'Overnight Success'

Statoil's foray into offshore Newfoundland dates back to 1996 – seven years before its first well in the Flemish Pass. Although this well was a disappointment, the company persevered, ultimately reaching the big breakout with the 2013 discovery.

Bay du Nord has been referred to as an "overnight success 17 years in the making." In other words, the pathway to this big hit was littered with an array of obstacles.

"Drawing on ideas, exploration and production successes from the Norwegian Continental Shelf, the original idea was that many of the same exploration plays could exist in the East Canada offshore basins," Dodson said. "Given new data and offshore land sales in the Flemish Pass, explorationists early on identified the potential in the Flemish Pass and nearby basins, extending the Jeanne d'Arc plays and the Norwegian experience to the north," he noted.

It sounds straightforward, but it's never smooth sailing in these types of endeavors.

Dodson emphasized that even though the Norwegian Continental Shelf ideas applied in principle, the local geological setting in the Flemish Pass provided additional geophysical and geological challenges.

"Identification of a working petroleum system with a working source rock, understanding the reservoir development, and not least the trap and seal system, was critical," he said.

This environment is rife with operational challenges, including shifting weather conditions, drifting icebergs and deep water.

Statoil, however, has become adept in handling such situations, having acquired vast environmental experience with harsh conditions on the Norwegian Continental Shelf.

Dodson offered a capsule summary of the action here overall:

"The exploration history of the Flemish Pass is a story of belief, countercyclical thinking and gradual building of knowledge and database," he commented. "The

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in Calgary) ranked as the most destructive and costliest natural disaster in Canadian history although it may be outdone by the Fort McMurray fire of early May.

Four people drowned in the flood, one of them in Calgary. Insurable damages are estimated to be close to $2 billion and total damages should round out at about $6 billion.

Then-Provincial Environment Minister Diana McQueen was quoted, "I want to stress that what Alberta has experienced in this past week was unprecedented… No report or recommendation looking at the lessons of the past could have prepared us for this event."

She apparently hadn't heard about the 1879 and 1897 floods, which were much bigger.

In the aftermath, everybody agreed that the community spirit and mutual support generated by the flood were awesome. But as for the central post-flood question – "What to do about the flood hazard going forward?" – there is no agreement, and the community spirit has, shall we say, thinned.

The province's immediate response was to try to clear the floodway, but it didn't feel it could force residents out. Instead, it offered to buy them out. Only half took the money and moved.

So now there is a combination of patchwork neighborhoods and remaining floodway obstruction. Remaining floodway residents theoretically will not be eligible for damage relief after the next flood. The couple thousand flood-fringe households can stay put but are required to flood-proof their homes to some degree, in order to be eligible for future damage relief.

Policies and Planning For the Next Big Flood

The province also attempted to enact one of the Groeneveld recommendations: it indicated it would require inclusion of a "location note" on floodplain land titles for information purposes. That lasted only three weeks: the province caved to pressure from well-heeled and politically connected residents of the Elbow floodplain, who continued to worry about their property values and decided that the location notes would be removed if homeowners followed the province's flood-proofing suggestions.

Knowledgeable institutions (such as WaterSMART Alberta) and academics (such as Ed Watts at Queens, author of the definitive text on hydrology of floods in Canada) are promoting a stop to floodplain development, or even de-development of floodplains, as the primary need. But after the flood, a Toronto Metro headline read, "Too soon to restrict building in Calgary flood zones, says province."

Watershed-scale thinkers like Kevin van Tiegham, the former superintendent of Banff National Park, call for watershed management. But floodplain residents see big engineering structures as the primary need, and such structures have the added benefit of allowing politicians to look like they are doing something bold and positive.

Most engineering attention has been paid to the Elbow River, along which private residents clamor for public protection, claiming the dam(s) are needed to protect downtown, even though the Bow was the source of downtown flooding in 2013.

The provincial government has given the go-ahead to a $200 million dry dam off the Elbow River a little ways upstream of Calgary, designed to impound floodwaters via a diversion canal. The province initially claimed a positive benefit/cost ratio, but later a Calgary Herald headline noted "Report says reservoir costs higher than future flood damage."

The 'Floodplain Dance'

Economic projections related to river flooding rest on so many tenuous assumptions that, in the end, most decisions about dams are made on political grounds, and that is certainly true in this case.

The lack of clear long-term economic benefit is perhaps overshadowed by the lack of any overall flood mitigation plan into which the Elbow dam could fit. The Bow River, after all, constitutes a much larger threat to city homes and businesses, according to a government-commissioned report. Meanwhile, the dam is opposed loudly by rural landowners who will be affected by the project, and quietly by citizens not on the floodplain who object to subsidizing the floodplain residents with their taxes and higher insurance premiums.

See **Predictability**, page 28

Looking downtown from Riverfront Ave. in Calgary, during the 2013 Alberta floods. Photo by Ryan L. C. Quan.

Predictability
from page 27

And so the floodplain dance continues. Or as Sonny and Cher used to sing, the beat goes on. Scientists cannot predict when and where the likes of Slave Lake fires or Montreal ice storms or Oklahoma tornadoes will happen, but they do know where rivers will flood next, and with what average frequencies. On the surface, it seems simple and rational to give the river room to do its thing – flood. But simplicity and rationality are not big players in considerations of flood hazards. Human beings like living on the floodplain, and governments find it difficult to tell them they can't. We have the same arguments over and over.

Consider this excerpt from a Calgary Herald editorial:

"Only too frequently people fail to realize that they themselves are largely responsible for the disaster brought upon them... in closely built municipalities, disastrous floods will inevitably follow encroachments on the old floodplain…"

This editorial wasn't written after the 2013 flood, but in 1913.

Ambition
from page 26

Bay du Nord discovery is an example of Statoil's global way of exploring through execution with rigor, replenishment of the portfolio and by cultivating the exploration culture."

"The success of Bay du Nord is the result of an ambitious and targeted drilling campaign in the Flemish Pass Basin," he added.

Given the current challenges faced by the industry, Dodson's take on worldwide exploration overall is to the point.

"Continuous global exploration work is critical to the sustainability of the oil and gas industry," he said. "All oil and gas reserves have been found by exploration at one point in time, and persistence and perseverance in this type of work will carry the industry forward."

"Exploration success depends on access to new areas, new technology and new ideas," he emphasized. "Plus, there are no short term solutions as exploration history shows that the largest successes have come from a combination of these three factors and patient subsurface work over time. Exploration success over time has come in cycles, and there are no short-term easy solutions."

Meanwhile, Statoil continues to fine-tune its understanding of the geology and potential of the Flemish Pass Basin as evaluation continues.

Over the course of the last 18 months, the company has overseen an ongoing drilling campaign – appraisals/near field drilling and a few wildcats – in the area, according to Kjersti Tvedt Morstøl, vice president of communications at Statoil in Norway.

Morstøl noted that results related to the campaign will not be available until sometime after mid-June.

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.

A Look Back At 40 Years of the Strategic Petroleum Reserve

By EDITH ALLISON, Geoscience and Energy Policy Office Director

As the United States Strategic Petroleum Reserve approaches its 40th birthday and the world is awash in excess oil, the U.S. Department of Energy (DOE) and Congress are taking a serious look at the reserve and its almost 700 million barrels of crude oil stored in 62 salt caverns in Texas and Louisiana. Additional small reserves of low-sulfur diesel (home heating oil) and gasoline that are located in the northeast are not a current concern.

Congress evidently saw a piggy bank filled with more oil than our international commitments require and last year decided to sell 174 million barrels (one-quarter of the reserve) to fund government activities.


ALLISON

Recent activity may lead one to wonder if we really need the reserve.

The oil sales include 66 million barrels to support expenditures authorized in the 2015 Transportation Bill and 58 million barrels for deficit reduction in the 2015 Bipartisan Budget Act.

At about the same time, a DOE study suggested that the reserve requires $1.5-$2 billion in upgrades, which the 2015 Bipartisan Budget Act would fund by selling an additional 40-50 million barrels from the reserve.

Do We Still Need a Reserve?

This recent activity may lead one to wonder if we really need the reserve.

Senators Lisa Murkowski (R-Alaska) and Maria Cantwell (D-Wash.) as chair and ranking member, respectively, of the Senate Energy and Natural Resources committee have answered the question. In multiple hearings, white papers and statements, both senators have spelled out the need for a strong reserve. More importantly, they have included provisions to preserve and strengthen it in legislation (Senate Bill 2012) that they have shepherded through the Senate.

Justification for an emergency oil reserve:

- Oil reserves in the United States and other nations are intended to offset the economic damage of major supply disruptions.
- The reserve has made emergency releases. In 2011, in response to the disruption of oil production in Libya due to civil unrest, the U.S. reserve released more than 30 million barrels as part of the IEA coordinated release of 60 million barrels. Other coordinated releases were in 1990-91 for Desert Shield/Desert Storm and in 2005 after Hurricane Katrina.
- Even though U.S. oil and natural gas production is at near record highs, the United States is still an oil importer.
- The United States and other oil consuming nations are dependent on oil produced in politically unstable areas.
- After the 1973-74 Arab oil embargo, the major oil importing countries formed the International Energy Agency (IEA) to coordinate a collective response to oil supply disruptions.
- The United States and most other IEA member countries are now holding more than the 90 days' supply required of IEA members. The U.S. storage surplus is primarily the result of declining imports as domestic oil production expanded. In addition, energy efficiency, renewable energy and natural gas consumption has reduced some of the need for oil imports in some countries.

International Petroleum Reserves

The IEA has 29 member countries. All except Canada are net oil importers and are required to hold or have access to reserves. Member countries are primarily in Europe, along with Korea, Japan, Australia and New Zealand in the Asia-Pacific area, as well as the United States and Canada.

Outside of the IEA, several countries have or are planning reserves: China has about 100 million barrels of storage constructed of a planned 500-million barrel reserve. The reserve will include aboveground and belowground storage in multiple locations. India started to build a 37 million barrel reserve in 2003. In Africa, Kenya and South Africa have petroleum reserves.

Future of the U.S. Strategic Petroleum Reserve (SPR)

A 2014 crude-oil test sale demonstrated

See **Policy Watch**, page 39

AAPG Education Upcoming Education Events 2016

AAPG HEDBERG RESEARCH CONFERENCE CENTER

Mudstone Diagenesis: Implications for Exploration and Development of Unconventional Reservoirs

October 16-19, 2016, Santa Fe, New Mexico

The purpose of this conference is to foster the free exchange of new ideas among leading experts from industry, academia, and government on the controls and impacts of inorganic and organic diagenesis on mudstone hydrocarbon generation, reservoir properties and seal quality.

This conference will promote the exchange of new ideas among the leading experts from industry, academia, and government on the controls and impacts of inorganic and organic diagenesis on mudstone hydrocarbon generation, reservoir properties and seal quality.

Until recently, most researchers investigating shales concentrated their research efforts towards understanding: (a) hydrocarbon generation and expulsion, (b) seal capacity and (c) overpressure generation. Most data used to support these investigations were derived from organic geochemistry, relatively low magnification optical petrography, and bulk rock characterizations. Notably lacking from these studies is the characterization and evaluation of the potential impact of mudstone diagenesis.

New analytical techniques in scanning electron microscopy (SEM) have allowed investigating mudstone properties down to the nanometer scale. New SEM observations of mudstone micro-texture have revealed the presence of authigenic cements, and have captured various stages of the transformation of organic matter during petroleum generation. An improved understanding of mudstone organic and inorganic diagenesis is required to advance the ability to better predict shale reservoir quality and heterogeneity.

SCHOOLS AND SHORT COURSES

In Conjunction with AAPG 2016 Annual Convention & Exhibition (ACE) - American Association of Petroleum Geologists (AAPG)

ACE SC 05 | Introduction to Oil Sands Thin Section Analysis

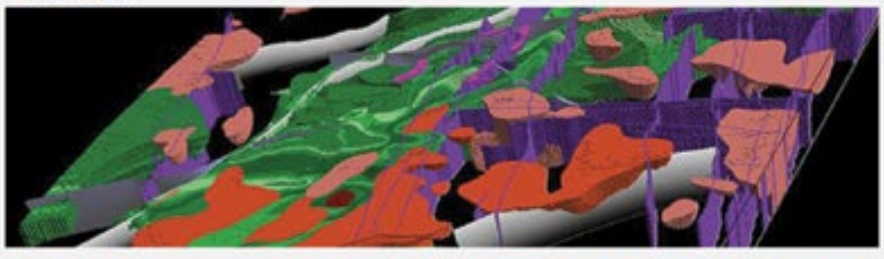
June 18, 2016

This course is designed for the beginner to seasoned professional who would like a review of unconsolidated oil sands reservoir petrology. This includes geologists, petrologists, asset teams, R&D teams, and petroleum engineers.

In Conjunction with AAPG 2016 Annual Convention & Exhibition (ACE) - American Association of Petroleum Geologists (AAPG)

ACE SC 13 | Advanced Geochemical Technologies: Methods That Reveal the Rest of Your Petroleum System

June 19, 2016



The course is geared toward exploration/development geologists, especially those engaged in basin modeling and/or geochemical applications. Although several new technologies and methods will be presented in this course, no particular knowledge or experience is required to understand them and benefit (i.e., beginners will benefit). However, for those who do have experience, even for seasoned experts in geochemistry, the technology and methods to be presented will add enormously to their problem-solving abilities (i.e., advanced participants will also benefit).

In Conjunction with AAPG 2016 Annual Convention & Exhibition (ACE) - American Association of Petroleum Geologists (AAPG)

ACE SC 14 | Integration of Petroleum Geochemistry and Reservoir PVT Analyses for Evaluation of Hydrocarbon Resource Plays

June 19, 2016

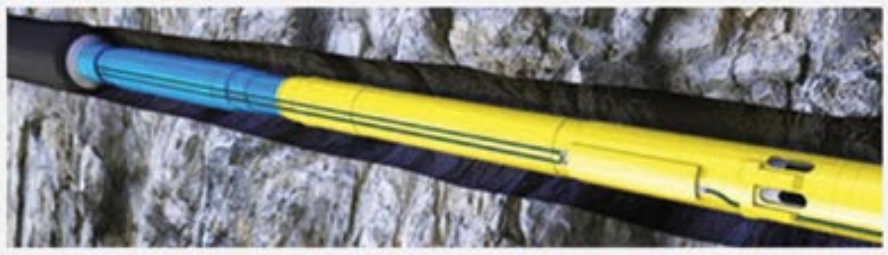
This course will address integration of source rock, produced oil and gas, mud gas and reservoir engineering data to better understand and exploit three-dimensional details of petroleum systems. Source rock, carbon isotope and oil biomarker geochemistry will be stressed as a way to determine quantity and type of generated hydrocarbons and migration distance and direction within source rock and tight oil plays. The integration of hydrocarbon phase behavior, as determined through PVT analyses, with these geochemical data allows an improved understanding of the nature and productivity of resource plays and co-located conventional reservoirs.

SCHOOLS AND SHORT COURSES

Great discounted rate for all geoscientists. Our loyalty discount provides a great way to take advantage of AAPG Short Courses, "Basic Well Log Analysis" and "Fractured Reservoirs". Use the discount code: **WECARE!** and receive 75% off the regular rate.

Basic Well Log Analysis

July 11-15, 2016, Golden, Colorado



The course assumes no logging knowledge and seeks to establish an understanding of basic petrophysical measurements and interpretation techniques which can be applied to routine tasks, and upon which more complex and advanced information and interpretive techniques can be built. The Basic Well Log Analysis course strives to provide a strong and coherent foundation for the understanding of other, specialized interpretation techniques involving well log data, which are not covered here.

Fractured Reservoirs: From Geologic Concepts to Reservoir Models

August 22-26, 2016, Casper, Wyoming

Course plus Field Trip

The short course provides a unique opportunity to learn all the aspects related to the understanding and modeling of fractured reservoirs. The unique feature of this course is the ability to take the geologic concepts and use them in reservoir modeling. Hands-on sessions are devoted to the examination of outcrop, core and log data and using that information and a software to create 3D fractured reservoir models.

www.aapg.org/career/training/

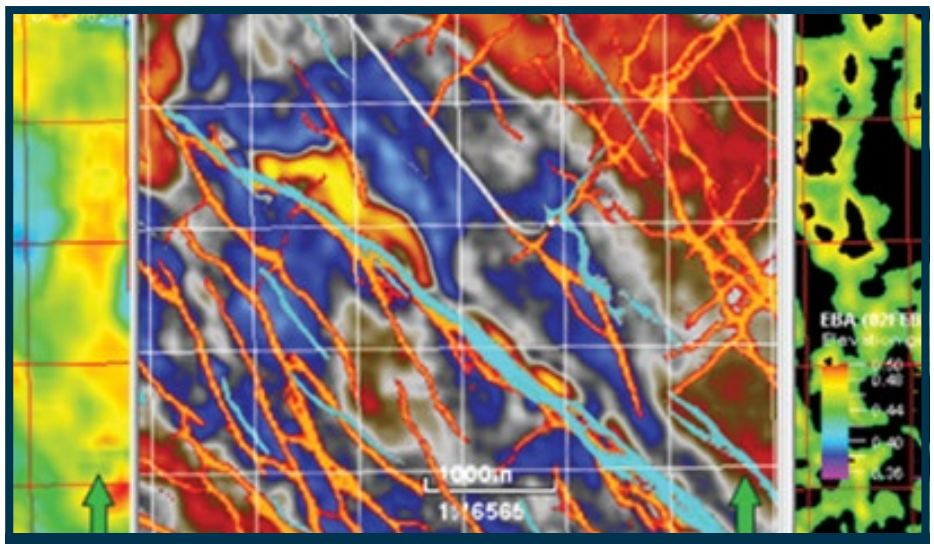
The Geophysical Corner is a regular column in the EXPLORER, edited by Satinder Chopra, chief geophysicist for Arcis Seismic Solutions, TGS, Calgary, Canada, and a past AAPG-SEG Joint Distinguished Lecturer.

Extracting Large-scale Fracture Networks

By AYON KUMAR DEY

This work demonstrates a modern workflow that directly extracts high-resolution, large-scale fracture networks from seismic inversion-based structural attributes. The workflow is successfully applied to a thrust-belt controlled, lower Triassic, siltstone reservoir in the Montney Formation of the Farrell Creek area in northeast British Columbia to extract a 3-D fracture network orthogonal to the primary stress direction.

Subsequently, these extracted seismic scale fractures are applied to analyze completions, production interference and well planning.



This work demonstrates a modern workflow that directly extracts high-resolution, large scale, fracture networks from seismic inversion based structural attributes. The workflow is successfully applied to a thrust-belt controlled, lower Triassic, siltstone reservoir in the Montney formation of the Farrell Creek area in northeast British Columbia to extract a 3-D fracture network that is orthogonal to the primary stress direction. Subsequently, these extracted seismic scale fractures are applied to analyze completions, production interference and well planning.

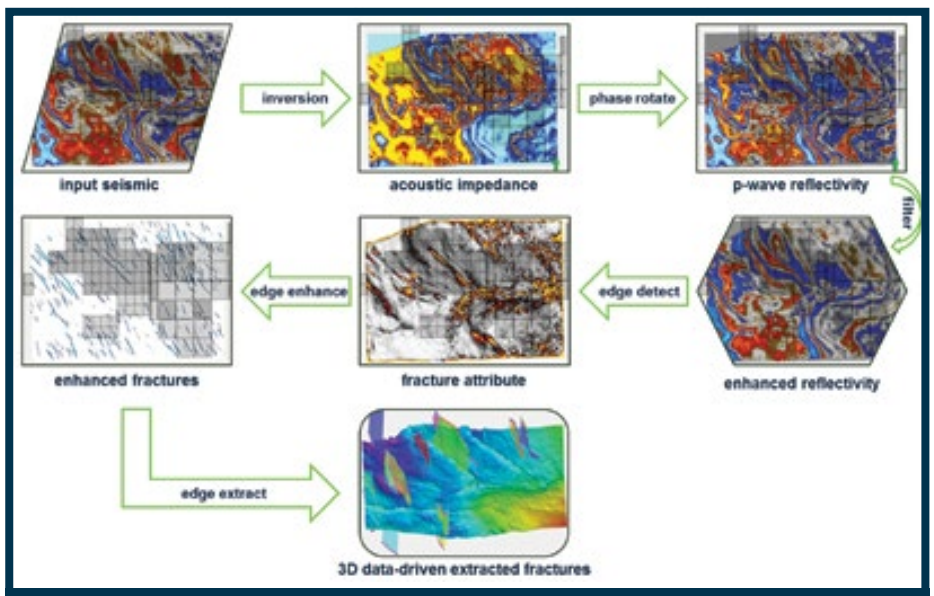


Figure 1: Seismic data-driven high-resolution fracture extraction workflow.

DEY

This work demonstrates that a seismic-data-driven approach to fracture identification and characterization is an added-value process.

High-resolution Fracture Network Extraction

The principal objective of this exercise is to provide asset teams with a rapid and independent view of the seismic-scale fracture networks present within an area of interest for integrated hydraulic fracturing, production and drill target analysis. A high-resolution fracture extraction workflow from seismic data has been developed to address this need.

A "systems" approach allows us to conceptualize the seismic data as the vertical fractional change in the geology that has been modified by seismic-wave propogation and earth-filtering effects. Minimization of these effects, as well as random noise, through seismic inversion enables a more accurate and complete understanding of the subsurface geology and delivers an optimal input for computing various structural attributes.

Figure 1 shows a block diagram illustrating the workflow employed to exploit this concept for the computation of a higher fidelity and higher resolution structural attribute. The final processed seismic (a band-limited interface property) is transformed to compressional (P-wave/acoustic) impedance (a layer-based bandwidth enhanced rock property) by simultaneously integrating well-log and lithostratigraphic information, as well as minimizing random noise, earth filter and seismic-wave propagation effects. Through a phase rotation, it yields the compressional-to-compressional mode reflectivity (i.e. the P-wave reflectivity) without loss of vertical resolution.

Exploiting the marginal 90-degree phase relationship between reflectivity and impedance avoids the inherent loss of resolution due to directly computing the reflectivity as the vertical derivative of the impedance. The polarity (standard/reverse) of the input seismic determines whether a positive 90-degree or a negative 90-degree phase rotation is required to obtain reflectivity from impedance. This is the base data from which structural attributes are computed since it is richer in information than the full-offset stack.

Although the reflectivity is the optimal starting point for structural analysis, it can be improved further by geological preconditioning. This is achieved via small window median filtering along structural dip in good signal-to-noise ratio (S/R) areas and diffusion filtering in areas with a poor signal-to-noise ratio. As a result, the reflectivity is cleaner and yields a fracture attribute with sharper boundaries or "edges."

High-resolution fracture sets orthogonal to the primary stress are computed via stereonet-controlled directional steering of the enhancement algorithm. Should image log or dip meter analysis be available, stereonets can then be built to enhance the extraction of specific structural elements observed via downhole analysis. Displaying the enhanced fracture attribute in 3-D orthogonal perspective with opacity set to highlight strong discontinuities allows the first order lineaments to be visualized. These discontinuities are then extracted as geobodies for a data-driven fracture model that can be applied as needed.

Application to the Montney Formation

The workflow is applied to a thrust-belt controlled unconventional siltstone reservoir that lies in the dry gas, distal shelf, portion of the Montney formation, northeast British Columbia, Canada (see figure 2). This formation (comprised of an upper and lower portion, each having several drillable lithostratigraphic zones) is a succession of clastic and carbonate shelf facies that have been deposited via westward progradation, with proximal facies deposited in the east and basinal facies deposited in the west. Its isopach averages 360 meters in the study area.

Figure 3 shows an application of the workflow to an anomalous completions result for a producing well in the distal shelf region of the Montney formation discussed earlier. The 3-D top-down view, on the left, shows that the fracture network locally isolates the thicker portion of the reservoir.

Furthermore, the fracture network directs and contains the production-tied-microseismic events. On the right is a section view, taken along the length of the lateral. This shows the lateral section of the well intersecting two major seismic-scale fracture corridors. These "throw"-related (the blue lineament) and "anticline"-related (the orange lineament) fracture-related attributes constrain the microseismic and promote downward, out of reservoir, growth.

In figure 4, we see an application of the discussed workflow to production analysis. On the production pressure curves, as Well A is shut-in there is an observed response in Well B and Well C. An explanation for this production interference is fracture connectivity between the wells. Extracting the fracture network confirms this, as seen in the lower right-hand panel.

A final application is shown in figure 5. Here we see near well-bore sweet spots for brittleness, hydraulic fracability, porosity and organic richness extracted as geobodies. These are co-rendered in 3-D with the extracted seismic fracture network and an integrated sweet spot is identified. Knowledge of previous, nearby well plans and production information allows this well to be planned knowing that intersecting

Continued on next page

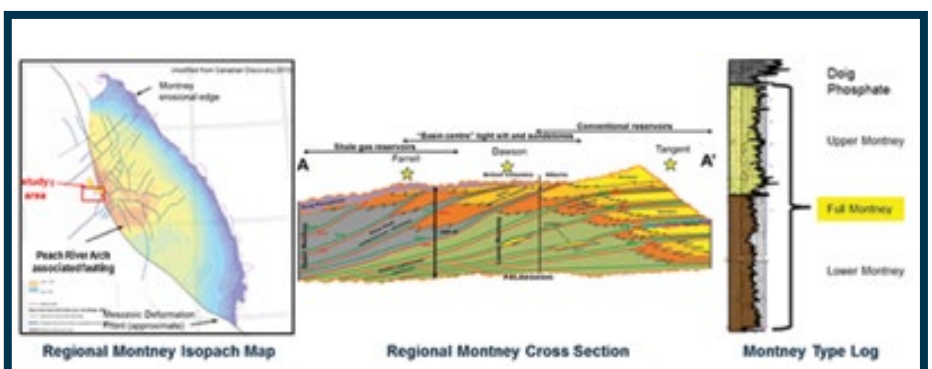


Figure 2: The regional geology of the Montney formation.

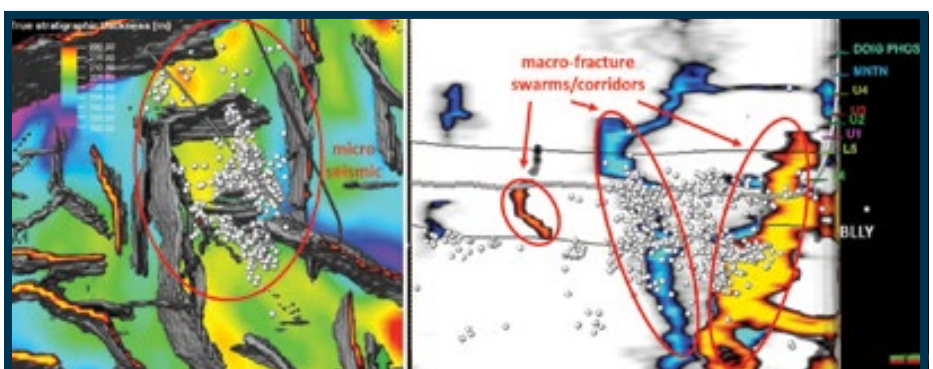


Figure 3: Applying extracted seismic fracture networks to completions analysis.

Continued from previous page

certain fracture attribute patterns at a high angle is preferred to drilling these same patterns in a roughly parallel, or slightly oblique, manner. As such, this well can be planned such that about two-thirds of the lateral can be ideally placed and completed.

In conclusion, this work demonstrates that a seismic-data-driven approach to fracture identification and characterization is an added-value process. The fracture attributes delivered via this workflow are a first step and should be correlated to downhole evidence (i.e. image logs) of fracturing.

Acknowledgements

The author would like to acknowledge the entire Sasol Canada subsurface team for their insights in the development and application of this workflow. Also to be acknowledged for supporting this work is the Progress-Sasol-Montney-Partnership joint venture.

Ayon Kumar Dey is the principal geophysicist at Sasol Canada E&P Ltd., Calgary, Alberta, Canada.

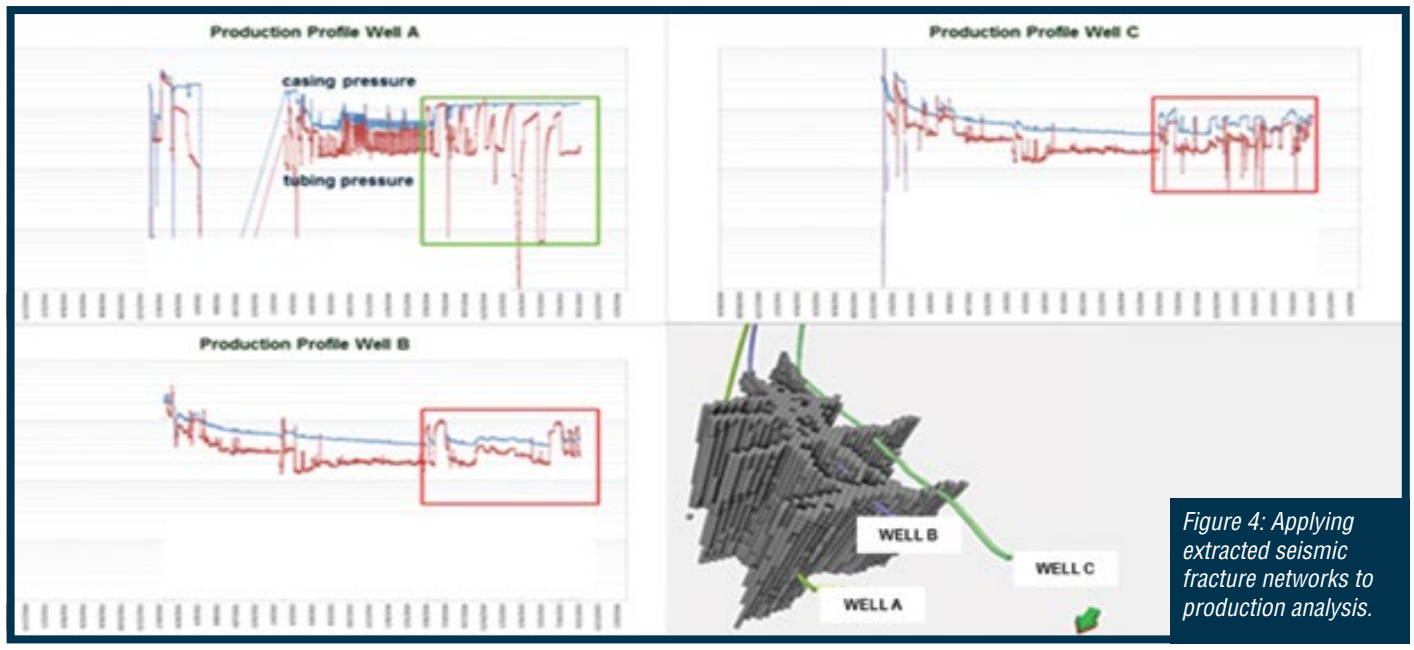


Figure 4: Applying extracted seismic fracture networks to production analysis.

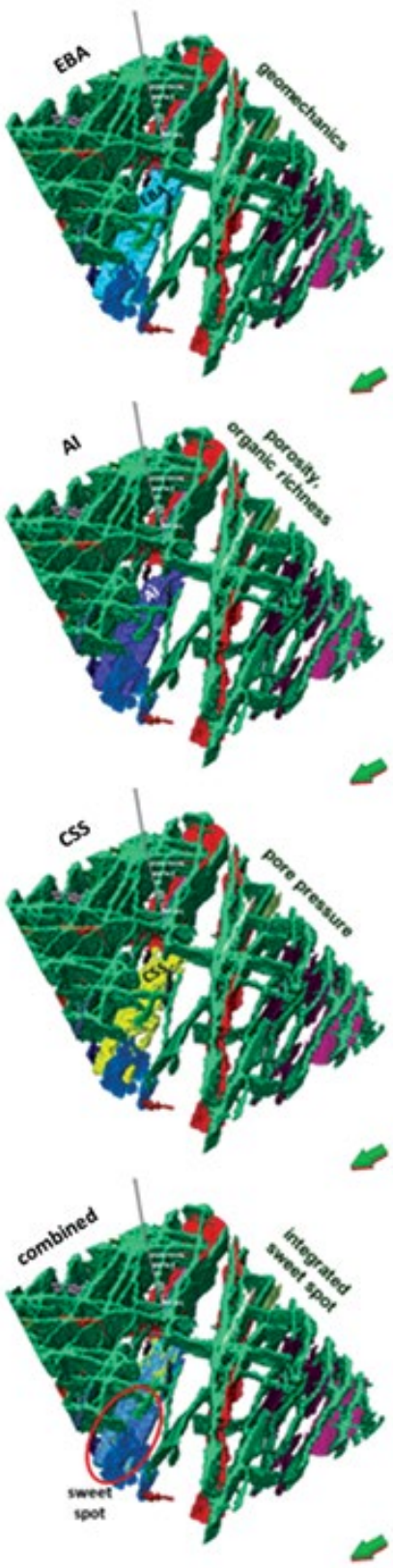


Figure 5: Applying extracted seismic fracture networks to well planning.

AAPG Involvement Equals Career Success

By LOW WAN CHING, Asia-Pacific Region Young Professional

My participation in AAPG activities has always been a source of wonderful memories.

My involvement with AAPG began in July 2013 when I was asked to help organize a talk by Robert Shoup for the Young Professionals of Kuala Lumpur, Malaysia. The event was wildly successful. There were 40 participants in attendance for Shoup's presentation of "10 habits of a successful geoscientist."

Prior to AAPG, I was involved in committees for various major oil and gas conferences held in Kuala Lumpur. However, back in those days, social networking events were mostly restricted to management and few events catered to YPs. After witnessing the wonderful turnout by students and YPs to Shoup's talk, I decided to form the AAPG KL YP Chapter in July 2013. I thought it would be a good platform for geoscience students and YPs from various oil companies in KL to mingle and network.

Once the Chapter was formed, technical talks were held almost every month. Thanks to our AAPG connection, we've been extremely lucky to invite Visiting Geoscientists from all around the world to present.

Low Wan Ching created and guided a YP Chapter in Kuala Lumpur, Malaysia.

Career Launch

Due to the activity of the KL YP chapter, I was very fortunate to be selected to represent the Asia Pacific Region at the 2014 Young Professionals Leadership Summit in scenic Snowbird, Utah. In the workshop, it was inspiring to be surrounded by highly motivated and like-minded YP representatives from the Regions and Sections debating various ideas on how to improve AAPG's connection with the students and YPs.

In late 2014, I was ecstatic to receive news that I had won the prestigious Chevening Scholarship offered by the government of the United Kingdom and a partial South East Asia Petroleum Exploration Society (SEAPEX) Dick Murphy Scholarship Award to pursue a master's in petroleum geoscience in Royal Holloway, University of London. To this day, I strongly believe that my active involvement in AAPG YP Chapter leadership was the key to obtaining these scholarships and advancing my geoscience studies.

While pursuing my master's, I was fortunate to be selected to represent my university in the AAPG Imperial Barrel Award (IBA) competition. It was a memorable and challenging experience. My teammates and I spent many long nights in the lab, working on our technical evaluation and putting together the presentation while simultaneously juggling coursework. Our hard work finally paid off when we managed to win the Europe Region competition and, ultimately, first place at the IBA Finals held at the 2015 AAPG Annual Convention and Exhibition in Denver, Colo. Keith Gerdes, president of AAPG Europe Region, was extremely delighted with our achievement since we were the first UK team to win the IBA Award in eight years.

Back to Kuala Lumpur

After graduating with my master's degree, I returned to Kuala Lumpur and presented my technical paper, "Structural Evolution of Deepwater Thrust Foldbelts, Offshore Sabah, Malaysia," at the Asia-Pacific Geoscience Conference in October 2015. Thanks to rigorous training and countless presentations for AAPG IBA, I was surprisingly calm and confident presenting my paper to a full crowd inside the conference hall. Participating in the AAPG IBA competition definitely helped me hone my technical preparation and presentation skills.

Currently, I have resumed my post as president of the AAPG YP KL Chapter after a year-long absence to pursue my master's. While I was away, committee members Chin Soon Mun, Jeen Ching and Nuraman Nusral managed to collaborate with the Indonesian Association of Geologists KL Chapter to

See **Activity**, page 37

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

READERS' FORUM

The article in the April EXPLORER by David Brown regarding the tighter credit issue and re-determination is timely. While I love geoscience articles, I am glad AAPG also recognizes we are in a business, and one that is in the midst of a struggle these days. Like other members, I have been through this a few times during my career. Although, I believe this one is a bit different than previous such events. Anyway, thanks for the article.

Don Felio
Vail, Colo.

* * *

I have been a proud member of AAPG since 1971. I retired from the industry several years ago, but maintain my membership.

I was disheartened to read the recent article, "Stemming the Loss of YPs" (December's ProTracks column). It was bothersome to hear that YPs are leaving the Association. It was also troubling to hear that "The implications are that AAPG is in danger of becoming irrelevant in the short term and nonexistent in the long term."

When I was a rookie petroleum geologist in 1971, like my peers, one of the first things on my agenda was to become a member of AAPG. It was the one thing that identified us as professionals and made us part of what we felt was an exclusive "club" to which we identified with a sense of pride.

What has happened? Is it simply a symptom of the attitude of the "Millenials" that belonging to a dynamic professional organization is no longer considered a privilege and honor?

Was the article perhaps biased, simply because it represented the opinions of a group of only nine individuals who attended the Houston YPLS meeting?

I wonder if other "old timers" like me have offered similar comments.

I never write notes like this, but just felt compelled to do so at this time. I enjoy the EXPLORER. Keep up the good work. Thanks for letting me bend your ear for a moment.

Michael Price
Seattle, Wash.

* * *

We are writing to respectfully correct a misstatement about award nominations in the May 2016 Explorer article about PROWESS.

We are proud to be involved in nominating female award recipients. In particular, one of our nominations this year has resulted in Dr. Brenda L. Kirkland becoming the first woman to receive the Grover E. Murray Memorial Distinguished Educator Award.

Gretchen M. Gillis and
Timothy N. Diggs

(Editor's Note: In last month's EXPLORER article, "PROWESS Committee Empowers Women Geoscientists," Barbara Tillotson mentioned that there were no women nominated for AAPG honors and awards in 2016. That was an out of date comment, and in fact there are multiple women who will be honored for their work in the oil and gas industry. For a list of people who will be receiving awards at the 2016 ACE in Calgary, please refer to the following link: aapg.to/Jy2m8)

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AAPG Foundation's Teacher of the Year

Bringing Geoscience to Life

By ANGELA EVANS, EXPLORER Correspondent

This year's AAPG Foundation's Teacher of the Year honoree admits science wasn't always her first love.

"Early in school, I did not care for science at all," confessed Alice Waterbury, a teacher at St. Mary's School in Mount Carmel, Ill. "It wasn't until high school that my love began to grow; and it was because science became more hands on, more about exploring and figuring things out in a real way."

That passion has grown into a labor of love spanning four decades. She currently teaches the entire fourth-grade class and one fifth-grade science course.

Alice Waterbury has been recognized for her innovative approaches to teaching.

Finding Her Niche

Waterbury said she feels an affinity for this age group in particular.

"I taught third grade for 16 years, then I went down to second grade," she said. "That wasn't for me."

She settled in with fourth grade and has been working with this age group since.

"Fourth graders can explore on their own, you can have more discussions and they have the ability to research," said Waterbury.

Though her personal preference is to teach fourth and fifth grade, she thinks science shouldn't be ignored in the curriculum for younger students.

"Anything you help them develop young is going to take hold and they're going to appreciate it so much more later," said Waterbury. "You can read a book and find out information, but a hands-on approach (of science) at an early age will create a love and foster a basic understanding of why it's important."

In many ways, Waterbury feels the earth sciences are the perfect pairing for the needs of today's children.

"The students of today have to be busy, have to be interactive. That's the group of children we are raising," she said. "The more hands-on things that we can do, the more group activities, the better."

Reflecting on her own lack of interest in science when she was younger, she can appreciate what today's children require in a modern classroom.

"Instead of sitting down and reading – and sometimes you need to sit down and read about things – you have to put it into practice."

Hands-on Approach

Several years ago, she began experimenting with that hands-on approach by growing plants in the classroom with her students. Slowly, the simple science of growing plants morphed into a more interactive exploration of subjects like geology and, specifically, the oil and gas industry.

Simple experiments like mixing layers of oil and water together to observe how they separate is an exciting visual experiment for her students, she said.

"At the fourth grade they are amazed by everything!"

Also in Waterbury's class, students get to "create fossils." They watch crystals bloom into existence and build simulations of the substructure of soil that show where the oil "lives."

"I love being able to explain to kids about how they get oil out of the ground, so we've been trying to build a derrick using straws and paper clips," Waterbury said. "It hasn't been successful yet but my fifth-graders want to try it again."

Hands-on interaction – because of the children's age and because of how their world is shaped by real-time technology – is a natural fit for teaching geosciences.

"They don't want to sit there and watch you perform an experiment. They want to do it," she said.

Another experiment they love is one in which they make natural gas using hard-boiled eggs for animal matter and lettuce for plant matter, which they measure out using a balance scale before placing in a plastic bottle.

"They use a graduated cylinder to measure the amount of pond water to carefully pour down the side of the bottle and not just directly onto the sand. The pond water represents the ocean. Finally,

Continued on next page

Continued from previous page

they stretch a balloon across the top and set in a warm place to observe what happens," said Waterbury.

"We discuss each of these steps and journal and draw what they have done and what they hypothesize will happen. After a few days, we look for physical and chemical changes," she added.

Creating gasses is easily one of the students' most memorable experiments of the year.

"When the room comes in and it smells, it's like 'yeah, that's the gas we're making over there,'" laughed Waterbury. "But the best part is to see the way the kids are enthused about what they are doing."

And, the hands-on experiments are especially important because of how much technology is infused into every element of children's lives today, Waterbury pointed out.

"They are very into the information world we live in. Our kids are so inquisitive and have all these resources. You constantly have to stay one step ahead of them," Waterbury said. "But science is always changing too, so we have to move with it and the students have to move with it if we are going to keep our nation running."

A Community Built on Oil and Gas

The oil and gas industry has been a major component of Mount Carmel's local economy over the years, and that influence persists today.

"We have oil wells all around us here," said Waterbury. "There are even some pump jacks right here in town. So when we're talking about the drilling, it's easy to make it relevant to them."

Many of the students live on large farm operations in Mount Carmel, and they understand they will be the stewards of the land one day.

"It's easier to personalize the lesson, because if a drilling company comes in, their family doesn't want the land destroyed," said Waterbury. "All the drilling companies and geologists have to be responsible about what they're doing."

Waterbury emphasizes to her students that the resources under the ground are important, but the land itself is just as important, which she demonstrates with a seemingly simple experiment.

"We mine chocolate chips from cookies and we talk about land damages," she said.

The cookie experiment demonstrates profit and loss: the chocolate chips represent profit, but each crumble created from the extraction process illustrates the damages for which they would have to pay.

"It's great when students take ownership of their role in protecting the land and resources. They think 'This is my soil, my parents' livelihood. We have to protect it,'" said Waterbury.

The Environment of a Classroom

Alice Wirth, principal of St. Mary's, has had the unique opportunity to see Waterbury in action for 27 years.

"She excels in bringing her science and math classes to life," said Wirth. "The students are imaginative, creative, and not afraid to ask questions and seek answers in Mrs. Waterbury's safe and respectful learning atmosphere."

Wirth also praised Waterbury for "encouraging students to reach beyond their comfort zones."

For her years of dedication and her passion for instilling in her students a love for the natural world and their role within it, the AAPG Foundation chose Waterbury as 2016's Teacher of the Year.

When Waterbury was notified of her award, she had a unique reaction.

"I was shocked," Waterbury exclaimed. "There have got to be a lot of teachers out there who do this and want their students to excel."

Though she is thrilled to be recognized, Waterbury said she feels the teaching profession in general should be honored and appreciated for all they do. And like most teachers, she considers what she does to be much more than just a job.

"I'm always thinking about my kids and about what I can do to stoke their enthusiasm," she said. "And yes, I refer to them as my kids; because they are my kids."

The honor from the AAPG Foundation comes with a $6,000 prize to be split between Waterbury and St. Mary's School. She will also receive an expense-paid trip to the AAPG Annual Convention and Exhibition in Calgary where she will be presented her award at the All-Convention Luncheon.

Activity

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organize a joint technical talk on full tensor gravity by Colm Murphy for students and YPs.

Lately, the AAPG YP KL Chapter has been very active. We recently organized two technical talks given by Howard Johnson and Bala Kunjan during November and December 2015, respectively. Howard Johnson from Imperial College, London, gave a very interesting talk on "Plio-Pleistocene fluvial depositional systems in SE Asia" and Bala Kunjan from Melbourne touched on the hot topic of "Addressing the concerns of young professionals and students during the ups and downs of the industry."

Both technical talks were tremendously well-attended, with more than 50 participants each, thanks in part to the use of social media.

Back in October, we began to reach out to geoscience students and YPs using our brand new Facebook page to post information on upcoming events. Since students and YPs are very active users of social media, this allows us to get in touch with more potential participants who are not on our original mailing list, and to spread the word to those who are not yet AAPG members.

To date, we have received a lot of positive feedback from event participants regarding our Facebook posts. In addition, we already have our lineup of speakers invited for monthly technical talks through February 2017. We welcome both potential speakers and out-of-town YPs to participate in these events.

My participation in AAPG has been an excellent learning experience. The AAPG YP KL Chapter continues to grow and has been successful thanks in part to constant support from the AAPG Young Professionals Committee and the Asia Pacific Region. Hopefully, sharing my experience and encounters with AAPG will encourage more geoscience students and YPs to join the Association and realize the benefits of staying AAPG members throughout their careers.

Donald O'Nesky Wins Chairman's Award

By TAMRA CAMBPELL, AAPG Administration Team

It is with great enthusiasm that the AAPG Foundation announces that Donald A. O'Nesky is the 2016 Chairman's Award recipient.

This award is given by the AAPG Foundation in recognition of persons who have made extraordinary contributions (monetary or service) to the AAPG Foundation while calling attention to the role and value of the Foundation.

O'Nesky has certainly met the qualifications for this award, not only through his service, but through his monetary donations as well.

Don O'Nesky and his wife Mary.

O'Nesky's Career with AAPG

O'Nesky joined AAPG staff in 1978 after retiring from the U.S. Air Force as a lieutenant colonel. He was appointed deputy executive director of the Association and the Foundation in 1985, and in 1997 was appointed executive director of the Foundation, in which capacity he served until 1999.

During this time, O'Nesky saw the Foundation through the process of becoming an Oklahoma non-profit corporation, and he oversaw the establishment of the Members of the Corporation.

O'Nesky joined the Trustee Associates, the major donor group of the AAPG Foundation, taking an active role in the organization by regularly attending the meetings and serving as vice-chair in 2009 and chairman in 2012. He continues to serve the Foundation as a part of the Members of the Corporation and as a member of the Fundraising Advisory Committee.

While O'Nesky never had a formal course in geology, the opinion of his friends and colleagues is that he has earned "a degree by association" and in 2002, they established the Donald A. and Mary O'Nesky Named Grant, as part of the Foundation Grants-in-Aid Program. This fund annually provides grants to graduate students whose thesis research has application to the search for and development of petroleum and energy-mineral resources, and/or to related environmental geology issues for their research projects.

Throughout the years, anyone who has stopped by the Foundation booth at the AAPG Annual Convention and Exhibition has likely spoken with O'Nesky, who is ever present and enjoys sharing the benefits of supporting the geosciences through the Foundation programs.

Military Veterans Scholarship Program

When the Foundation established its newest program, the Military Veterans Scholarship Program, it turned to O'Nesky – a graduate of the U.S. Air Force's prestigious Air Command and Staff College and the Industrial College of the Armed Forces, as well as a 2000 inductee into "Who's Who in the Military in Oklahoma" – to assist with the development of the program.

O'Nesky's background provided him the knowledge and leadership skills to make the program a reality. He now serves as the chairman of the Military Veterans Scholarship Committee, which oversees the selection of the scholarship recipients on an annual basis.

O'Nesky currently resides with his wife of 55 years, Mary, in Venice, Florida. The AAPG Foundation will present O'Nesky with his award at the 39th Annual Trustee Associates Meeting in Hawaii this October.

For more information on the Foundation, Trustee Associates and Grants-in-Aid program, visit foundation.aapg.org.

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

Foundation Contributions for April 2016

General Fund
Talal K. Al-Hosni
Syed M. Ali
Scott W. Allison
Kathy L. Aulstead
Seymour R. Baker
Jack R. Banttari
Kurt Bayer
Monty S. Beharry
Mark E. Bengtson
John W. Bishop
John R. Bitler
Robert E. Blaik
Jon F. Blickwede
Hege M. N. Bolas
Philip Braithwaite
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Mike Brown
Timothy S. Brown
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John O. D. Byrd
David C. Caulfield
Arthur L. Champine
Yves M. R. Chevalier
Chevron Matching Employee Fund
Matching gift given by David Fugitt
Robert E. Childress
James J. Chodzko
Steven R. Clawson
Gareth E. Cross
Anna M. Cruse
M. A. Custer
Gerhard Diephuis
Timothy Diggs
Calin Dragoie
James A. Drahovzal
Harvey R. Duchene
Subhasis Dutta
Paul J. English
Miguel F. Etayo
Bruce A. Falkenstein
Michael T. Farley
Barry M. Faulkner
Michael D. Fawcett
David R. Feineman
Lucas J. Fidler
Jacek B. Filbrandt
D. Ramsey Fisher
Laura S. Foulk
David S. Fugitt
Antonio J. V. Garcia
Beatriz Garcia-Fresca
Matthew D. Gentry
Kenneth C. Gester
Steven L. Getz
Kathryn A. Gibbons
Jerome E. Glass
Craig L. N. Glassinger
Steve K. Grimsley
Richard H. Groshong Jr.
Claudia J. Hackbarth
John K. Hall
Michael A. Hall
Judith L. Hannah
Dexter L. Harmon
John O. Hastings Jr.
David R. Henderson
Joanne E. Henson
Alan P. Heward
John W. Hidore
Debra K. Higley
Douglas O. Hill
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Gary J. Hoose
Warren J. Hudson
Tanya L. Inks
James W. Jennings Jr.
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James C. Jones II
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Fiona E. Kilbride
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Sayi P. Malineni
William V. Maloney
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David J. McBride
Andrew McCarthy
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James D. McColgin
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Douglas F. Minken
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Thomas H. Neel
Kerry D. Newell
William H. Nichols
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Valerie K. Walker
Kane C. Weiner
Bonnie R. Weise
Michael J. P. Welland
Stanley E. Williams
Paul D. Wilson
David F. Work

Awards Fund
Jan E. Van Hinte Sr.
Baoming Zheng

Teacher of the Year Award
Amanda M. Veazey
Steven J. Williams

Digital Products Fund
Bryn Mawr College
Arthur W. Leibold
Colorado School of Mines
Kim R. Butler
Indiana University, Bloomington
Kate H. Baker
Arthur W. Leibold
Kansas State University
Samuel H. Peppiatt
Michigan State University
Joao C. A. Figueira
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University of Southern CA, Los Angeles
Peter F. Cowell
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Distinguished Lecture Fund
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Dean A. McGee Distinguished Lecture Fund
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Education Fund
Jennifer L. Burton
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Grant from Donald W. and Susan E. Lewis Fund at Fidelity Charitable in honor of Larry Funkhouser
Susan S. Nash
Elwin M. Peacock
In memory of Charles Weiner

Grants-in-Aid Fund
Melody A. Bechberger
Philip R. Brown
Piotr K. Misiarz
Elwin M. Peacock
In memory of Cyrus Strong V
Christopher A. Rautman
James D. Suydam

Barrett Family Named Grant
Amanda L. Kohn

Bernold M. "Bruno" Hanson Memorial Environmental Grant
Margaret A. C. Rogers

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Timothy F. Lawton
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Michael S. Johnson Named Grant
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Norman H. Foster Memorial Grant
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Kenneth C. Gester

Richard W. Beardsley Named Grant
Peter MacKenzie

Robert K. Goldhammer Memorial Grant
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Thomas A. Hendricks Memorial Grant
John W. Mason

Weimer Family Named Grant
Laura S. Foulk

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James A. Hartman Student Leadership Summit Fund
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Military Veterans Scholarship Fund
D. Gregory Cable
Anonymous
James J. Chodzko
M. A. Custer
James A. Gibbs
In memory of Charles Weiner
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Harry William Mueller III
Noble Energy Matching Gift Program
William S. Peirce
Sarah Springer and Rusty Riese

John F. Bookout Jr. Military Veterans Scholarship Fund
Jerry G. McCaskill Jr.
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Named Public Service Fund
Jack C. and Catherine I. Threet Endowed Fund for the Advancement of Petroleum Geology
Gregory M. Larberg
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The Gibbs Family Endowment Fund
James A. Gibbs
Robert B. Peacock

E.F. Reid Scouting Fund
Terri Duncan
Ronald L. Hart
Bryan Haws
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Visiting Geoscientist Fund
Herbert G. Martin
Jon H. Pedersen

Policy Watch
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inadequacies in SPR distribution infrastructure. In addition, many of the facilities are reaching the end of their design life.

The distribution infrastructure was designed when SPR needed to move crude to refineries in the U.S. interior. Today, refineries in the Midwest are well supplied by Bakken and Canadian oil. However, the SPR now needs more marine distribution capability to supply coastal refineries.

The 2015 Quadrennial Energy Review, "Transforming U.S. Energy Infrastructure in a Time of Rapid Change," details the SPR deficiencies and estimates the upgrades and maintenance would cost $1.5–$2 billion.

Congress has seemed especially interested recently in drawing down SPR oil to pay for other government programs. However, Murkowski and others have opposed using the SPR like a piggy bank and have advocated for needed repairs and upgrades. SB 2012 passed the Senate in April and would require that the Energy Department conduct a full assessment of the reserve's effectiveness and role in national security. Such congressionally-mandated studies are often the basis for future appropriations.

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 classification and anniversary date are listed.

IN MEMORY

Myron (Mike) Horn


HORN

Myron (Mike) Horn was an influential part of AAPG and Datapages. He passed away March 26 at the age of 86.

He became a member of AAPG in the 1950s and served in many different capacities for the duration of his membership.

Horn was chair of the Research Committee and co-chaired the Geothermal Survey of North America.

During his tenure as AAPG Editor, AAPG published more pages than in any other comparable period of time.

He received the AAPG Distinguished Service Award in 1986, Certificate of Merit in 1993, Honorary Membership in 1997 and Special Award in 2011.

Horn also served as an invaluable member of the editorial board of Search and Discovery, was a contributor, and its most frequent viewer and examiner.

As a consultant, he prepared research reports and databases on a number of subjects, including burial history, source rocks, basin history, giant fields, stratigraphic traps and fractured reservoirs.

He worked tirelessly as a volunteer with AAPG/Datapages on several important projects, centered on his research as a consultant and presented as databases.

His most recent project, in conjunction with Peter Wigley of the UK, was the spatial location and cataloging of more than 10,000 published seismic images for inclusion, along with his other databases, in the current DEO-GIS project.

These databases have involved thousands of hours of his time, utilizing his ingenuity, innovation and intellectual insight.

Horn received a bachelor's degree from the University of Colorado in 1952 and then went to work for the United States Navy.

He later received a master's degree followed by a doctorate from Rice University.

In 1960, Horn joined the Pure Oil Company research lab as research geophysicist where he developed the first comprehensive computer system for log analysis.

In 1964, when Pure merged with Union Oil, Horn joined Cities Service Research.

In 1970, he became Director of Exploration and Production Research.

His staff was involved in a wide range of geoscientific research, and his generous policy in regard to publication, professional involvement and attendance at technical meetings not only served Cities' recruitment well, but also the profession and AAPG, in particular.

He then held two management positions in Occidental operations before retiring to begin his career as a consultant.

Charles Weiner

WEINER

AAPG Emeritus member Charles Weiner passed away at the age of 92.

Charles became a member of AAPG in 1952. In the years that followed, he was named as a Chairman and Trustee Associate.

In his career, Charles was a founding partner of the Texas Crude Oil Company. He was involved with the discovery of a billion barrels of oil in eight countries. At the age of 82, he created Westerly Exploration.

He passed away April 6, 2016.

Charles Thomas Austin, 82
Houston, Texas, May 24, 2015
Joseph Buford Carl, 85
Decatur, Ala., July 14, 2015
Arthur Leo Evans, 91
Calgary, Alberta, Feb. 20, 2016
Charles Ray Gober, 80
Throckmorton, Texas, March 21, 2016
Donald R. Hembre, 83
Littleton, Colo., March 7, 2016
Glen Dean Hollensbe, 54
Mount Vernon, Ill., April 23, 2015
Perry Gregory Holloway, 88
Shreveport, La., April 15, 2015
Myron K. Horn, 86
Tulsa, Okla., March 26, 2016
Thomas Edward Lains, 67
Oklahoma City, Okla., Sept. 28, 2015
Keith Floyd Oles, 94
Colorado Springs, Colo., Jan. 28, 2016
Harry Ptasynski, 87
Casper, Wyo., Dec. 19, 2013
Jaser Nicola Rafidi, 88
Metairie, La., Aug.19, 2015
Cyrus Strong, 83
Houston, Texas, April 7, 2016
Harry Vernon Tucei, 86
Tulsa, Okla., Sept. 18, 2014
Charles Weiner, 92
Houston, Texas, April 6, 2016
John William Wood, 85
Dripping Springs, Texas, Feb. 13, 2015
Delmar G. Westover, 80
Edmond, Okla., Aug. 2, 2015

AAPG Seeks Your Officer Nominations

Aapg would like your assistance and advice in a very important process. The AAPG Nominating Committee, a sub-committee of the Advisory Council, is responsible for recommending a list of nominees for AAPG office to the Executive Committee for its approval each year. And to help us compile the best list possible, we're seeking your input and suggestions as to potential AAPG officer candidates.

The deadline for nominations is Aug. 1, 2016. Nominations received after the date will be held for next year's officer nominations.

The nominating committee will consider candidates for the following positions:

- President-Elect: (one-year term: 2017-18; President 2018-19)
- Vice President Regions: (two-year term: 2017-19)
- Secretary: (two-year term: 2017-19)

Consider the following before submitting a nomination:

The person making the nomination must acquire the nominee's permission to submit his/her name and determine if he/she is willing to serve if elected.

The potential nominee should be informed of the level of commitment the office requires.

It should be made clear to the person being nominated that a nomination does not ensure candidacy.

Review the complete Charge to Nominator online for a comprehensive list of what is required to make a nomination.

There are additional provisions in the Bylaws (Article II, Sections 14 and 15) advising limitations on candidacy. If you plan to make a nomination, please review the Bylaws.

We ask that you please submit your recommendations on the form(s) provided on the AAPG website. These forms are intended to bring greater uniformity and consistency to the nomination process and will ease the task of submitting nominations.

While completing the online forms is the most efficient method, you can also download the forms and email or fax to (918) 560-2626 by Aug. 1, 2016.

DEG
from page 42

Balancing Demands

As I close out this year as president of the Division of Environmental Geosciences I am honored by the support and work of the great team of the Executive Committee: Vice President Bruce Smith, Secretary-Treasurer Sean Kimiagar, Editor Michele Cooney, President-Elect Tim Murin and Past President Jeffrey Paine.

I also see great challenges ahead of us as an industry with growing demands for global energy, yet with increased pressure to reduce our environmental impact. That is precisely why AAPG created the DEG and why this year we have taken the steps to recharge and revitalize the DEG Advisory Board with representatives from every AAPG Section and Region, with specialists and members with a passion for the environment.

You, the members, along with the Advisory Board and the incoming Executive Committee can make a difference. You can inform the public. You can work to secure the energy of tomorrow. And most importantly you can work to make sure that it is generated in a safe and environmentally sound manner.

DEG Awards
from page 42

seismic models and extracted attributes, Farnsworth, Texas."

- The Best Poster at the 2015 Annual Convention goes to S. Flewelling, M. Sharma, D. Merrill, A. Lewis and J. Rominger for "Evaluation of human health risks via drinking water for spills of hydraulic fracturing fluids."
- The President's Certificate for Excellence in Presentation (Poster) goes to A.W. Laake and Z. Wolfe for "Geohazards in Green Canyon, Gulf of Mexico."
- The DEG Past-Presidents Award is given to Jeffrey Paine for his service in 2014-2015.

The DEG Certificate of Merit is awarded to:

- Doug Peters for his outstanding efforts in the coordination of the technical program for the 2015 ACE and the compilation of the technical judging scores to award the Best Paper and Best Poster Awards.
- John Hughes for his global efforts in the coordination of the technical program for the 2015 Melbourne ICE.

DIRECTOR'S CORNER

Three Fundamental Constants of the Energy Industry

By DAVID CURTISS

Over the past months I've written frequently about strategies each of us can use to not only survive the current downturn in oil and natural gas prices, but discover ways to thrive.

That may seem like a tall order, particularly if you've recently experienced a layoff, or even if you've kept your job while your colleagues and friends did not. But my fundamental belief is that the ingenuity and drive that led you into this profession are the same characteristics that will propel you into the next phase of your career.

One theme I keep revisiting is that of searching for ways to view your current situation from different vantage points: we need to avoid linear thinking and expand our perspectives to identify opportunities to add value to our employers, industry and profession.

After all, that's what we get paid to do.

But broadening our thinking doesn't just happen.

I'm constantly looking for ways to create new perspectives, and it often comes down to asking questions – questions I haven't previously considered.

Here's one for you:

"I very frequently get the question: 'What's going to change in the next 10 years?' And that is a very interesting question; it's a very common one. I almost never get the question: 'What's not going to change in the next 10 years?'"

That quote is from Jeff Bezos, founder and CEO of Amazon, from a 2012 video interview.

Bezos and Amazon are disrupters.

They've disrupted entire industries, beginning with bookstores and electronic books to large retailers selling everything from furniture to groceries. Leveraging technology, aggressive marketing and razor-thin margins – they have changed the ways consumers purchase and receive goods and services.


CURTISS

What aspects of petroleum geology and our industry will remain the same in the next 10 years? How might you and I use this knowledge to add value and position ourselves for a successful future?

"And I submit to you that that second question is actually the more important of the two, Bezos continues, because you can build a business strategy around the things that are stable in time."

Fundamental Constants of the Industry

Amidst all the changes our industry is experiencing, from unconventional resources to low commodity prices and the great crew change, there may be a useful perspective here that we can adopt for ourselves.

What aspects of petroleum geology and our industry will remain the same in the next 10 years? How might you and I use this knowledge to add value and position ourselves for a successful future?

I've been pondering this question, and here are three conclusions I've come up with:

- We will still need energy in 10 years and the majority of it will come from fossil fuels, particularly oil and natural gas.

In fact, the latest reference case by the U.S. Energy Information Administration in the early release of its 2016 Annual Energy Outlook indicates that in 2040, two-thirds of U.S. energy consumption will come from petroleum and hydrocarbon liquids and natural gas – two-thirds!

It's true that the energy mix is shifting and the reference case supports that. It shows petroleum use for transportation dropping by 10 percent due (mostly) to efficiency gains, and renewables are growing at a rapid clip. Circumstances are changing and that change is accelerating. But humanity will remain reliant on fossil fuels as a significant source of energy because the global energy system is enormous, on a scale that most people have difficulty fathoming. If we want the lights to stay on at an affordable price, we're going to need these fuels.

- A second element that will not change is fundamental earth processes.

Ours is an evolving science, and there is still much to learn and discover about how earth systems work, but the fundamentals are rooted in physics and are immutable. It's our understanding of these processes that changes.

My background is in petroleum systems and basin modeling. As a graduate student, when most geologists would ask about the reservoir, I was asking about the source rock. Ten years later, everyone was asking about the source rock that, in the case of some unconventional petroleum systems, is the reservoir.

- Which leads me to a third aspect of the industry that won't change in the next 10 years: the need for ingenuity and innovation to continue finding and developing these resources to fuel the planet.

The oil and natural gas contained within these unconventional petroleum systems was there all along – we even knew it was there. But it was ingenuity and innovation, both technological and business, which enabled producers to develop these resources and unleash the unconventional energy revolution.

The need for oil and natural gas, the opportunity for new understanding and new discoveries about how the earth works, and a continuing need for creativity and ingenuity are three circumstances that won't change over the next 10 years.

How might you and I position ourselves to use these insights to prepare for the future?

What other aspects won't be changing?

Reach out to me on Twitter (@DavidKCurtiss) and share your thoughts.

DIVISIONS REPORT: DEG

Perceptions and Reality of Energy Resources

By JEFFREY B. ALDRICH, DEG President

Quick, name three nuclear power plants. What word describes them?

If you are like most of the North American or European public, the names that come to mind would be "Fukushima," "Chernobyl" and maybe "Three Mile Island."

According to Gallup, the most common term used to describe nuclear energy is "dangerous."

Ask the same public to name three oil or gas fields and the most common terms associated with them might be "Macondo," "Exxon Valdez" and "Gasland."

The public, in the developed world, focuses on only the worst cases from three out of 441 nuclear power plants, of which only one of those three, Chernobyl, caused any deaths.

Currently, nuclear facilities produce more than 10 percent of the global energy mix and have been doing so safely for decades.

Likewise, there are more than 932 giant oil and gas fields and countless total fields, yet the public perception is focused on rare disasters and celluloid fantasy.

Also, according to Gallup, the U.S. oil and gas industry, thanks to low gasoline prices, is approaching an all-time high public approval rating – a dismal 34 percent, which is only slightly above Congress at 31 percent.


ALDRICH

When you are facing a daily challenge of survival, the lowest-cost form of energy is often the only viable solution.

A More Global Perspective

Now I would like to turn your attention to the other 82 percent of the world's population that was not surveyed – the just over 6 billion people who do not live in a developed country.

Well over half of this population still has no access to reliable power, which is far more than the population that uses three quarters of the power generated today (that population being us). Therefore, if you are reading this, you are part of the top 18 percent of the world that uses about 55 percent of all the energy generated globally each year.

If the bottom 30 percent were asked about nuclear or oil or gas energy, they would look at it against the alternatives of charcoal or animal dung. They would ask you first, "How much does it cost?" then, "How reliable is it?" and "How much will it improve my life?"

When you are facing a daily challenge of survival, the lowest-cost form of energy is often the only viable solution.

At the COP21 accords in Paris last year, India committed to reducing future emissions, but they have also set higher production targets for coal, growing annual coal production from 550 million tons in 2016 to 1.5 billion tons by 2022. India is also signing a $4.5 billion gas pipeline deal with Iran to bring 1,112 MMSCFD to India.

Also, China is already well along on the construction of the Power of Siberia pipeline bringing 1,029 BCF per year to China.

Energy security has a much different feel if energy is less than 5 percent of your budget and you don't even think about it not being there, as in the United States. If the cost of energy is equal to your food costs and it takes a significant amount of your time to gather your energy, then access to secure, cheap energy has much more value to you.

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DEG 2016 Honors and Awards

AAPG's Division of Environmental Geosciences (DEG) is pleased to announce the recipients of its 2016 awards for service to the organization and for presentations (oral and poster) given at the 2015 Annual Convention and Exhibition (ACE) in Denver.

- The Bernold M. "Bruno" Hanson Excellence of Presentation Award for Best Paper at the 2015 Annual Convention goes to J. Moortgat and H.R. Brourman for "Viscous and gravitational fingering in EOR and carbon sequestration."

- The President's Certificate for Excellence in Presentation (Oral) goes to A.C. Hutton and R.S. Balch for "Geologic modeling of an active CO2 EOR and carbon storage project using 3-D

See DEG Awards, page 41