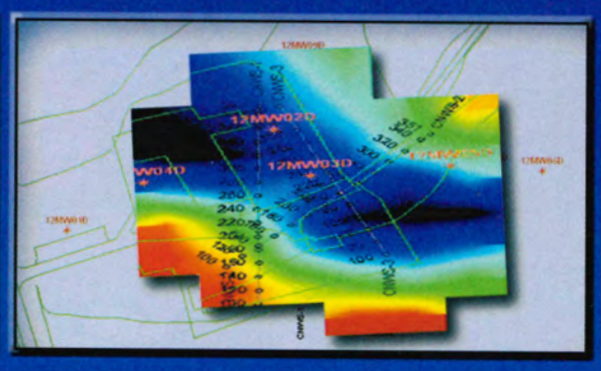
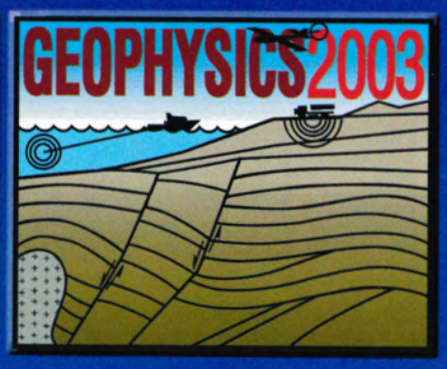
AAPG AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, AN INTERNATIONAL ORGANIZATION

EXPLORER

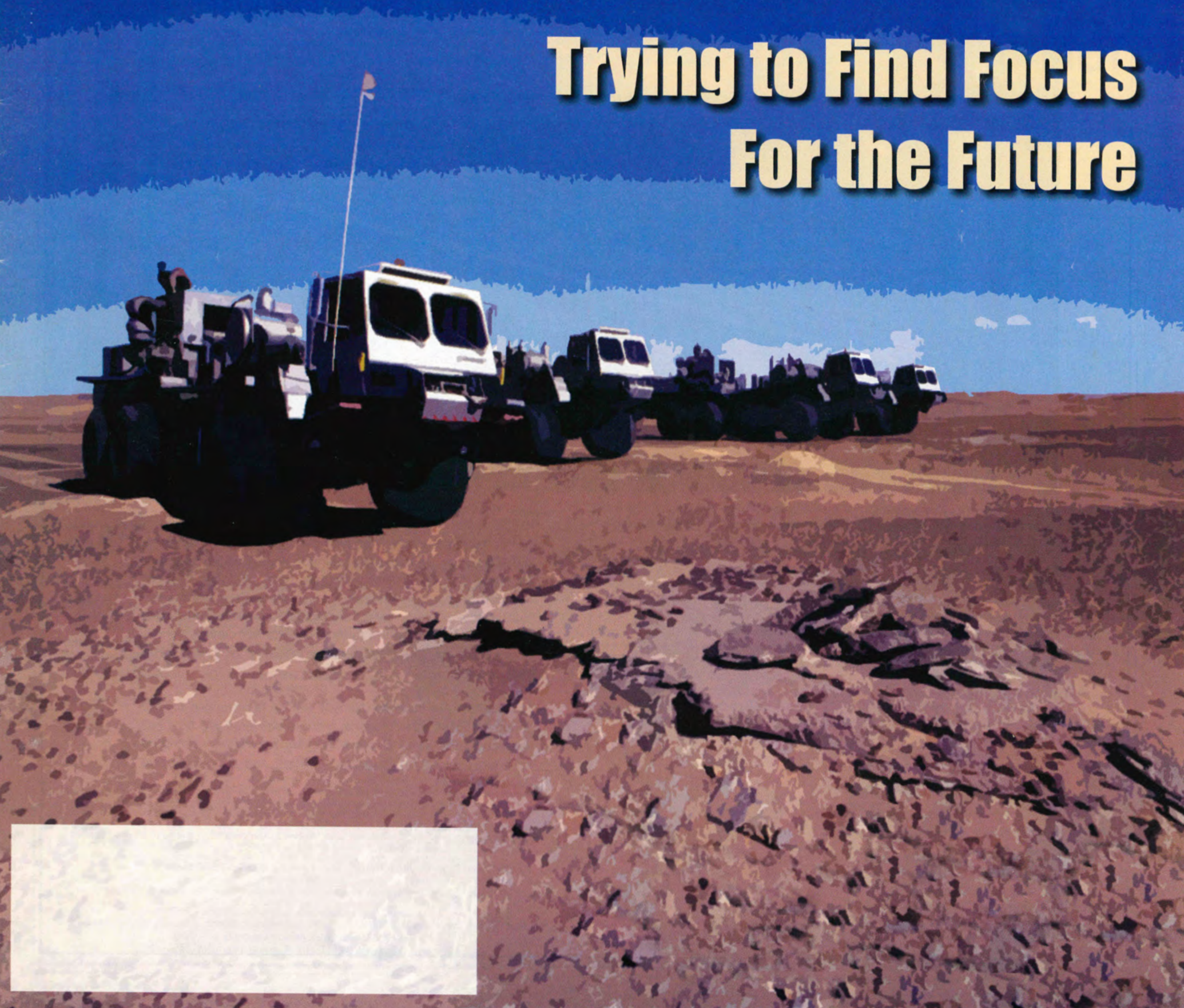
MARCH 2003





The Good, The Bad, The Ugly

Trying to Find Focus For the Future



Vol. 24, No. 3
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AAPG EXPLORER

On the cover: The road has been bumpy lately for the geophysical industry, but even the roughest roads can be overcome. This month's EXPLORER takes a look at the industry's problems, triumphs and potential for recovery and success – including a glimpse of the next generation of technological advances. Stories start on page 8. Cover design by Rusty Johnson. Photos courtesy of WesternGeco, Tom Temples (see page 18) and Fairfield Industries.

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Photo courtesy of Utah Travel Council

Are you getting into a Utah state of mind? The magnificent geologic splendor that can be found in Arches National Park (above) is a reminder of the geologic beauty that surrounds the site of this year's AAPG Annual Meeting, set May 11-14 in Salt Lake City. The pre-registration deadline is April 8. For more information, see the story on page 6, or go online to the Web site at www.aapg.org.

PRESIDENT'S COLUMN

Changing Image Not Impossible Mission

By DAN L. SMITH

Changing our image is not an impossible task. Difficult? Yes, especially when you consider the influences and attitudes that brought us to today:

❒ *"The Oil Business is cannibalism – the big men eat the little men. You find anyone successful in the oil business, and he's got a guy somewhere who wants to knife him. I think every oil person is a J.R. Ewing."* – A Houston citizen.

❒ The image of the Texas oilman as a crude, blustery, high roller was magnified in the 1950s book and movie "Giant," in which James Dean played oilman Jett Rink.

❒ Once upon a time the television series "Dallas" depicted J.R. Ewing as public enemy number one. The popular series depicted a bunch of egotistical high rollers out to cheat people.

❒ "Dallas" was followed by "Dynasty," which continued to project a very negative, false, distorted image of the industry.

❒ First there was the *Exxon Valdez*. Now there is the "old, rickety" oil tanker *Prestige*, which cracked and leaked about seven million gallons of oil along the coast of Spain. Spillage is a major public image problem. The public doesn't understand that these disasters have nothing to do with geoscientists and exploration.

❒ *"An MBA sitting in front of a computer trading natural gas and electricity has replaced the grizzled roughneck in recent years as the icon of the energy industry. There is a basic distrust of pricing fundamentals, causing a flight of investment capital from the oil industry."* – The Houston Chronicle.

❒ *"Offshore drilling is an inherently dirty business. Even the newest technology would still significantly pollute and forever despoil the only remaining pristine waters left in the Gulf of Mexico."* – Editorial in a recent Florida newspaper.

❒ *"Job opportunities are poor; career options are limited; oil companies continuously lay off personnel; earth science students are nerds, unaware of what happens in society, do not care about their appearance and are idealistic."* – A public survey by Utrecht University in the Netherlands.

❒ *"The current gasoline price run-up has reinforced the image of the energy industry as a villain. This looks uncomfortably close to price gouging."* – The Houston Chronicle.

Well, I'm getting tired of this, and you probably are too, so I'll stop with my favorite: *"You rock people are really weird."* – Taxi driver comment to me, upon learning of my passion.

* * *

Let's face it. The oil industry has a very poor public image, and geoscientists have NO public image – except that they collect rocks and fossils. Reality is very different from perception.

How can we expect policy makers to understand our issues when our neighbors haven't the foggiest idea of what's going on? We are not a beloved industry in the public eyes (see page 32). In all the concern over the industries such as airlines, agriculture, auto and steel, there is little recognition of the importance of the petroleum industry to security and to our way of life.

Some have said that changing our image is an impossible task. My definition of impossible is: *That which no one can do until someone does it.*

So, what is AAPG doing?

Significant progress has been made

See **President's Column**, page 6

GARDEN BANKS GREEN CANYON

"In-Depth" Spec

from the 3D Specialists

Phase GC I	7200m streamer PSTM	91 blocks	Available
Phase GC II	7200m streamer PSTM	78 blocks	Available
Phase GC III	7200m streamer PSTM	38 blocks	Available
Phase GC IV	8100m streamer Kirchhoff PSTM	161 blocks	Available
Phase GC V	8100m streamer Kirchhoff PSTM	88 blocks	Available
Phase GC-AV	7200m streamer Kirchhoff PSTM	73 blocks	Available
Phase GB-HR	9000m streamer Kirchhoff PSTM 25m X-line!	317 blocks	In progress
Phase MC-AV	8100m streamer Kirchhoff PSTM	170 blocks	90 blocks available
Phase A	3D PSDM 500m x 500m grid	101 blocks	Available
Phase B	3D PSDM 500m x 500m grid	132 blocks	In progress

President's Column

from page 3

by the Public Outreach Committee and other AAPG committees on the following projects. Details can be seen on our Web site (www.aapg.org).

✓ A media workshop was conducted at the February AAPG Leadership Conference in Tulsa to empower and instruct our leaders on how to reach the media. As Victor Yannacone said, "The salvation of society lies in education – not education in the schools, but education through the mass media, which are now shaping the hopes, aspirations and moral judgment of this and the next generation."

✓ Develop a cadre of talented geoscience writers and speakers who easily communicate energy issues to the non-technical public and provide them with materials. This will include a rapid response team that will meet threats to rational science wherever they occur.

✓ AAPG's Visiting Geologists Program is expanding rapidly to reach as many university students and professors as possible – to tell them the truth about energy exploration.

✓ Develop a graphics collection and prepare programs for members to use in public presentations. See the Slide Bank area on the AAPG Web site (January EXPLORER).

✓ Identify and document examples of outstanding oil and gas exploration and development operations. Demonstrate sound and modern E&P practices to the public and the media.

✓ Publish a colorful and information-packed booklet for the public of how modern petroleum operations are conducted without damaging the environment – based on the recent AAPG summit in Washington, D.C., "Energy and Environment: A Partnership that Works."

✓ Develop materials that meet teacher needs – coordinating with AAPG's Youth Education Activities Committee. Their Web site (www.aapg.org/k12resources/) features a special page called "Geo-Resources" for teachers and volunteers to use for finding teachers aids. Our sister societies and various state organizations are contributing.

✓ Develop and implement Earth Science Week activities and programs, and to become involved with Earth Day. The American Geological Institute, with strong financial support from AAPG and the AAPG Foundation, provides Earth Science Week packets full of teaching materials and activities.

✓ A special "Knowledge Capture Committee" will prepare videotape interviews of geologists, landmen, engineers, refinery employees, drilling contractors and others who may contribute to the history of the industry. We will work with public television with the goal of presenting these to the general public.

✓ The Government Affairs Committee of the Division of Professional Affairs will continue to develop special "White Papers" on major issues affecting our livelihood and the realities of our profession.

* * *

AAPG will lead the effort to tell the truth and overcome unscrupulous, unprincipled and scientifically irrational public perceptions.

We will teach the public that oil and gas doesn't come from big hollow caverns in the dirt. No energy consuming person should be left behind in understanding the basics of where their energy comes from.

Only then will policy makers pay attention to reality and make rational decisions that have long-term positive consequences for society.

Public image is everything.

Dan L. Smith

Deadline Nears for Salt Lake City

It's time to get serious about your plans for Salt Lake City.

The pre-registration deadline for this year's AAPG Annual Meeting is April 8 – and by pre-registering, members can save money while securing slots on the many field trips, short courses and other activities.

This year's meeting will be held May 11-14 at the Salt Palace Convention Center in downtown Salt Lake City. The theme is "Energy – Our Monumental Task."

There are many ways to register: by mail, by fax, by telephone and – the newest way – online at https://commerce.aapg.org.

Salt Lake, of course, was the site of the recent Winter Olympics and is in the heart of a region that features some of the planet's most beautiful and amazing geology.

The huge technical program – including papers, posters, short courses and field trips – is divided into nine themes:

✓ The Business Side of Geology.
✓ Global Energy Resources.
✓ Environmental Issues.
✓ Reservoirs.
✓ Structure and Tectonics.
✓ Technologies – New and Proven.
✓ Stratigraphy, Sedimentology and Paleontology.
✓ Petroleum Systems and Geochemistry.
✓ Student Presentations.

And speaking of the technical program, meeting officials are looking for volunteers to help in the judging of papers and posters – a function that determines the winners of the Matson and Braunstein awards, as well as the SEPM and Division awards.

Volunteers are asked to judge one oral or poster session. For that, participants get to attend the free judges' continental breakfast on Monday, May 12, and also receive a certificate of participation and a logo pin.

To volunteer, simply mark your registration form.

For complete meeting information, follow the meetings link on the AAPG Web site at www.aapg.org.

Some of Damage Self-Inflicted

Seismic Industry in Tough Spot

By LOUISE S. DURHAM
EXPLORER Correspondent

Did you hear the one about the fella with a cell phone for an office and no seismic equipment, jockeying with the big seismic industry's guys for a job?

Before you laugh, get this: He was low bidder by several million dollars on a sizeable data acquisition project. Rubbing salt into an open wound, he then proceeded to call the contractors, offering to do a deal in exchange for capacity.

This bizarre tale speaks volumes about the current dire straits of the once-robust geophysical industry.

E&P companies seemingly are awash in 3-D seismic data, contractors have enormous surplus capacity eating up the balance sheet, and the rig count is abysmal. Not surprisingly, the contractors have been nailed to the wall by the oil finders who have all the leverage when it comes to cutting deals for data and services.

The challenges the industry must address are varied and daunting:

✓ Consolidation of the customer base, i.e., mergers.

✓ Tendency on part of clients to view data and services as commodities to be bargained for as cheaply as possible.

✓ Clients' use of "brute force" in the form of market power to attempt to shift risk to seismic service provider.

✓ Denial and/or ignorance of non-exclusive data ownership rights.

✓ Changing standards for safety performance.

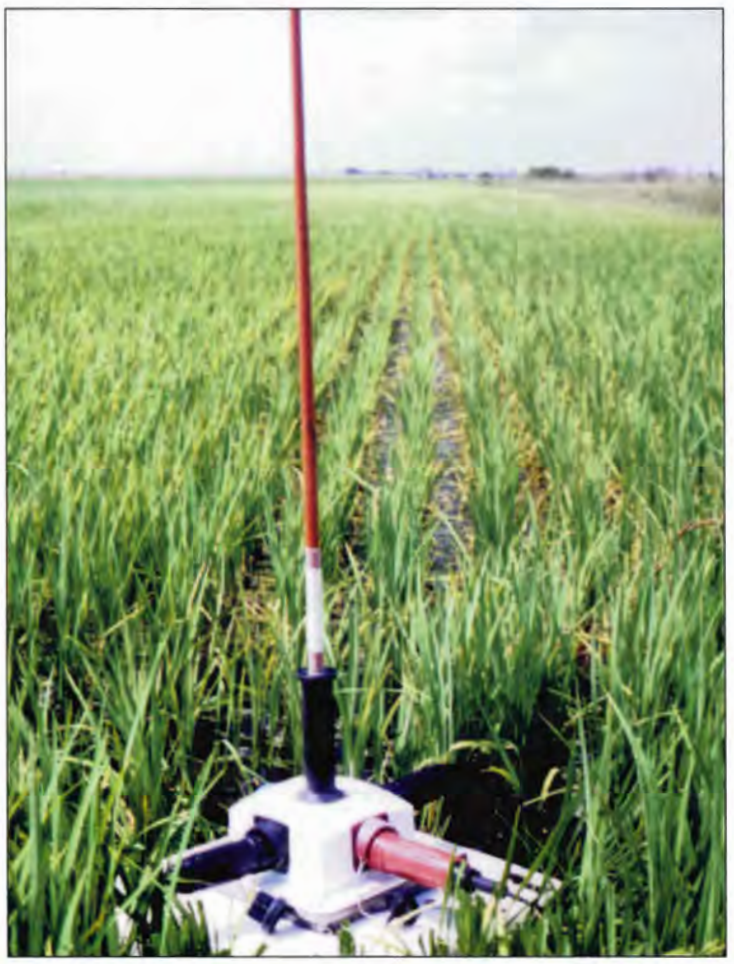
✓ Quick-changing and evermore onerous environmental rules and regulations.

Despite all the finger pointing, however, the consensus among most members of the geophysical community is the blame for the current situation rests on their collective shoulders. After all, it was they who overextended during the 1990s as the clamor for 3-D reached a frenzied pace.

"I don't blame the oil companies for taking advantage of us if it's thrown their way," said Jim White, vice president North and South America for WesternGeco. "They're now in a position to capture the value of seismic at a fraction of the cost.

"Kudos to them for knowing to take advantage," he said, "and silly on us for not knowing better."

Amazingly, when industry giant WesternGeco recently decided enough was enough and shut down its sizeable land operations in North America, except for Alaska, the action caused nary a ripple among its clients.



Hello ... hello? Is anyone listening? A variety of factors have combined to make these turbulent times for the geophysical industry – not the least of which was, according to officials, the active days of the past decade that may have led to an over-supply of seismic data.

Photos courtesy of Fairfield Industries (left) and WesternGeco (below)

"We thought it would send reverberations through the industry," White said. "But our clients weren't concerned, and I don't think it was that big a deal for them.

"It's a short-term mentality, and I think they need to be thinking long term," he said. "When other companies like us start shutting operations, it will leave them in a real lurch, because the dramatic drop in R&D spending will really hurt them."

Owning the Orchard

It's popular in some corners to tie the decreased demand for seismic data to the continuing decline in drilling activity. Varied reasons for this decline have been proposed (see related story, page 10), but some industry veterans think the oft-mentioned lack-of-prospects theory should be laid to rest.

"If you truly believe there's a lack of prospects, then you need more seismic data," said Marc Lawrence, senior vice president at Fairfield Industries, "so there's no lack of prospects.

"It's just that the shallow, easy stuff is gone," he said. "So now is the time to apply technology – but they're staying away from it in droves.

"For instance, multi-component seismic technology has a lot to offer, but no one embraced it" he said. "We offered it, but the market didn't respond, so we had to pull away from it because we're not going to give data away this time."

Many companies, including the big guns, are eyeing the deep gas potential (>15,000 ft.) on the Gulf of Mexico shelf. This activity likely will require additional data because the plethora of earlier shoots in this region were undertaken using acquisition parameters that aren't

necessarily ideal for the deep targets being chased today.

Still, random unique areas such as this are not sufficient to keep a whole industry churning along as in the glory days of the recent past.

"I can't find an E&P company who says they don't have enough seismic data," said James Wicklund, managing director, energy research at Bank of America Securities. "Some say they're looking at a brand new area and will have to buy some new data," he said, "but I refute the idea you must have data going forward at an ever-increasing rate.

"And if the top 15 companies in the Gulf have bought every block with 3-D in the Gulf because it's been shot, then how, going forward, will this be a growth business?

"It's like buying an orchard to get apples," Wicklund said. "You go from tree to tree, and your chances of running out of apples anytime soon are greatly reduced," he said. "After all, you own the orchard."

'Serious Dialogue' And Proactive Steps

For 2003, Wicklund predicts the primary activity of the seismic business will be reprocessing of seismic data. Although a good business for the seismic folks, he noted it's not enough on its own to promote higher revenues and earnings.

One of the industry's many problems is over-capacity in the spec business, both land and marine, and the contractors' unwillingness to address this in many instances.

"They say they're retiring two boats,

See **Industry**, page 12

Historically, the seismic industry has often dealt with cycles that blow hot and cold, but the current downturn is inspiring some creative ideas for future operations.

'There Will Be a Drilling Response'

Price Nice, But Where's the Action?

By LOUISE S. DURHAM
EXPLORER Correspondent

There are few noises louder in the oil fields than the silence that accompanies a dormant drill bit.

Lately, the silence is deafening.

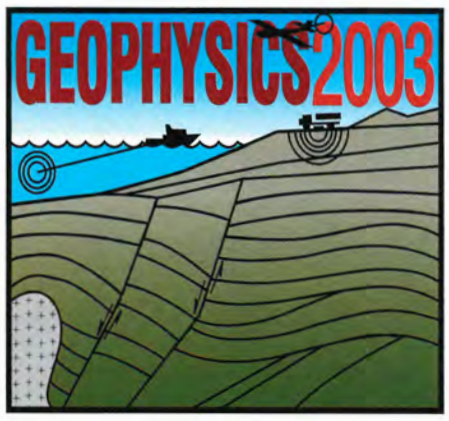
As the frustration mounts over the apparent disconnect between current somewhat-lofty commodity prices and drilling activity, everybody has a theory:

✓ Lack of prospects.
✓ Risk-aversion is rife in the investment community.
✓ Mergers.
✓ Prospect of war has frozen activity.
✓ Prices may fall.
✓ There are ample energy supplies.
✓ Et cetera, et cetera.

In fact, there might be some logic for the dearth of drilling action – and a light at the end of the tunnel.

"Globally, '02 was the first or second warmest year in history and was second or third in the U.S.," said Jim Wicklund, managing director of energy research, Bank of America Securities.

"Prices were high, but the expectation and fear was to have another warm winter," he said. "And there was significant risk, especially early in the fourth quarter, that we were going to double-dip into a recession.



"Even when near-term prices are high, no industry wants to commit capacity-expanding CAPEX in the face of a possible recession," Wicklund noted.

He pointed out it wasn't until early December that gas prices hit the $5 mark and the United States was actually experiencing winter. While this provided encouragement to the oil finders, the Patch remained quiet for a number of reasons:

✓ By mid-December, budgets were already spent.
✓ No one worked the last couple of weeks of the month because of the mid-week Christmas and New Year.
✓ Winter had arrived with force, but would it last?

At the end of January, however, it was still colder than average. And despite lingering concern over the possibility of a recession, especially with a war in Iraq still threatening, the oil industry is significantly encouraged, according to Wicklund.

"The optimism that gas prices will stay above the economic threshold is very high," he said, "so we will see drilling activity picking up."

When queried as to the absence of an obvious sign of a turnaround so far, the veteran industry analyst likened the situation to receiving a bonus check one day and being asked why the new addition to the house was not in place the next day.

"Drilling is a process," he emphasized. "New budgets have been in place less than a month, and the industry only had confirmation that commodity prices would stay high in the last month, i.e., weather."

History plays a role in this scenario as well.

The rig count drops from December to January every year. In fact, the January average has been lower than the December average each year since 1949, according to Wicklund.

He noted that even though higher commodity prices ensure to a large extent that drilling activity will pick up, they only really ensure it will pick up in the seasonal fashion it usually does, which would be March or April, possibly February. And normally, once it's bottomed, it will continue to increase sequentially through year-end.

"You would never expect to see drilling activity pick up in January," Wicklund noted, "and it will drop again this year from December to January.

"So the point is not why aren't we drilling – in December there was no money, in January no urgency, e.g., it's 10 percent more expensive to operate in winter.

"The real question is will they begin drilling late in the first quarter, as I think they will with gas prices where they are," Wicklund said. "If not, then you have a problem."

Given the increasing demand for natural gas, particularly in the United States, and the tight (and iffy) crude oil supply situation – even OPEC only has two member countries with any excess available production capacity, at least at the moment – it has to be only a matter of time before drilling must take place.

It's simple economics.

"If there's no drilling, the price goes up," Wicklund said, "and if the price goes up there will be a drilling response." ❑

Industry

from page 8

but then announce they're coming out with a new one that's six times more efficient," Wicklund said. "Net-net: they've just increased capacity."

The contractors are grappling with the problem.

"We see capacity being taken out, but it's an individual choice," said Chip Gill, president of the International Association of Geophysical Contractors. "It's both involuntary, like the CGG *Mistral* that sank in December, and voluntary, like WesternGeco laying off land crews and retiring boats."

He concurred with Wicklund that new capacity seems to pop up as the old goes out.

Desperate times call for desperate measures. The rumor spreading through the contracting community holds that spectators have witnessed grinders going to work on geophones and cables when crews are retired to ensure the equipment doesn't get back in through the back door.

Although the hole the industry sits in is largely self-excavated, Gill asserted a large piece of the current problem stems from the clients. He noted they have not hesitated to take advantage of the contractors, at the same time acknowledging they can't be blamed for doing so.

To salvage what's left of the geophysical industry and regain some semblance of financial strength, he noted the E&P companies and the geophysical folks are going to have to engage in some serious dialogue.

"We're in a weak economic position compared to our clients, and we're limited in what we can do together by anti-trust laws," Gill lamented. "We've got two hands tied behind our backs."

Nevertheless, he pulled out a list of initial proactive steps for the service providers:

✓ Shine a spotlight on the circumstances and pose tough questions, e.g., What do E&P companies expect out of the geophysical industry going forward? Do they want back into the geophysical business?

✓ Shine a spotlight on the abuse of data ownership rights to help curtail it. A deal's a deal, and leveraging concentrated purchasing power and market clout to negate the terms of the contract are flat out wrong.

✓ Shine still another spotlight on the value of the non-exclusive data business model to resource managers and governments so they understand the contribution it brings to the full cycle economic engine that fuels the E&P industry.

The Next Big Thing

There's another school of thought that says it's time for the geophysical community to aggressively reinvent itself.

Since the E&P industry got most all they need of the last big thing, the seismic industry is going to have to come up with something blockbuster as the next new big thing, according to Wicklund.

"The idea of providing data is becoming antiquated in *every* industry," Wicklund said. "The trend is to provide solutions, which the seismic industry has not yet learned to do, even though they would argue they do this indirectly.

"It's the oil industry geologists and geophysicists who provide the solution, i.e., where to drill and what prospects have value.

"The seismic companies may say it's not their job to pick drilling locations but to provide the tools," Wicklund commented. "But these days you don't provide the tools, you fix it for them.

"The seismic industry has to take all the tools it's got and provide an integrated solution to the industry that will look a lot like doing the oil companies' job for them," he said. "This has been the resistance point in the past."

In other words, the seismic industry must make what will be a very difficult transition from being a data service provider to being a partner and a solution provider.

"The oil and gas companies don't need more data; they need more time in the day," Wicklund said. "If a seismic company comes in and says here's a worked-up qualified drilling prospect with the economics run on it, then instead of giving you a bag of groceries they've given you a meal from Eatzi's," he said. "That's where it's got to go."

He cited the deal Diamond Geophysical once struck with PGS.

Diamond approached PGS to work prospects on their library of data with the proviso they would sell a license to the data when they sold a prospect, essentially becoming a marketing entity for the data. Even though cautioned that no one would buy prospects worked up by a third party, they forged ahead, applying the best technology in the business to work up prospects over the next two years, according to Wicklund.

When Spinnaker Exploration was cranking up, they approached PGS to license their GOM data and learned about Diamond where they purchased the prospect inventory.

"For the next two years, Spinnaker was a home run," Wicklund said.

"It would appear the future of the business is much more of a Diamond Geophysical business model," he noted, "rather than a shoot-and-sale-of-data business model."

Getting Healthy

Thoughts about change are being voiced by others.

"The general gloom today may prompt a reshaping of how the geophysical industry does business," said Chris Usher, president, worldwide data processing, PGS.

"We may be much more clever, such as outsourcing of certain capacity into alliance formats where the lines are maybe blurred a bit," he said. "Why have fixed capacity when someone else could take the risk?"

Regarding the pervasive feeling among the data gatherers that the clients don't feel their pain, Usher had some encouraging words.

"The oil companies are alert to the problems of the industry," Usher said. "The largest companies with the longest term outlook understand that a healthy contractor community is good for their business." ❑

South Africa Investment Paid Off

Different Data Gave New Insights

By KATHY SHIRLEY
EXPLORER Correspondent

When Forest Oil International acquired a large block in the Orange Basin offshore South Africa from Anschutz in 1998 it was nothing more than a big acreage play with a couple of intriguing hints.

Those hints – coupled with state-of-the art 3-D seismic technology – ultimately led to a major gas discovery and the potential for several more.

"Thirteen wells had been drilled on the block by Soekor (the South African state company) in the mid-1980s when the firm launched an aggressive campaign to try and find internal resources," said Tim Berge, chief geophysicist with Forest's international group. "All the wells were drilled on the basis of 2-D seismic into what appeared to be structural closures."

Although a couple of those wells had shows, no commercial accumulations were encountered.

But one well in particular, the A-K1, intrigued Berge when he began mapping the block.

"That well had a combined test of 57 million cubic feet of gas a day out of three sands," he said. "That's a pretty good test. But, when I mapped the 2-D data I couldn't get the structure to close – there was no way to account for the trapping of gas based on the structural model."

Forest had a commitment to shoot 1,200 kilometers of 2-D data in the block, but Berge argued internally that the A-K1 well was likely a stratigraphic trap and 3-D seismic would better image the block's stratigraphic nature.

"You could see on the log character that the sands were likely thick enough to be seismically resolvable," Berge said, "and they had properties that we felt would lend themselves to direct detection and AVO work if we had the right kind of data."

So Forest negotiated with the government to change its commitment to 3-D data and in 2000 shot a 312-square-kilometer survey in the A-K1 well area.

"When we got the 3-D data we could see all these channels and bright spots," Berge said. "The area turned out to be much more complicated than the structural model with a blanket sand that had been developed from 2-D seismic."

3-D and Inversion Techniques

Forest, committed to drilling a well by the end of 2001, got busy working the 3-D data – and Berge said application of 3-D seismic and inversion techniques were the technical keys that made this play work.

"One of the first things we did was forward modeling so we could understand, based on the one well we had, what the predicted AVO response and stacked response would be from the productive sands," Berge said. "Once we had that in hand we started trying different inversion techniques."

An intercept gradient was tried first.

"It was fairly easy to calculate," Berge said, "and we found that we had a negative near trace response and a negative AVO gradient, or a 'class three' AVO."

Forest then worked the seismic data with an elastic inversion technique that uses pre-stacked time migrated data to extract compression wave vector and an estimated shear wave vector, which are then cross-plotted to determine lithology, porosity and fluids.

"This method seemed to correlate best with the penetrated anomaly, and tied best to my one point of control in the older A-K1 well," Berge said. "Based on this data we did a volumetric map, which we based our first four well locations on."

The method turned out to be "very accurate" in predicting reservoir, he added, and "fairly accurate" in predicting gas content.

"Inversion work was used to predict exactly where and how thick the sands would be in the drilling program," he said. "Depth estimates came right from that volume as well."

Forest also measured the in-place reserves from the volume of anomalies.

"We used the volume not only for predicting and planning the well campaign but also for estimating reserves from the field as drilling progressed," he said. "We wanted to test the largest reservoir compartments with the highest predicted porosity and lowest water saturations first, and that was borne out by the drilling program.

"Every inversion attempt, especially if it's independent of other approaches,

continued on next page

Exploration Program Will Follow New 3-D

State-of-the-art seismic acquisition, processing and interpretation techniques continue to be keys that unlock the treasure for Forest Oil in South Africa.

Forest recently shot a 712-square-kilometer 3-D survey offsetting its original 3-D coverage there. The firm is going through much of the same process with the new data and will follow up with an exploration drilling campaign, according to Forest's international chief geophysicist, Tim Berge.

"We are planning on applying for a mining license that will include the footprint of the two 3-D surveys and a little padding around them, which will include the Ibhubesi Field development," Berge said.

"This field is by no means defined – when we go back and map our 2-D dataset we see quite a number of anomalies throughout the Orange River Delta," he said.

The company thinks this is a large regional stratigraphic accumulation, and every one of these little meanders could be considered its own field.

"We think there is potential for an eventual upside of 48 trillion cubic feet of gas in the entire delta off South Africa and Namibia in the Albian-Aptian and Kudu formations, and in a deepwater structural play," he said.

On the Namibia side of the delta there is a large field discovered years ago by Shell that's been a stranded gas resource for some time. The field's estimated reserves of 1.2 trillion cubic feet of gas from the Kudu Formation is a strong indication of the Kudu's productive potential, according to Berge.

In addition, Forest has already shot a 1,000-square-kilometer deepwater 3-D survey that covers a big structural lead at the shelf-slope break.

"We can see big growth faults in great rollover structures," Berge said. "This region is still in the prospect stage – it's an entirely different play."

Forest has 32,000 square kilometers in two blocks in a basin that has been virtually unexplored with a documented hydrocarbon system and multiple plays in multiple reservoirs.

The firm currently is working hard to develop a market for its gas; with exploration finding costs of about 3.8 cents per thousand cubic feet of reserves, Forest's Orange Basin acreage will be increasingly important to the company.

– KATHY SHIRLEY

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offers some risk reduction," he concluded. "Every time you try something different you are looking at a somewhat different part of the dataset, or looking at it in a different way – and that has potential for giving you additional insight into the real rock properties."

Test Time

The four-well drilling program was set to evaluate the field and prove up a core area with enough reserves to be economically developed. Wells tested individual compartments containing 28 to 520 billion cubic feet of gas for a total of 1.15 trillion cubic feet.

❒ The first well, the A-K2, tested 30 million cubic feet of gas and more than 600 barrels of condensate a day from a 20-meter pay sand, according to Berge. Reservoir characteristics were better than expected; the sands were clean and well sorted with average porosity of 21 percent and almost no water saturation.

No water was produced and no significant reservoir pressure draw-down was seen during the 12-hour test.

❒ The second well had a 15-meter gas bearing sand of similar quality as the older A-K1 well.

Notably, the lowest gas sand in the well is deeper than the lowest proven gas and highest proven water in A-K1, clearly showing that this is a separate reservoir and stratigraphic trap, he said.

❒ The third well targeted the largest and brightest anomaly in the data set. It found two thick and porous sands as predicted, but they contained low gas saturation water.

Additional elastic inversion showed that these sands had less rigidity than others in the area. This factor, combined with high porosity, accounts for its high values in the elastic cross plot volume, according to Berge.

❒ The fourth well tested a feature that appeared to be a preserved cut-off meander loop. The well tested 71 million cubic feet of gas and 1,340 barrels of condensate daily from combined tests of the upper two zones.

This well achieved the highest gas test rate ever achieved in South Africa, he said.

"This drilling program uncovered a giant regional stratigraphic trap and discovered the Ibhubesi commercial gas field," Berge said.

Ibhubesi produces from the Albian-

See **South Africa 3-D**, next page

South Africa 3-D

from previous page

Aptian, and internal estimates for the proven, probable and possible reserves is one trillion cubic feet of gas.

"The 3-D seismic was key," Berge said.

"We were completely successful in predicting the presence of high reservoir quality sands on 10 occasions in five wells," he said. "We predicted commercial gas content eight times for a success rate of 80 percent; porosity predictions were always within two PUs of the target interval; and thicknesses ranged from about 30 percent less than predicted to about 30 percent more than predicted."

Even the wet well was important to the overall drilling campaign; after drilling it, Forest scientists went back and did some revision and re-calibration of the inversion volumes.

"In fact, it was probably a good thing that we had a wet well," Berge said, "because I feel we have a very good calibration point now."

The Ibhubesi Field is a fluvial incised valley complex with excellent reservoir properties:

✓ Porosity averages about 20 percent.

✓ Permeability ranges from 300 to 400 millidarcies.

✓ The field boasts high deliverability wells with reserves of 50 to 300 billion cubic feet per channel.

✓ Application of 3-D seismic technology provides excellent reservoir imaging and delineation, which allows for efficient low risk field development and low finding and development costs.

"We were successful on three out of four wells based on the 3-D seismic."

"I have been able to quantify the importance of 3-D seismic and inversion methods," Berge said. "The mid-'80s drilling campaign based on 2-D seismic included 14 wells – and being fairly generous, three of that total were discoveries, for an overall success rate of 21 percent," he said. "We were successful on three out of four wells based on the 3-D seismic, or 75 percent. That translates to a risk reduction attributable to the 3-D and inversion work of about 54 percent."

"Based on our well costs and an estimated price of gas of $1.50 per thousand cubic feet, the difference between the two programs would be $15.2 million in dry hole savings and $216 million of added value from additional discovered reserves," he said.

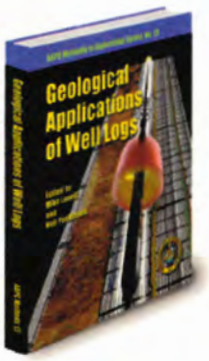
"All that for 3-D seismic acquisition and processing costs that totaled $5 million." ❑

Exploration Series Offers Fresh Look At Well Logs

Methods 13 Gives Geologic Applications

Premise: Geological applications of well logs are as broad as geology itself and petroleum geologists can learn from their colleagues in other disciplines.

Realization: The "Geological Applications of Wireline Logs," a 1999 conference sponsored by the Geological Society of London, used that premise as its theme.



Result: The newest volume in AAPG's Methods in Exploration Series, No. 13, includes papers from that conference in a publication that offers good reading as well as a chance for geologists – even the most veteran – to get a fresh look at well logs.

The papers were intended to promote cross-fertilization among the three geological constituencies: practicing petroleum geologists, log users in other industries and academic researchers.

The book is divided into three sections (each introduced by an overview paper describing the principles involved). They are:

✓ **Technology and techniques**, featuring NMR, real-time measurement, thin-bed analysis and the ability to "geo-steer" the drill stem to a precise target.

✓ **Sedimentology**, introduced by John Doveton (University of Kansas), a section that emphasizes rock features that can be determined by using well logs.

The section also includes papers on resistivity images, paleocurrents and stratigraphy of the oceanic crust.

✓ **Stratigraphy and fractures in the stress field**. Covered are fluid flow, fracture networks, crustal features and discussions on underground storage of nuclear waste and development of geothermal energy.

AAPG Methods in Exploration No. 13 is $54 for AAPG members ($79 to nonmembers). Catalog 524-03.

Contact the online AAPG Bookstore at (http://bookstore.aapg.org) or telephone (toll-free in USA & Canada) at (800) 364-2274; others call (918) 584-2555. ❑

'Pay Me Now or Pay Me Later'

Seismic Tech Goes Environmental

By KEN MILAM
EXPLORER Correspondent

As a self-described "oil industry refugee," Tom Temples says he has been trying to bring petroleum technology into the environmental business since 1991.

He has met with a surprising amount of resistance – and some success.

Horizontal drilling, advanced geophysical methods, high-resolution seismic, ground-penetrating radar all represent potential tools that are "very applicable to the environmental business," he said.

Temples said technologies and computer programs for reservoir modeling hold promise for environmental study as well.

Working with the Department of Energy through the 1990s and the University of South Carolina Center for Water Research and Policy since 1999, Temples has had opportunities to apply techniques like seismic stratigraphy to help explain problems affecting cleanup efforts at certain waste sites.

In two examples covered in a poster session to be presented in May during the AAPG Annual Meeting in Salt Lake City, high-resolution seismic data were collected initially to see if contaminants could be detected directly.

Seismic technology proved to be a valuable tool in another way – understanding the subsurface geology of the sites and providing explanations for unexpected problems and pointing the way to better solutions, Temples said.

❒ At one location, a Savannah River Site seepage basin, contaminants were migrating through the aquifer system to a lower level than could be explained by traditional characterization methods. Stratigraphic data allowed scientists to identify a channel allowing the contaminants into the lower aquifer.

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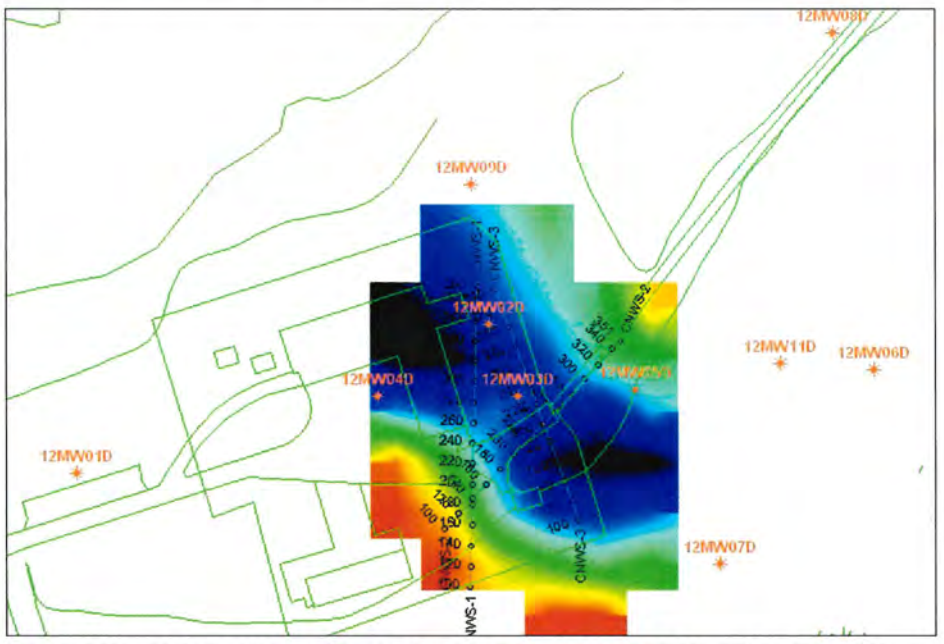
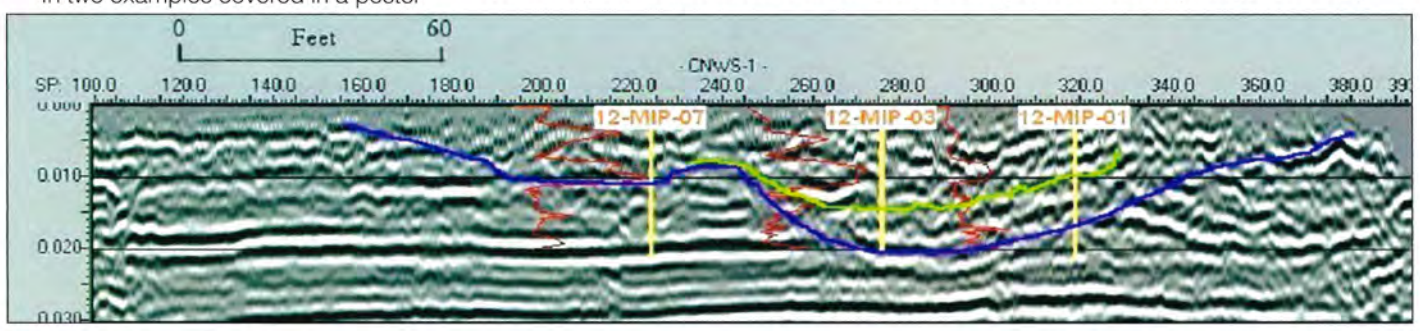


Seismic technology helped detect a troublesome underground solvent plume at the Charleston Naval Weapons site. Above, a structure contour map on base of the channel (purple event on seismic section below; green event is a younger channel).



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❒ At the Charleston Naval Weapons site, an underground solvent plume was spreading in the "wrong" direction, according to predictions. Standard cross-section interpretation did not show a channel that was apparent from seismic data, Temples said.

"I doubt it would have been picked up if we had not shot the seismic data," he said, adding that identifying the channel allowed remediation efforts to be better focused.

The result: A reactor barrier wall – an underground structure filled with crushed iron to break up the chlorinated solvent – could be placed more effectively.

Positive Factors

The environmental business remains resistant to new technology, Temples said, citing several possible reasons – including, of course, "because we've never done it that way."

Customary environmental waste-site characterizations are made from drilling core holes in a grid pattern over the site.

"Mother Nature is not always cooperative," Temples said, citing how drill holes may not detect channels that allow contaminant migration and, in some cases, actually may exacerbate the problem by opening a secondary pathway for contaminants.

Cutting down the number of holes drilled, he added, is an immediate advantage of newer technology.

Cost is a factor as well.

In explaining, Temples said that moving into environmental geology from the oil industry was "eye opening" – in petroleum exploration, resources seemed virtually "unlimited" if an undertaking looked profitable, but in environmental geology, the end result usually will cost money.

Perhaps a lot of money, he added, depending on what the geoscientist finds at a particular site.

"Instead of generating a revenue stream, I'm going to cost someone some money," Temples said.

But he quickly adds that deploying advanced technology on the front end can have cost benefits.

"It's the old 'pay me now or pay me later' – go in cheap and have to spend a lot of money to redesign a system," he said.

"Doing it right, up front, also increases out credibility with the regulatory agencies," he said. "We don't want to have to go back and say, 'we missed this and we missed that.'"

On the other hand, some regulatory agencies are not comfortable with new, unfamiliar technology.

Overworked and underpaid staffers like to "cookbook" remediation efforts, Temples said. "Trying a new technique puts an extra burden on them."

The University of South Carolina has a 120-channel seismic system and several companies specialize in environmental geophysics, Temples said, and he and his colleagues use commercially available software, including PC-based and UNIX systems, in their research.

For Temples and other oil patch refugees, environmental sites may provide targets for their expertise for some time to come.

Waste sites vary from traditional landfills to seepage basins to simple burial pits.

From the 1950s into the '70s, the common way to dispose of industrial waste was to "go out and bury it – out of sight, out of mind," Temples said.

"Now they're all leaking." ❑

Environmental Tech Sessions Set

Tom Temple's poster on "The Use of Seismic Stratigraphy for Waste Site Characterization" will be presented during the morning of Tuesday, May 13, at the AAPG Annual Meeting in Salt Lake City.

It is part of the five-poster DEG session on "Petroleum Technologies in Environmental Geology," chaired by Temples and Doug Wyatt.

Temple's co-authors are Michael G. Waddell and William Domoracki, both with the Earth Sciences and Resources Institute at the University of South Carolina, Columbia, S.C.

Other posters in the sessions include:

❒ Geological 3-D Modeling of Southeastern Tertiary Coastal Plain Sediments, Savannah River Site, South Carolina – An Applied Geostatistical Approach.

❒ Seismically Derived Aquifer Characteristics Across Faulted Coastal Plain Sediments, Savannah River Site, South Carolina.

❒ Formation Damage Caused by Excessive Borehole Fluid Pressures During Environmental Drilling in Unconsolidated Coastal Plain Sediments: A Petroleum Engineering Analog.

❒ Application of High-Resolution Geologic Modeling to Environmental Remediation in Coastal Plain Sediments.

New Book Takes Reservoir Focus

While the technology to drill a horizontal well has been with us a long time, asset teams now have the background to consider the geology in planning to maximize the reservoir.

AAPG is offering a new publication this month that helps teams make that next step.

Horizontal Wells: Focus on the Reservoir, edited by Timothy R. Carr, Erik P. Mason and Charles T. Feazel, provides an overview of the new technical approaches required for best use of horizontal and extended-reach technology in different reservoir situations.

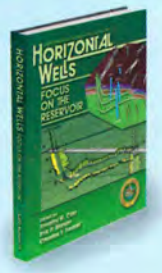
The volume, AAPG Methods in Exploration Series No. 14, includes selections from more than 50 papers presented at the 1999 joint AAPG/SPWLA Hedberg research symposium, "International Horizontal and Extended Reach Well Symposium: Focus on the Reservoir."

The book's 16 chapters describe case histories of actual horizontal and extended-reach wells and drilling programs in a variety of geologic settings all over the world.

It also discusses the evolution of technical knowledge required from geoscientists, engineers and managers to develop a detailed and integrated approach to the design and execution of a horizontal well.

Case histories include articles from:

✓ California.
✓ The Gulf of Mexico.
✓ The UK North Sea.
✓ Alaska.
✓ Venezuela.
✓ Wyoming.
✓ The Michigan Basin.



"Horizontal Wells ... " highlights the changes in our understanding of petroleum reservoirs – and the type of knowledge required to move beyond the limitations of vertical wells to a horizontal perspective.

The publication is $49 for AAPG members ($74 to nonmembers). Order catalog number: 525-02. ❑

Member Drive Heats Up

Every Region, Section Reports New Applications

AAPG's Membership Enhancement and Development Drive activity is heating up as it moves into the final three months of the program.

Applications continue to come in from all AAPG Sections and Regions; at press time a total of 160 applications have been received from 102 recruiters.

Now we are beginning to roll! Ask a friend to join. It's important for our profession and our industry.

Also, we have a new leader for the Grand Prize trip to Barcelona.

Although new applications have been received from every Section and Region, the Asia/Pacific Region is tied for the lead in the regional race with the Africa Region, each having 22 applications.

The Gulf Coast Section leads the Section race with 47 applications. The Rocky Mountain Section is second with 11.

Sectional and Regional Breakdowns are:

Gulf Coast – 47
Eastern – 4
Rocky Mountain – 11
Mid-Continent – 5
Pacific – 5
Southwest – 8

Africa – 22
Asia/Pacific – 22
Europe – 16
Canada – 7
Latin America – 1
Middle East – 12

An equal goal of the membership drive is to communicate the benefits of AAPG membership. These many benefits offered by AAPG have been highlighted in the Membership Value Pyramid (focus of Rick Fritz's "Director's Corner" in the November EXPLORER).

Using the pyramid makes it easy to discuss with potential members the benefits available to AAPG members and portrays the building blocks needed to support a strong professional community. It's downloadable on www.aapg.org.

Remember, the top recruiter in each Section and Region will be awarded 250 AAPG dollars. Of course all members who recruit "get stuff," including a desk flag for everyone who recruits one new member and special recognition lapel pins for those who recruit three or more.

The top overall recruiter will receive a travel voucher, four nights lodging and registration for the 2003 AAPG international meeting in Barcelona, Spain.

The new leader is Kamil Idris of Talisman Energy in Calgary, Canada.

So, when you're talking to new recruits, and you're not quite certain as to how best to communicate to them the many benefits of AAPG membership, consider the Pyramid. It contains all the important benefits, which will make the recruit ask you, "How can I join?"

It might be the easiest way in which you have ever won a prize. ❑

IT'S NOT TOO LATE TO...

Participate in AAPG's Membership Drive!

Members Know Best!

You already know who should belong to AAPG and you are the best person to tell them about the benefits of membership. To recognize AAPG members who share what they know, we offer the following recognition:

1. AAPG items and recognition in publications
2. AAPG Dollars — dollar-denominated prizes that can be redeemed for AAPG products or programs
3. Top Section/Region recruiters will receive special awards

Here's What Dan Smith says...

"A healthy AAPG is good for everybody in the upstream industry. We AAPG members need to tell others about our great programs and member benefits."

Dan L. Smith
AAPG President

WIN a trip to Barcelona in 2003!

Recruit the MOST new members and win a trip to the 2003 AAPG International Meeting in Barcelona (includes registration, hotel lodging for four nights, and a travel voucher)!

Get your recruiter kit to start right away, contest ends April 30!

Participation Benefits:

- More members = more programs helping geologists
- More members = better programs (wider financial base)
- More members = higher professionalism in upstream industry
- Recruiter prizes, including a trip to Barcelona in 2003!

SOUNDS GREAT! HOW CAN I PARTICIPATE?

It's as easy as 1, 2, 3...

1. **Get your Recruiter Kit today! Contact AAPG at 800-364-AAPG, or e-mail: driggs@aapg.org**
2. **Tell your colleagues about AAPG's programs and benefits**
3. **Everybody wins!**

Nine Areas Show Meaningful Development

Technology Advances On the Way

By DAVID BROWN
EXPLORER Correspondent

Geologist or geophysicist?

With seismic, the lines are blurred.

"The geologist/geophysicist distinction is fading to 'geoscientist,' because a lot of geologists are doing seismic interpretation now," said Mike Bahorich.

Bahorich is executive vice president-E&P technology for Apache Corp. in Houston, an AAPG member and president of the Society of Exploration Geophysicists (SEG) for 2003.

As part of his duties as SEG president, he will be speaking on "The Road Ahead for 3-D Seismic" around the world.

And with that in mind, he outlined for the EXPLORER nine areas of coming seismic advances, in computing, digital recording, massive channel counts, 3-D imaging, time-lapse 4-D, anisotropy, seismic attributes, multicomponent recording and visualization.

Bahorich gained fame for his work at Amoco in developing the seismic coherence cube, introduced in 1995. It was the most recent big-idea breakthrough in geophysics.

"Almost all of the technologies that are of significant benefit to us today have been known and worked on for years," he said. "The cycle time from development to 50 percent penetration in the industry is often five to 10 years."

As an example, he cited the recent introduction by Input/Output Inc. of digital multicomponent recording hardware, a technology heralded for over a decade but only now becoming commercially available.

Pete Maxwell is commercialization manager for Input/Output's VectorSeis® multicomponent products in Houston. The company has spent 15 years in developing the technology.

After initial work was complete, about four years ago, it then conducted more than 30 field tests in cooperation with Veritas DGC, plus other tests across Europe and one in China, Maxwell said.

Input/Output made its first sale of the technology in November, to China National Petroleum Corp. subsidiary BGP.

New advances in geophysics will be vital for the industry to meet global energy demands, Bahorich noted.

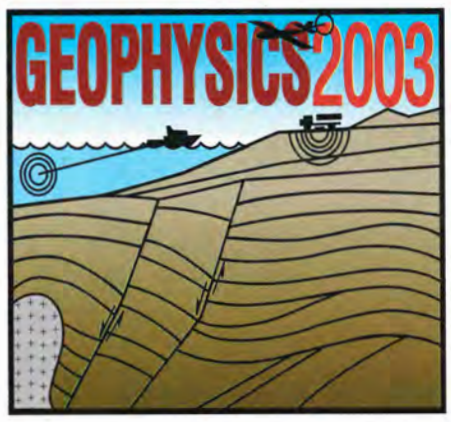
"The E&P industry is facing a tremendous challenge, to add 37 million barrels (of production) a day over the next decade," he said. "Advances in 3-D seismic will play a significant role in meeting that challenge."

Bahorich predicts meaningful developments in the following areas:

❒ Computing.

Look for declining storage costs, transmission costs and costs per cycle. "As those drop, we're going to see a number of benefits," he said.

"You'll see more thin-client application use. You'll see interpretations being done at home more often. You'll also see software that quickly accesses prestack data over a network."



Faster speeds and lower costs will benefit algorithms like prestack wave-equation depth migration. Archival storage of prestack data on disc will allow quicker analysis.

❒ Digital Recording.

"Even today, on almost every seismic survey the initial recording is an analog signal recorded by a coil and magnet in a geophone," Bahorich said.

By contrast, digital recording provides the potential for a lighter system with better dynamic range and higher fidelity.

A few digital geophones with chips are in use right now, he believes, and the number will increase as costs come down.

❒ Massive Channel Counts.

Bahorich looks for another big jump in channel counts as technology improves.

"For years we recorded 48 channels, and then we went to 96, often used in a 2-D split spread geometry," he said. "When we went to 3-D we started with these small channels."

That count grew into the hundreds, then reached the 1,000-channel point, and Bahorich expects the increase to continue.

"I think we'll be seeing in the future channel counts in the 10,000 to 20,000 channel range," he said.

Increased channel counts could lead to the elimination of field arrays, with arrays being formed and analyzed in the computer.

"You can do smart array forming and resolve problems in the presence of significant surface static. Improved wave-field sampling give you a better signal-to-noise ratio, resulting in a better image," he added.

❒ 3-D Imaging.

As computing costs come down and speeds increase, complex algorithms will be used more widely, to the benefit of imaging and interpretation.

"The new wave-equation, depth-migration methods are expensive now, but they offer a more accurate solution," Bahorich said, "especially in the presence of rapid velocity variation associated with salt features."

❒ Time-Lapse 4-D.

"I think time-lapse will continue to

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expand. One of the things people don't realize about time-lapse is that it's still largely confined to the North Sea," Bahorich noted.

Little 4-D seismic work now occurs in the Gulf of Mexico shelf, where only a few companies monitor reservoirs with a series of 3-D seismic acquisitions.

"As 4-D becomes more common and cheaper to implement, you'll see it spread beyond the North Sea and deepwater plays," he said.

❒ **Anisotropy.**

In general, geophysicists ignore the fact that the velocity of sound waves varies with direction, according to Bahorich.

"We know that the subsurface is heterogeneous, but we've always assumed that each little unit is isotropic," he said. "Over the next five years you'll begin to see more algorithms that correct for anisotropy."

Techniques exist for handling anisotropy, but they may not be well understood – and aren't often applied.

"This is an example of a technology that's underutilized, in my mind," Bahorich said. "We have some tools to correct for anisotropy, but we generally ignore it."

❒ **Seismic Attributes.**

Mathematical inversion of seismic attributes to rock properties will increasingly aid interpretation, Bahorich predicted.

When attributes are tied to well control they can be correlated to petrophysical properties, enabling the interpreter to identify and associate high correlations with specific properties, like porosity.

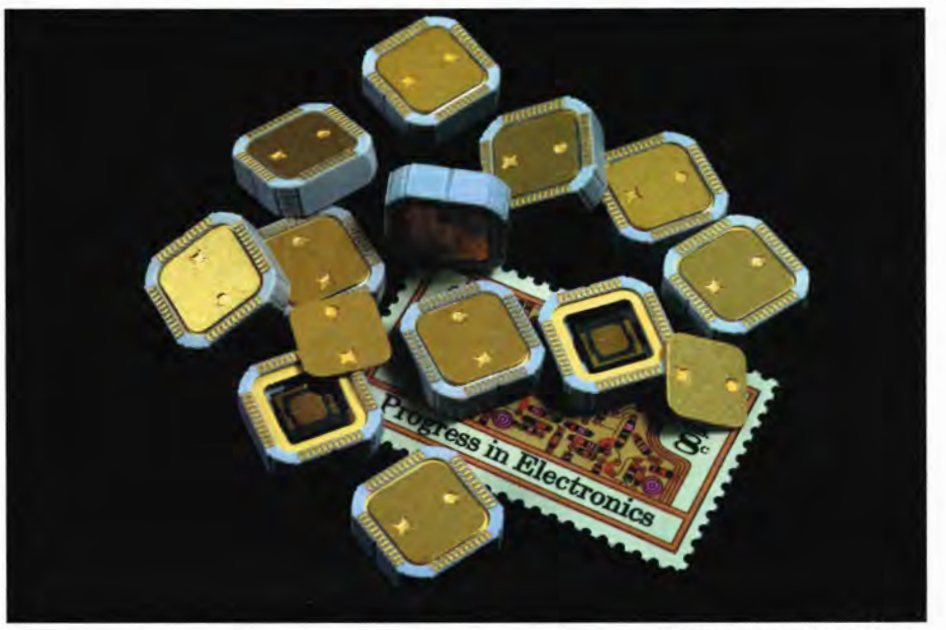

Photo courtesy of Input/Output

Good things come in small packages? The micro-electromechanical systems (MEMS) sensor chip is designed to provide better views below gas clouds and salt; help predict lithology and fluid type; and provide better fracture and stress identification.

"We have new techniques using neural networks to do this more rapidly and efficiently," he said.

❒ **Multicomponent Recording.**

After years of talk, the industry is finally seeing lighter-weight, multicomponent recording hardware in the introduction stage.

Multicomponent devices record sound in three orthogonal directions, picking up P-wave and shear-wave information.

"The converted shear-wave data allows you to look through gas clouds. Sometimes your structure map can look like a doughnut – the center is depressed because of all the gas," Bahorich said.

Input/Output claims its new hardware will not only provide better views below gas clouds and salt, but also help predict lithology and fluid type and provide better fracture and stress identification.

With its improved lithology/fluid discrimination, the technology might even be used to calibrate bright spots, Bahorich said.

❒ **Visualization.**

Something positive about computer games for kids?

"Graphic cards keep getting better and better" as those games become more sophisticated, Bahorich said. That results in better seismic displays on the desktop.

"Visualization systems tend to allow you to animate through data very rapidly," he said. "This is important because we're predators. Our eye is trained to see things in motion.

"As you go from one line to the next, things change. You can spot anomalies much more quickly when they are in motion."

Large-screen displays allow collaboration in seismic interpretation, and the costs don't have to be extravagant, according to Bahorich. He said collaboration can be done with a PC and a $5,000 projector.

"There have been some spectacular failures in this area," he noted. "The business model of setting up a million-dollar visualization room and renting it out to companies has not done well.

"You will be able to get a better visualization set-up for $25,000 in 2005 than you could have for $1 million in 1995."

* * *

As geologists add seismic interpretation to their professional toolkits, it's important for them to understand and utilize advances in geophysics, said Bahorich.

"Geologists should stay up with the latest technology, to be able to use the best tools for whatever problem is being faced," he said.

Bahorich noted that this knowledge can be acquired from a number of sources, including training sessions, professional papers, industry publications and the World Wide Web – not to mention the short courses and other support available from professional societies like SEG and AAPG.

"The individual geoscientist can find some fantastic resources," he said. "Bright people take advantage of what professional societies offer." ❒

They shared their stories: from left, Bill Barrett, Michel T. Halbouty, Robbie Gries, Marvin Davis and Thomas Barrow.

'You Can't Even Find Oil at a Gas Station'

Paths to Success Weren't Smooth

By LOUISE S. DURHAM
EXPLORER Correspondent

Humor, tales of woe, euphoric moments of success relived – it was all there at the recent Legends in Wildcatting 2003 event sponsored by the Houston Geological Society.

As five honorees shared their career stories with the SRO crowd of 565 attendees, their enthusiastic, optimistic nature was much in evidence.

In fact, it was clear from the get-go that wildcatters share not only these traits but a number of others, including a sense of humor.

"H.L. Hunt once told me, 'The guy that drills the most has got a chance of coming up with the most,'" said renowned wildcatter **Marvin Davis** during his turn on the dais.

"Well, early on, I drilled 80 straight dry holes," he said, "and I was walking around talking to myself. I figured there was no oil left in the U.S.

"I remember I took my family on an outing, and when we went to the gas station the pump didn't work," Davis said. "That's when my wife told me, 'You can't even find oil at a gas station.'"

But the best was yet to be. The tenacious oilman hung in there to ultimately amass a fortune drilling oil and gas wells and also venturing into other businesses, including the film industry.

Perseverance just goes with the territory.

"I've drilled thousands of wildcats and explored in 25 of the 33 producing states" said honoree **Michel T. Halbouty**. "And I've drilled in some of which have yet to produce," he added wryly.

"At one time, I discovered 14 straight fields and followed this streak with 36 straight dry holes," Halbouty, a past president of AAPG, said. "It almost destroyed me.

"Wildcatting can be heartbreaking," he admitted, "but my credo is: Don't quit, don't give up."

Although on the cusp of 94 years of age, the legendary oilman continues to hunt for new oil and gas finds on a full-time basis.

"I couldn't live without wildcatting," he said, "even though I've gone broke twice."

Besides the need for such traits as optimism and creativity, Halbouty emphasized that successful oil finders must have faith in their own convictions. They must rely on their own geological reasoning no matter how different or far out it might seem.

"Many good potential oil finders have been ridiculed by a boss who stifled a good idea with overbearing arrogance born of ignorance," he noted. "Never be afraid to experiment with an unusual idea or concept – and once you're convinced, go for it."

Honoree **Robbie Gries**, past AAPG president, shares this conviction.

"Some of the best fun in geology is taking risk where you're challenging a dogma," Gries said.

Both Gries and Halbouty expressed optimism that the United States harbors the potential for substantial new production. Halbouty emphasized, however, that it won't be

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found if no one drills for it.

His wildcatting cohort, **Bill Barrett**, is doing his part to make it happen.

Barrett continues to enjoy immense success drilling in his longtime stomping-ground, the Rocky Mountain region. And he thinks there is a lot of oil and gas yet to be found in conventional traps.

Sometimes known to flout the conventional approach to finding oil and gas – he once used a nuclear device for a frac job (EXPLORER Century Issue, December 1999) – it was much in character when he said, "I think ultimately a large part of our job is to make the unconventional conventional.

"That's what innovation is," Barrett continued, "looking at or doing something in a way not done before."

Lessons and legends go hand-in-hand in the viewpoint of this oil finder. Noting he has experienced decades of lessons accompanying both successes and failures, Barrett opted to share some of these with the audience:

✓ Timing is important; never underestimate it.

✓ If necessity is the mother of invention, technology must be the father. It will open up huge reserves for you.

✓ Despite reliance on geology, geophysics and such, it's still about creativity and motivation of talented people. Keep an open mind for ideas and ways to do things.

✓ Be a VIP – strive for Vision, Integrity and Performance as values for yourself and your company. Your reputation in the industry is more important than reserves on the books – and more delicate.

✓ Innovation is exacting, precise work. The details are the difference. A lot of conventional thinkers overlook the details that might lead to an unconventional discovery.

✓ Geology has been the one consistent thread through (my) experiences and successes. Utilize the geology. It will help find a lot of oil and gas and decrease the number of dry holes.

✓ Hitting singles are for guys named Peewee. If you don't take a swing at the big reserves, you're never going to hit it big. It's better to have drilled and lost than never to have drilled at all.

✓ Protect the environment, but challenge onerous, unnecessary regulatory and environmental regulations. Become involved in the political process, and fight for what is fair and right.

✓ Listen to your gut. Science, technology and numbers are king, but trust your instincts, which are formed through past experiences.

Honoree **Thomas Barrow** also had some sound advice: "Listen to the new geologists," he said, "they have great ideas."

He should know.

While earning his doctoral degree, Barrow's dissertation project focused on the stratigraphic and structural history of the East Texas Basin. The project, which was sponsored by Humble, convinced the company to drill the discovery well for the huge Neches Field in east Texas.

"A hundred million barrels from a graduate student isn't bad." ❑

Student Expo Set This Month

Looking for new hires and companies?

Students studying in geosciences-related disciplines still have time to sign up for the 2003 AAPG/SEG Spring Student Expo, which will be held at the Sarkeys Energy Center on the University of Oklahoma main campus in Norman, Okla., on March 14-15.

The Student Expo, sponsored jointly by AAPG and the Society of Exploration Geophysicists, provides an opportunity for students to showcase their work in poster format and to network with industry representatives, who also have been invited to present posters of company activities.

Companies also will have the opportunity to host exhibit booths and network with students.

Student résumés and abstract books are available to companies seeking interviews. Company personnel will be able to informally talk with students during an icebreaker the evening of March 14, as well as during the poster session and more formal on-site interviews.

The expo's culmination will be the awards reception, with guest speaker AAPG President Dan Smith.

An informational brochure and registration form are available via the OU School of Geology and Geophysics Web site at http://geology.ou.edu.

Seismic Zone Good at Hiding Its Faults

New Madrid Study Sheds New Light

By KATHY SHIRLEY
EXPLORER Correspondent

A recent geologic study may shed some light on a mid-western U.S. seismic zone that is much discussed but little understood.

The New Madrid zone, which trends northeast-southwest through eastern Arkansas, western Tennessee, southwest Missouri and western Kentucky, has been the site of several significant earthquakes.

Unfortunately, the region is far away from tectonic plate boundaries, and as such is a mystery when compared to the data available for seismically active plate boundaries such as California and around the Pacific Rim.

That's a reason why Margaret Guccione, professor of geosciences in the Fulbright College of Arts and Sciences at the University of Arkansas, and AAPG member Ron Marple with WesternGeco decided to take a closer look at the Bootheel lineament surface rupture in the New Madrid seismic zone.

Their recently completed work combined resistivity and shallow core samples in an effort to prove that the Bootheel lineament is in fact a major fault – knowledge that could help scientists better understand the distribution of earthquakes in the seismic zone, which encompasses both Memphis and St. Louis.

"Researchers have speculated that one or more faults might occur within the New Madrid seismic zone, the site of earthquakes in 1811 and 1812 that rang bells in Boston and temporarily blocked flow of the Mississippi River," Guccione said.

"However, surface faults that have mostly horizontal movement have been obscured by liquefaction of sand in the new Madrid seismic zone."

Finding Fault

Liquefaction is caused by shaking saturated sand during an earthquake. The liquefied sand may build up water pressure and explode toward the surface, causing the soil and clay to collapse into the resulting hole. Collapse of the soil can look similar to a fault.

The New Madrid seismic zone has only two features that have been suggested as possible ruptures – the Reelfoot scarp and the Bootheel lineament.

The Bootheel lineament is a 135-kilometer-long linear feature that can be seen on aerial photography and satellite, she said. The lineament trends sub parallel to the New Madrid seismic zone, but classifying the feature as a fault has been complicated by extensive sand liquefaction along the lineament, making any surface tectonic offset difficult to pinpoint.

The Bootheel lineament is recognized by:

✓ A contrast in sand blows on opposite sides, generally denser to the southeast.

✓ Shallow linear depressions.

✓ Continuous or discontinuous linear bodies of sand.

✓ Apparent truncation of fluvial features against the lineament on the southeast side.

This study's purpose was to examine a filled paleochannel visible on aerial photographs east of the lineament that is truncated by the lineament, but not obvious west of the lineament.

Guccione and Marple felt this could provide a piercing point to test their hypothesis.

"In the early 1990s Ron (Marple) was part of a research group looking at the New Madrid seismic zone, and they noticed on aerial photography and satellite imagery this long linear feature," Guccione said. "It wasn't continuous, but they could trace it from about New Madrid, Missouri, south into Arkansas near Jonesboro."

The feature was identified by differences in the kinds and amounts of sand blows on either side, she added. In addition, in some locations there are small depressions along the lineament.

"These depressions aren't big," she said, "just enough to hold water when it rains. They also saw some small, inactive, filled-in channels that come right up to the lineament and are then truncated. It was these features that helped delineated the feature as a lineament."

Marple and his fellow scientists suspected this feature was a fault, but they couldn't be sure. They did some seismic reflection work across the area, which did identify a fault in the deep subsurface, but the fault could not be imaged in the shallower sediments.

The scientists then trenched across the lineament in one location, but there was so much liquefaction and displacement of layers that it was impossible to tell if it was simply liquefaction or tectonic forces at work.

"When the sand explodes to the surface in these sand blows, whatever is at the surface has to drop down to fill the void and sand covers it," Guccione said. "So, the resulting feature can look like either a fault due to displacement or ground failure due to the sand blows."

Channel Resistivity

Marple decided to locate a channel that terminates at the lineament and then attempt to locate the same channel on the other side at an offset position. He knew that was likely because the New Madrid seismic zone is caused by strike-slip or lateral movement.

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He enlisted Guccione to participate in the project to acquire and study cores in the area.

The scientists chose a truncated channel at a location near Carruthersville, Mo., a few miles west of the Mississippi River in the central portion of the Bootheel lineament. Initially Marple acquired resistivity measurements across the channel where it can be seen on the east side of the Bootheel lineament.

The resistivity showed the channels very nicely, but when he moved to the west side of the lineament the channel was no longer visible and the resistivity was no help.

"On the west side all Ron got were very consistent, uniform resistivity readings," Guccione said. "There is so much clay present on that side of the lineaments that it obscures any channel."

Despite this setback, Guccione went ahead with her portion of the study, and with the assistance of University of Arkansas geocience students, conducted coring operations over the span of three years. The group drilled over 100 cores up to eight meters deep in a 300 by 300 meter area to reconstruct the geologic history of the lineament for the past 12,000 years.

She examined the composition of the cores and used radiocarbon dating to determine the age of the material in the cores.

"We started drilling on the east side, where we could see the channel," she said. "With this approach we knew what the channel fill looked like, what was on either side of it, how deep it was and about how wide it was before moving to the west side of the lineament where the channel is obscured."

Conclusions

According to the authors, the coring project supports the suggestion that the lineament is a surface rupture and that it has both vertical and horizontal offset, with the east side moving relatively up and south and the west side moving down and north.

The boundary, or lineament, between the uplifted area and the depressed area is very narrow, less than six meters wide.

There is a record of at least three seismic events in the past 10,500 years and a total vertical offset of more than three meters during that time. There also is evidence of a total horizontal offset greater than 10 meters in the last 2,500 years. This movement is consistent with other studies in the seismic zone.

The research, however, did not pinpoint if there was any offset during the major earthquake of 1811.

The scientists mapped a series of cross sections through time to uncover these findings:

❒ During the Late Pleistocene, glacier melting brought sediments into the area via the braided stream of the Mississippi.

Clays then began to fill in the depression – but sometime between when the sand was deposited and the clay began to fill in, there was some type of rupture and vertical motion 10,300 to 12,300 years ago.

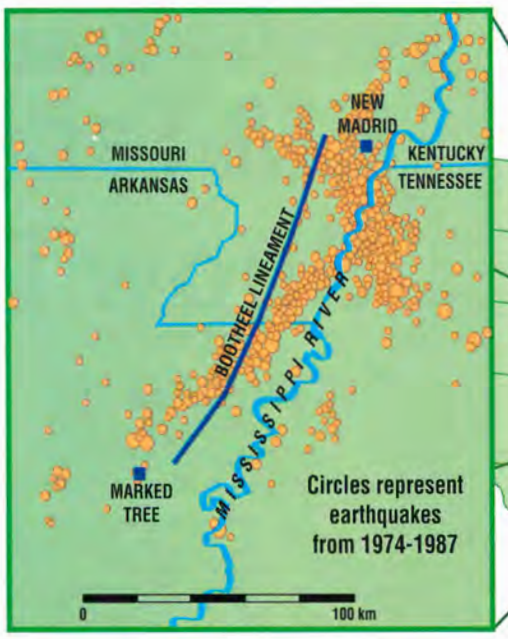
Following the rupture, clays likely filled in to make the ground surface flat once again, according to Guccione.

❒ The next event occurred between 1450 and 1470 AD, and this was likely the biggest rupture in the area.

During this event a huge pile of sand erupted to the surface, and the west side of the lineament dropped down.

Based on this data, the authors concluded there was about three meters of vertical movement in the area.

❒ Once again clay filled in to make the surface flat.



The Bootheel lineament in Missouri and Arkansas, in relation to the New Madrid seismic zone.

For more on this subject, visit the AAPG Web site. www.aapg.org

❒ The next seismic event was in 1811 and there are some liquefaction features at the surface consistent with this time frame.

"The earthquake was definitely felt in this location along the Bootheel lineament, but we don't see any vertical motion so there is no concrete evidence that the lineament ruptured," Guccione said. "There likely was lateral motion that we can't see.

"To me, this movement is a very strong argument that there is a surface fault," Guccione added. "We can demonstrate three meters of vertical offset in the last 10,000 years and more than 10 meters of lateral offset in the last 2,500 years. This vertical movement will now have to be taken into account for the structure and tectonics of the area.

"I feel very confident that the Bootheel lineament is actually a fault." ❒

GEOPHYSICAL CORNER

EM Techniques Show Promise

The Geophysical Corner is a regular column in the EXPLORER, edited by Denver consultant R. Randy Ray. This month's column is titled "Electromagnetics Help Lower Drilling Risk."

By TERRY W. DONZE

Updated electromagnetic profiling techniques hold promise for evaluating shallow oil and gas plays along basin margins.

An electromagnetic (EM) exploration system has been commercialized by Montason Exploration Inc. using recently developed theory combined with computer and measurement instrumentation.

The basic geophysical properties of subsurface reservoirs indicate the range of resistivity variation is much larger than the range of P-wave seismic velocities (figure 1, page 29). By measuring subsurface conductivity, a "virtual" resistivity log can be derived for geological mapping, the company says.

Since resistivities of hydrocarbon-filled and wet reservoirs vary significantly, EM resistivity data may define reservoir fluid content without drilling.

Real World Field Tests

Data acquisition consists of an electrical transmitter (Tx) with magnetometer receivers (Rx) positioned up to 1.5 miles away. Data is sampled between the transmitter and receiver (figure 2, see page 29)).

The system records the magnetic induction caused by electrical signals put through a transmitter on the ground. The input signal and the earth's magnetic response are both monitored. Computer processing outputs a conductivity log.

Accuracy depends on the thickness-depth ratio, conductivity contrast and background noise.

Some of the scientific theory has been published in the United States and Russia. Successful lab and field tests have been independently conducted.

Testing was done in the shallow Cretaceous Niobrara chalks in the D-J Basin in eastern Colorado, where:

✓ Niobrara gas pay varies from 25 to 70 feet thick.

✓ Porosity is 30-40 percent.

✓ Formation permeability is below a millidarcy.

✓ Productive wells need fracture stimulation.

Niobrara gas fields are structurally

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Figure 1 – Comparison of resistivity variation in hydrocarbon reservoirs to P-wave seismic velocity. There are large variations in formation resistivity as compared to seismic velocity when water saturations decrease.

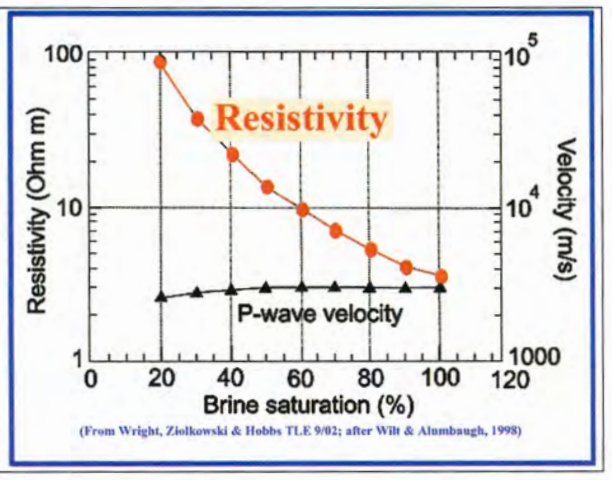
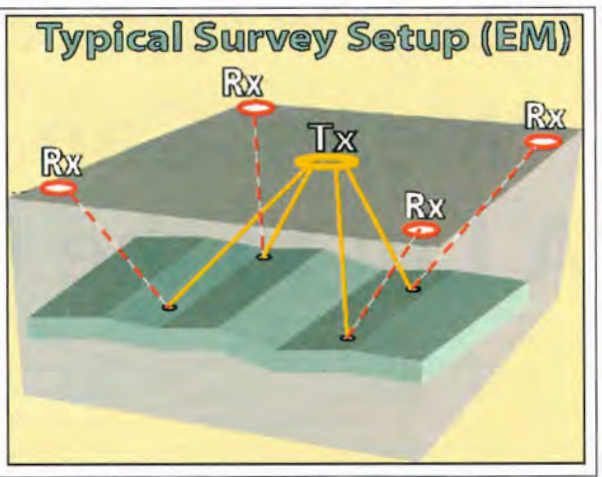
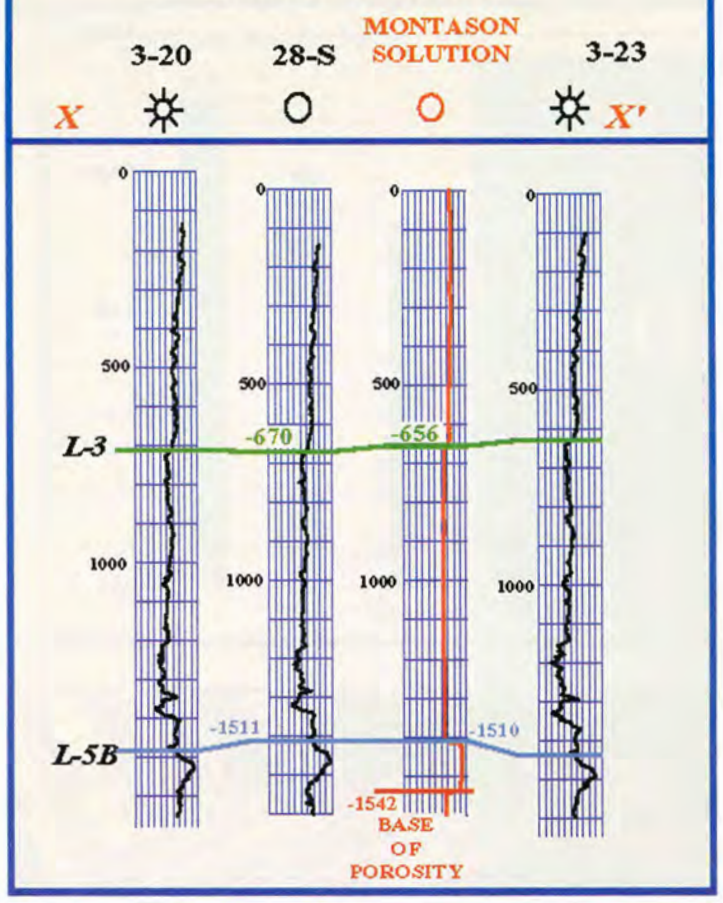


Figure 2 – Typical EM survey with a central transmitter and several magnetometer receivers up to 1.5 miles away from the center. Subsurface data is measured halfway between the transmitter and receiver.



3(a) STRUCTURAL CROSS-SECTION: BEECHER ISLAND

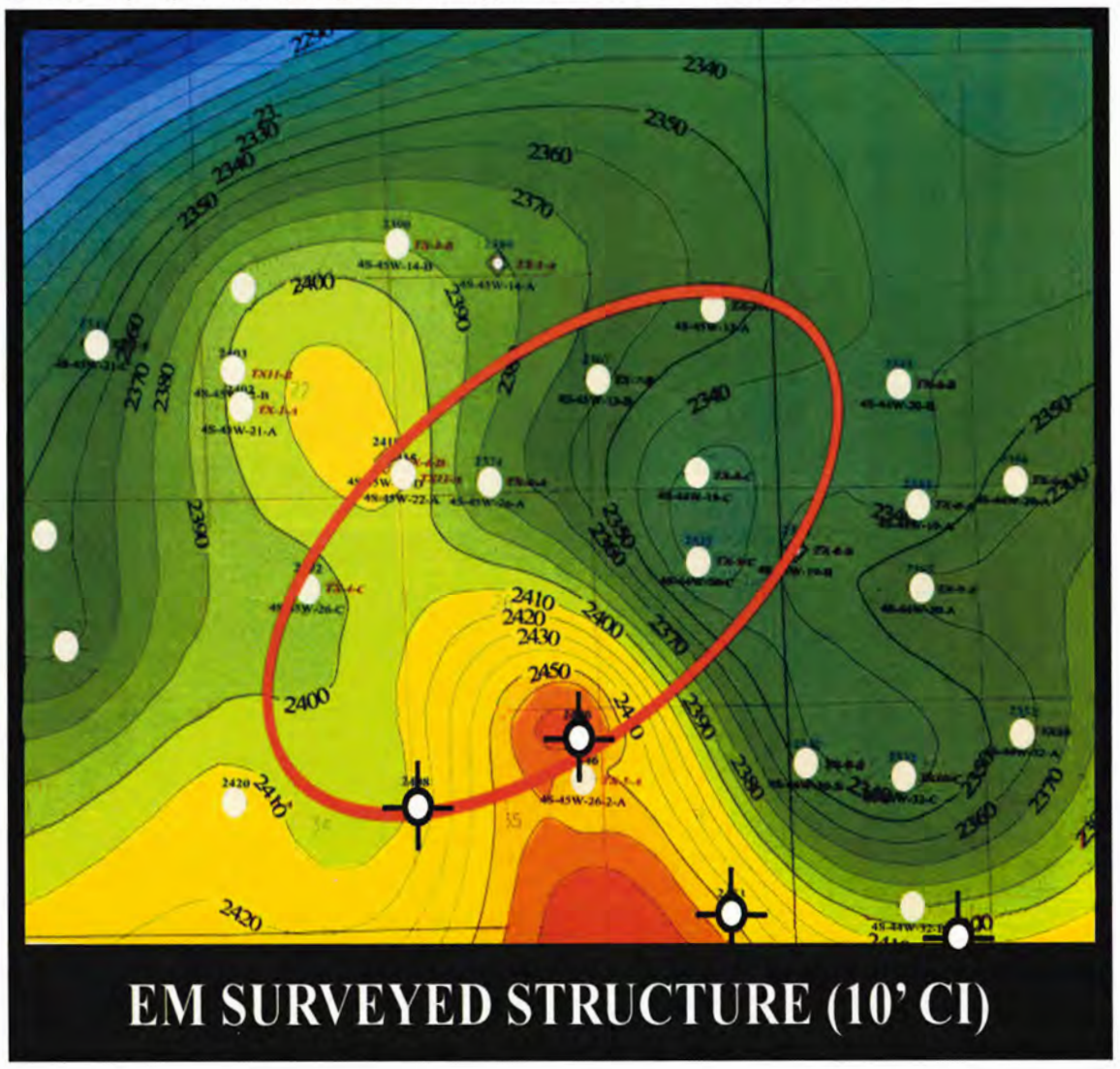


3(b) BEECHER ISLAND RESULTS

SUBSURFACE LAYER	FIELD ACTUAL	MEI SURVEY
Layer 2-B	3.50 ohm-m	3.50 ohm-m
Layer 3&4	2.70 ohm-m	2.70 ohm-m
Beecher Zone	10 ohm-m	10 ohm-m
Top Layer 3	670 ft.	656 ft.
TOP Beecher(L-5B)	1,511 ft.	1510 ft.

Figure 3(a) – Comparison of Niobrara resistivity logs to an EM profile measured over the Beecher Island Field. The table (3b) shows a comparison of the EM measurements with actual well measurements.

Figure 4 – EM-derived structure map from 29 "virtual" logs gathered adjacent to existing wells. The map indicated a prospect lead to be too small to support the cost of drilling and development.



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trapped accumulations. Typical gas wells produce under 500 MCFPD and have reserves averaging from 100-700 MMCF up to 2 BCF per well.

Formation resistivity is 1-2 ohm-m in wet wells and 4-25 ohm-m in producers.

Beecher Island Field covers 27 square miles; production is at 1,400 feet, with 200 feet of structural closure.

One of the EM tests was done on the field's crest. The results (figure 3) show that when the Niobrara is gas saturated, EM can measure the depth and resistivity of the pay zone.

A survey also was conducted over the structural lead shown in red (figure 4) at an 1,800-foot depth. The survey resulted in 29 "virtual" logs being added to existing subsurface data to produce the EM-derived structure map.

The lead was verified to the northwest, but proved to be substantially smaller than expected. EM verified a structure that was too small to drill because of remote pipeline access.

In this case, EM saved thousands of acreage, drilling, completion and other exploration dollars that otherwise would have been spent on an uneconomic venture.

Applications

Reconnaissance work can be done as well as prospect evaluation, because the method is fast, adaptable and relatively inexpensive.

❒ Since lateral facies boundaries can cause resistivity changes, the system can be used for stratigraphic exploration.

❒ Reservoir work, such as gas storage projects, can use EM for field boundary delineation. Reservoirs like the Eagle Sand in Montana, shallow gas in California and the Trenton, Clinton and other shallow formations in the eastern United States can be mapped.

❒ EM can map shallow coal beds because they have strong resistivity contrast with surrounding rocks.

❒ Local conductivity variations in coal beds also can be mapped.

❒ Other areas that can benefit are minerals and groundwater exploration, archeological and environmental work.

The current EM system's depth limit is about 2,500 feet, but signal penetration is area dependent and some areas allow deeper penetration. Advanced system designs will soon permit recording well below 5,000 feet.

A conductivity contrast is necessary for the tool to work. In the examples presented, productive Niobrara generally has a 100 percent or greater contrast, but EM detects much lower contrasts. Mineralized zones are identifiable since they generally show very high contrasts.

Effective analysis of EM profiles requires calibration to known subsurface conditions. Cultural problems affecting use are electric transmission lines, pumps, pipelines with cathodic protection and high traffic areas.

EM surveys are highly efficient – analysis is completed in a few days, allowing for great acquisition versatility. Because of this, the crew can be redirected to sample an anomaly on a tighter grid before moving.

EM also is easy on the environment, lowering permitting costs due to negligible surface disturbance.

The Bottom Line

The main advantage of an EM survey is its low cost compared to 3-D seismic designed for high frequency at shallow depths. This is especially true when the cost of three-component data necessary for subsurface fluid detection is added to the basic 3-D cost.

(Editor's note: Terry Donze is an independent geophysicist/geologist working in Denver.) ❒

BUSINESS SIDE OF GEOLOGY

'Mean' Can Mean A Lot to the Project

By PETER R. ROSE

There seems to be a lot of confusion about the relationship between chance of success for a drilling prospect and various possible outcomes of recoverable reserves. Such confusion could lead to bad E&P business decisions.

Here's an example: Assume an onshore trend wildcat (Prospect Alpha) in a known play. The estimated prospect reserves distribution (PRD) is shown in figure 1: P90 = .15MMBOE, P50 = 1.0MMBOE, P10 = 7.0MMBOE.

Employing Swanson's Rule, the mean (= average) of the PRD, truncated at P1 and P99, is about 2.5MMBOE, which happens to fall at about P27.

Assume further that Prospect Alpha's chance of success (Pc = Pcompletion) is estimated at 30 percent.

In simplistic applications of E&P risk analysis, the prospect-team would say that the chance of success represents their confidence in "landing somewhere on the PRD," the mean of which is about 2.5MMBOE.

But that's not the same as saying that Prospect Alpha has a 30 percent chance of finding 2.5MMBOE!

Figure 2 expresses reality, and presents quite a different picture. It confirms that the team is 30 percent sure (Pc = 0.3), that Prospect Alpha will find 30,000 BOE (= P99) or more, and that the Swanson's Mean of all reserve outcomes between P99 and P1 is indeed about 2.5MMBOE.

However, what's the chance of finding the P90 reserves outcome (= .15MMBOE) or more? That's 0.3 x 0.9 = 27 percent.

How about the P50 outcome (1.0MMBOE) or more? That's 0.3 x 0.5 = 15 percent.

What about the P10 outcome (7.0MMBOE) or more? That's 0.3 x 0.1 = 3 percent!

Now, back to the original question: What's the chance of Prospect Alpha finding the mean reserves outcome of 2.5MMBOE or more?

Answer: 0.3 x 0.27 = 8 percent.

A key point here – whenever you're working in the cumulative probability domain, always remember to add "or more" to any reserves outcome.

* * *

Now let's introduce another dose of reality.

Again, following simplistic risk analysis procedures, we would construct a cash-flow model of the project – based on the mean reserves outcome, laying

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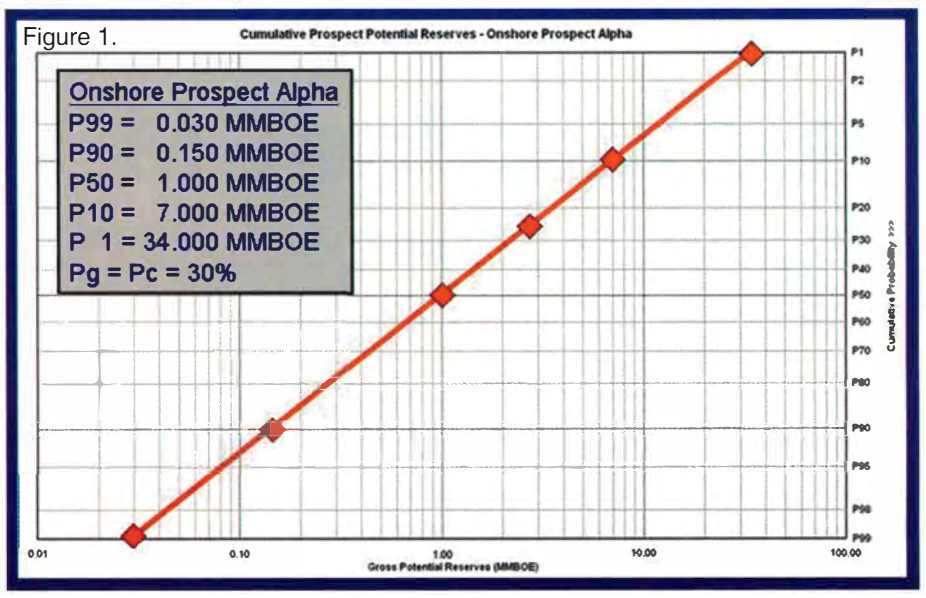
Figure 1.



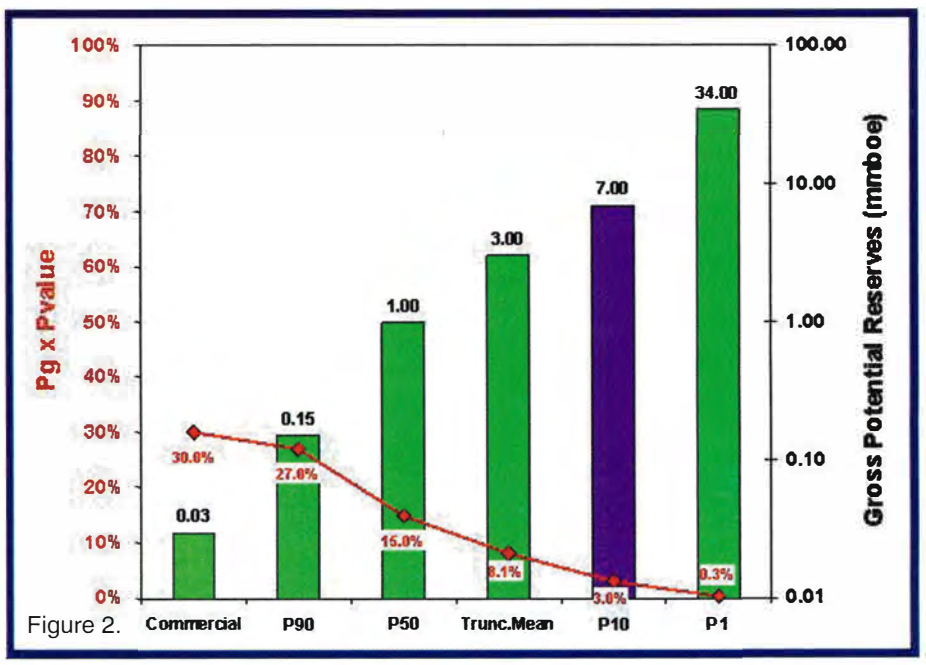


Figure 2.

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out projected investments, production revenues and operating costs over the life of the contemplated field and taking into account the time-value of money.

Obviously, such a cash-flow model has to "fit" the geologic parameters leading to the mean reserves outcome – that is, the values employed for numbers of development wells must be compatible with the mean productive area.

Similarly, projected production rates must be compatible with average net pay and HC-recovery factors for the mean reserves case.

The result is project present value (PV) that fits the geology and risk analysis.

Now, suppose that the PV of the mean reserves case (2.5MMBOE) turns out to be $10MM, discounted at 8 percent – or $4 PV per recoverable BOE.

If you're still tracking, you already realize that Prospect Alpha does not have a 30 percent chance of being worth $10MM, or more! If the $4 PV per BOE is constant for all reserves outcomes, we could say there's:

✓ A 27 percent chance of a result worth $0.6MM (.15MMBOE x $4 PV/BOE) or more.

✓ A 15 percent chance of reserves worth $4 MM (1MMBOE x $4 PV/BOE), or more.

✓ A 3 percent chance of reserves worth $28MM (7.0MMBOE x $4 PV/BOE) or more.

But in the real world, we know that PV/BOE is seldom constant. Onshore, relative profitability is commonly larger for large fields than small ones (usually because of economies of scale), so PV/BOE is successively greater for the P90, P50, mean and P10 outcomes.

Let's suppose that PV/BOE for the P90 reserves case (.15MMBOE) is (-)$2, giving a PV of $(-)$.30MM, which indicates an outcome that is commercial but not full-cycle economic.

For the P50 case, PV/BOE is $3, giving a PV of $3.0MM. And for the P10 case, PV/BOE is $5.50, giving a PV of $38.5MM. The mean of the calculated PV's is $12.7MM, substantially more than the PV of the mean ($10MM).

Simplistic risk analysis procedures have undervalued Prospect Alpha!

* * *

A few concluding comments:

❒ For many international production-sharing contracts, PV/BOE *decreases* as size of discoveries increases because the country-share gets larger as field size gets larger. Offshore projects may show non-linear "step-functions" in the PV/BOE curve, owing to irregular variations in costs of marine facilities.

❒ The implication here is that proper economic evaluation of prospects requires not one economic run, but at least three.

Some overworked reservoir engineers may understandably complain that this approach triples their work, generating economic analyses. However, getting the appropriate project mean PV will lead to more realistic evaluations, better decisions and improved profitability – and that's well worth the extra time and work!

In any case, however, it's usually better to calculate the mean of all the PVs rather than the PV of only the mean reserves case.

Some overworked reservoir engineers may understandably complain that this approach triples their work

Most important, though, is to understand the difference!

* * *

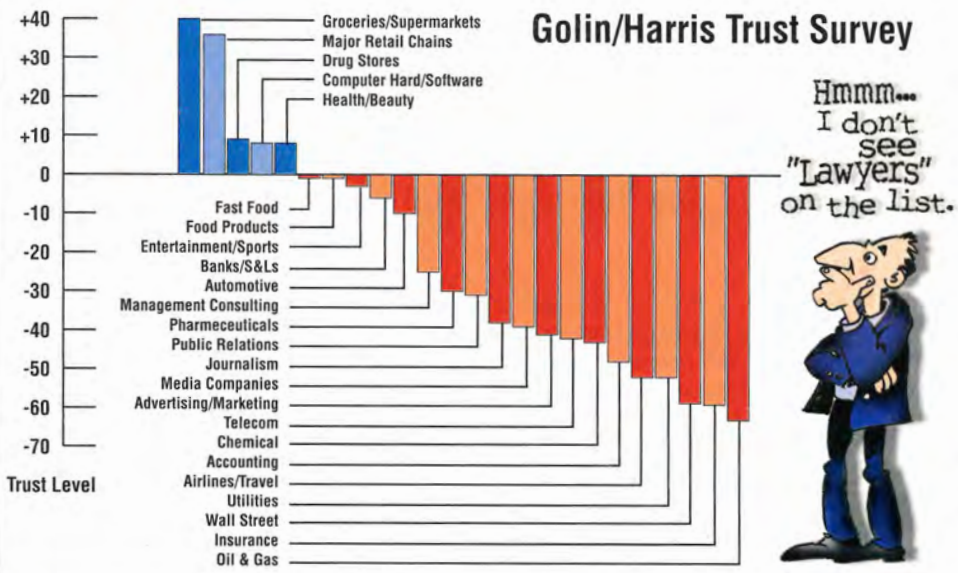
Recommended Reading: *The Nature of Economies*, by Jane Jacobs, Modern Library (Random House), 2000.

A very interesting, very unusual little book (190 pp.) by a distinguished American author that explores the remarkable similarities between ecological and economic communities – and establishes clearly that, rather than ecology and business being natural enemies, they are in fact both part of the same larger natural system, with many mutually beneficial benefits.

I've read this book twice now, and believe it should be required reading for environmental activists as well as free-market proponents.

Read it, you'll like it!

(Editor's note: Peter R. Rose is senior partner of Rose & Associates, Austin, Texas.)



The Answer Is ...

We Don't Think Too Much of Them Either

(Editor's note: Well, did you have a good Valentine's Day last month? Did all that talk about love make you feel important, significant and admired?

Good. Now let's get back to reality.

For the past several months the EXPLORER has offered this column as a service to our members – it's our way of helping you prepare yourself to educate the public about your profession and industry. They have questions, and we provide answers here that are so basic even THEY can understand them.

But this month, the question is designed to help you, our wonderful members – because, it turns out, THEY already have some thoughts about you and your professional life.

Question of the month: Is the public's opinion of the petroleum industry really low, or is that media propaganda?

Short answer: It's even worse than you think.

And if you think there's nothing wrong with having J.R. Ewing for a neighbor, brace yourself ...

A recent Golin/Harris poll asked what industries people felt they could trust. The oil and gas industry finished dead last, with a negative 63 percent rating.

Surveys taken during times of high oil prices find public sentiment running 4-to-1 against the industry.

Roger Olien is a history professor and J. Conrad Dunagan Chair of Regional and Business History at the University of Texas of the Permian Basin in Odessa, Texas. With Diana Davids Olien, he wrote the book *Oil and Ideology: The Cultural Creation of the American Petroleum Industry.*

Their work traces the growth and reputation of the industry from its beginnings through World War II, a time when the Rockefeller-Standard Oil monopoly first turned public opinion against Big Oil.

"I don't think it's changed much at all. The industry today is seen more accurately as a global big business," Olien said. "With the disappearance of three of the Seven Sisters, it's hard to argue with that."

Olien attributes the public's view of the petroleum business, in part, to "a pervasive ignorance of economics." And the industry hasn't had much success in spreading its story, he noted.

Shell Oil did release a series of short education films about petroleum in the 1960s, Olien recalled. "The text was sort of high school level and the photography was beautiful," he said, "but nobody has followed up on it."

In fact, hundreds of millions of dollars have been spent over the years to turn public opinion around – to little avail.

Speeches and statements from industry leaders don't do any good at all, Olien observed:

"Anything they say is seen as self-interested, for good reason."

– DAVID BROWN

INTERNATIONAL BULLETIN BOARD

(Editor's note: This column is devoted to international items of note to the AAPG, including the activities of AAPG-related groups around the world.

News items, press releases and other information should be submitted to the EXPLORER/International Bulletin Board, P.O. Box 979, Tulsa, Okla. 74101; telephone: 918-560-2616; fax: 918-560-2684; or e-mail: dfree@aapg.org.)

AAPG's international members, for administrative purposes, are organized on a regional basis, allowing for better communication and representation in association matters.

Listed here are the current presidents of the six international regions, along with contact information for each.

These leaders, plus the overall international organization, are responsible for your link to AAPG.

❒ **Africa** – Adebayo O. Akinpelu, manager of exploration, shelf president, Chevron Nigeria Ltd, Lagos, Nigeria. Telephone – 234 (1) 260 0600, ext. 8455; fax – 234 (1) 260 0600, ext. 7746; e-mail: OAKI@ChevronTexaco.com.

❒ **Asia/Pacific** – John Kaldi, director, National Petroleum Centre for Geology and Geophysics, University of Adelaide, Adelaide, Australia. Telephone – 61 (88) 303 4291 (general), or 61 (88) 303 4299 (direct); fax – 61 (88) 303 4345; e-mail: jkaldi@ncpgg.adelaide.edu.au.

❒ **Canada** – John Hogg, vice president, Atlantic Canada offshore and new ventures, EnCana Corp., Calgary, Canada. Telephone – (403) 645-2533; fax – (403) 645-2926; e-mail: john.hogg@encana.com.

❒ **Europe** – Frithjof Overdal , BP Norway, Stavanger, Norway. Telephone – 47 (52) 01 4320; e-mail: oeverdf@bp.com.

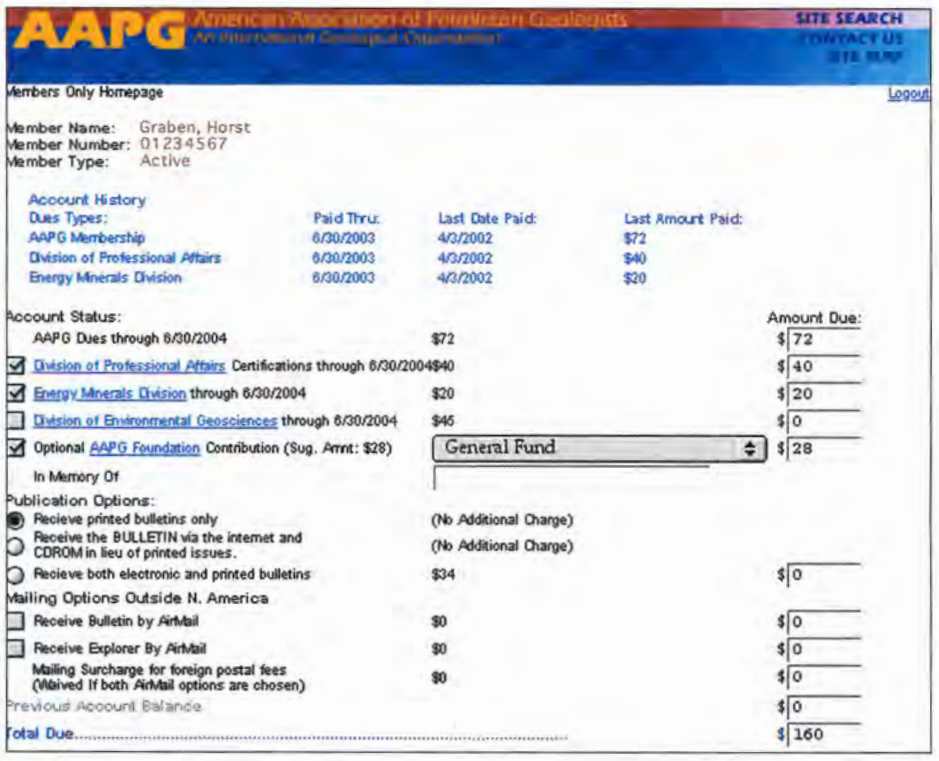
❒ **Latin America** – Marcio Rocha Mello, Analytical Solutions, rio de Janeiro, Brazil. Telephone – 55 (21) 257 91105; e-mail: marcio@anasol.com.br.

❒ **Middle East** – Mahmoud M. Abdul-Baqi, Aramco, Dhahran, Saudi Arabia. Telephone – 966 (3) 875 5327; fax 966 (3) 873 8095; e-mail: orcharsa@aramco.com.sa

* * *

Meeting reminder: The 2003 CSPG/CSEG convention, "Partners in a New Environment," will be held June 2-6 at the Stampede Park Round Up Centre in Calgary, Canada.

For more information visit the Web sites at www.cspg.org or www.cseg.ca, or contact Lori Humphrey-Clements at (403) 264-5610.



AAPG American Association of Petroleum Geologists
An International Geological Organization
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Members Only Homepage — Logout

Member Name: Graben, Horst
Member Number: 01234567
Member Type: Active

Account History

Dues Types:	Paid Thru:	Last Date Paid:	Last Amount Paid:
AAPG Membership	6/30/2003	4/3/2002	$72
Division of Professional Affairs	6/30/2003	4/3/2002	$40
Energy Minerals Division	6/30/2003	4/3/2002	$20

Account Status:		Amount Due:
AAPG Dues through 6/30/2004	$72	$ 72
☑ Division of Professional Affairs Certifications through 6/30/2004	$40	$ 40
☑ Energy Minerals Division through 6/30/2004	$20	$ 20
☐ Division of Environmental Geosciences through 6/30/2004	$45	$ 0
☑ Optional AAPG Foundation Contribution (Sug. Amnt: $28)	General Fund	$ 28
In Memory Of		
Publication Options:		
◉ Recieve printed bulletins only	(No Additional Charge)	
○ Receive the BULLETIN via the internet and CDROM in lieu of printed issues.	(No Additional Charge)	
○ Recieve both electronic and printed bulletins	$34	$ 0
Mailing Options Outside N. America		
☐ Receive Bulletin by AirMail	$0	$ 0
☐ Receive Explorer By AirMail	$0	$ 0
Mailing Surcharge for foreign postal fees (Waived if both AirMail options are chosen)	$0	$ 0
Previous Account Balance		$ 0
Total Due		$ 160

www.update

We're Doing A Lot Of Business Online

By JANET BRISTER
Web Editor

Online transactions are starting to pop up throughout AAPG's Web site.

Members have requested the ability to pay their membership dues online. Today that function is a reality.

AAPG's Executive Director Rick Fritz "christened" the new system (and is now current on his 2004 dues – thanks, Rick).

You'll find the interface pretty straightforward. It reflects the invoice that you received from AAPG for your Active membership – complete with division options, optional Foundation donation, etc.

All other members will have the opportunity to pay their dues through our site once their statements are mailed to them in April.

Let us know what your experience was like.

Why Stop There?

Since you already have your credit card in hand, why don't you use the online registration for the annual meeting?

To date close to 60 percent of attendees have successfully registered online for the Salt Lake City meeting. In fact, here are a few hints that will help the registration experience.

✓ First, find your printed registration form. If you don't have that, go into the registration information area and print a copy of the form.

✓ Browse through the meeting information. Check on the field trip, course or event you wish to attend and look for cancellations or sold out notices.

✓ Mark the event(s) on your printed registration form.

NOW you are ready to enter the registration area.

Once your registration is complete, print the final page that acknowledges your order.

Remember, the acknowledgment is NOT a receipt for events you'll be attending – it just shows you what you ordered. You will receive a confirmation later showing what you are successfully registered for.

Good browsing!

inMEMORY

Marie Bellomy, longtime executive director of the West Texas Geological Society, died Dec. 9 in Midland, Texas.

Bellomy began her association with the organization in 1962 as office secretary for the Joint Societies Office. She became the WTGS executive director in 1979.

Ball, Mahlon Marsh, 72
Evergreen, Colo., Oct. 4, 2002
Calcraft, Andrew Philip, 49
Brisbane, Australia, Nov. 16, 2002
Cobb, Robert Eugene, 73
Dallas, Jan. 9, 2003
Foote, Richard Q., 76
Navasota, Texas, Dec. 18, 2002
Hailey, Johnny Bill, 60
Abilene, Texas, Dec. 28, 2002
Helland, James Hans, 80
San Antonio, Dec. 25, 2002
McKee, Hugh, 81
New Orleans, Jan. 13, 2003
Passel, Charles F., 87
Abilene, Texas, Dec. 27, 2002
Priddy, Charles Parrish (AC '61)
Huntington Beach, Calif.
Shane, John W., 78
Farmersburg, Ind., Dec. 24, 2002
Sims, Samuel Eberle, 88
Houston, Nov. 5, 2002
Smith, Andrew Allan, 56
Folsom, Calif., Feb. 11, 2002
Werner, Hans Helmut (AC '57)
Opp, Ala.

(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.)

MEETINGS OF NOTE

Editor's note: Meetings listed here are sponsored by AAPG or an affiliated group. An asterisk denotes a new or changed listing. For further information on these listings contact the AAPG convention department (convene@aapg.org).

Also, a comprehensive list of earth science meetings is maintained by the American Geological Institute on its Web site, which can be accessed via a link from AAPG's Web page (www.aapg.org).

2003 U.S. Meetings

May 5-8, Offshore Technology Conference, Houston.

May 11-14, AAPG Annual Meeting, Salt Lake City, Utah.

May 21-23, Pacific Section, AAPG, annual Section meeting, Long Beach, Calif.

* Sept. 3-7, AAPG Foundation Trustees Associates, annual meeting, Whistler, B.C., Canada.

Sept. 6-10, Eastern Section, AAPG, annual Section meeting, Pittsburgh.

Sept. 9-11, APPEX (AAPG Prospect and Property Exposition), AAPG, Houston.

* Sept. 21-24, Society for Organic Petrology, annual meeting, Washington, D.C.

* Oct. 5-8, Society of Petroleum Engineers, annual meeting, Denver.

Oct. 12-14, Mid-Continent Section, AAPG, annual Section meeting, Tulsa.

* Oct. 22-24, Gulf Coast Association of Petroleum Societies, AAPG, annual Section meeting, Baton Rouge, La.

Oct. 26-31, Society of Exploration Geophysicists, annual meeting, Dallas.

Nov. 2-5, Geological Society of America, annual meeting, Seattle.

2003 International Meetings

May 25-29, Geological Association of Canada/Mineralogical Association of Canada, annual meeting, Vancouver, Canada.

May 31-June 5, Canadian Society of Petroleum Geologists, annual meeting, Calgary, Canada.

June 2-5, European Association of Geoscientists and Engineers, annual meeting, Stavanger, Norway.

* Sept. 3-7, AAPG Foundation Trustees Associates, annual meeting, Whistler, B.C., Canada.

Sept. 8-12, Offshore Northwest Europe, annual meeting, Aberdeen, Scotland.

Sept. 21-24, AAPG International Conference and Exhibition, Barcelona, Spain.

Nov. 24-26, Petroleum Geology of Northwest Europe, London, England.

April/May Education Highlights

An Overview of Exploration Play Analysis

http://www.aapg.org/education/2003/courses/rose.html
Instructors: Peter R. Rose, Rose and Associates, Austin, Texas; Gary Citron, James A. MacKay, Rose & Associates, Houston, Texas
Date: April 9-11
Location: Austin, Texas

Great intro course for staffers, attorneys, bankers

Introduction to Concepts and Techniques of Petroleum Geology – Includes 1-day Field Trip
http://www.aapg.org/education/2003/courses/landon.html
Instructor: Susan M. Landon, Independent Geologist, Denver, Colorado
Date: April 23-25
Location: Dallas, Texas

Wide array of courses and field seminars in conjunction with Salt Lake City Annual Meeting. See 2003 Annual Meeting Announcement or go to:
http://www.aapg.org/education/2003/05may.html

To get more information or register, call 1-888-945-2274 ext. 662 or e-mail educate@aapg.org

EDUCATION CALENDAR

Short courses are listed here in chronological order; field seminars are sorted by subject matter, subsorted by date. An asterisk (*) indicates a change in the dates from those previously published.

2003 Short Courses

* Quick Look Mapping Techniques for Prospect Evaluation
March 5-6, Fort Worth
(with Southwest Section meeting)

An Overview of Exploration Play Analysis
April 9-11, Austin

* Reservoir Engineering for Petroleum Geologists
April 15-16, Dallas

Introduction to Concepts and Techniques of Petroleum Geology
April 23-25, Dallas

Introduction to the Petroleum Geology of Deep-Water Clastic Depositional Systems
May 8-10, Salt Lake City
(with AAPG annual meeting)

Coalbed Methane
May 10, Salt Lake City
(with AAPG annual meeting)

E&P Methods and Technologies
May 15-17, Salt Lake City
(with AAPG annual meeting)

Applied Subsurface Mapping
July 14-18, Dallas

Terrigenous Clastic Depositional Systems and Sequences – Applications to Reservoir Prediction, Delineation and Characterization
July 22-23, Austin

Well Log Analysis & Formation Evaluation
Aug. 5-8, Austin

* Quantification of Risk – Petroleum Exploration & Production
Aug. 19-22, Golden, Colo.

Practical Salt Tectonics
Sept. 3-5, Houston

Pore Pressure Prediction in Practice
Sept. 20-21, Barcelona, Spain
(with AAPG international meeting)

Deepwater Sands – Integrated Stratigraphic Analysis
Sept. 25-26, Barcelona, Spain
(with AAPG international meeting)

Recent Advances in Normal Fault Growth and Linkage: Implications for Petroleum Exploration in Prospective Rift Provinces
Sept. 25-26, Barcelona, Spain
(with AAPG international meeting)

Structural Styles and Traps
Oct. 11-12, Tulsa
(with Mid-Continent Section meeting)

Log Analysis of Shaly Sands
Oct. 22, Baton Rouge, La.
(with GCAGS Section meeting)

Siliciclastic Sequence Stratigraphy
Oct. 25-26, Dallas
(with SEG annual meeting)

Fractured Reservoir Characterization and Modeling
Nov. 10-14, Austin

2003 Field Seminars

Carbonates

Carbonate Reservoirs: Physical Reality Meets Virtual Reality in Middle Eastern Carbonates
March 30-April 3
Begins, ends in Muscat, Oman

Carbonate Sequence Stratigraphy: Outcrop and Subsurface Seminar
April 26-May 3
Begins, ends in El Paso, Texas

*Carbonate Reservoir Characterization: From Rocks to Fluid Flow Simulation Using Sequence Stratigraphy, Paradox Basin, Utah, USA
May 15-19
Begins, ends in Durango, Colo.
(co-sponsored with SEPM, held in conjunction with the AAPG annual meeting)

Sequence Stratigraphy and Reservoir Distribution in a Modern Carbonate Platform, Bahamas
June 23-28
Begins, ends in Miami, Fla.

* Controls on Porosity, Distribution in Carbonate Reservoirs
Sept. 25-29
Begins, ends in Almeria, Spain (held in conjunction with the AAPG international meeting)

Clastics – Ancient

Clastic Reservoir Facies and Sequence Stratigraphic Analysis of Alluvial-Plain Shoreface, Deltaic and Shelf Depositional Systems
April 27-May 3
Begins, ends in Salt Lake City

Wave-Dominated Shoreline Deposits and Foreland Basin Stratigraphy, Book Cliffs, Utah: Depositional Models for Hydrocarbon Exploration
June 9-17; Aug. 18-26
Begins, ends in Moab, Utah

Clastics – Modern

Modern Clastic Depositional Environments
April 13-19; May 12-18; Sept. 22-28
Begins, ends in Columbia, S.C. and ends in Charleston, S.C.

Modern Deltas
Sept. 8-12
Begins, ends in Baton Rouge, La. and ends in New Orleans

Sequence Stratigraphy

Sequence Stratigraphy Field Seminar: Sequences and Facies on an Active Margin
Oct. 12-17
Begins, ends in La Jolla, Calif.

Tectonics and Sedimentation

Exploration Potential, Tectonic Framework and Depositional Systems of Strike Slip and Extensional Basins
April 26-May 2
Begins, ends in Palm Springs Calif., and ends in Las Vegas

Salt and Extensional Tectonics – Paradox Basin
June 1-6
Begins, ends in Grand Junction, Colo.

E&P in Thrusted Terrains, Practical

continued on next page

FOUNDATION UPDATE

AAPG Foundation officials report that 320 applications were received for this year's Grants-in-Aid program. Winners will receive letters of notification in early May; those names also will be available at the Foundation booth during the annual meeting in Salt Lake City.

Foundation General
Oluwafeyisola S. Adegoke
Nick Banbury
Richard R. Bloomer
In memory of Charles F. Passel and Johnny Bill Hailey
ChevronTexaco Corporation
John David Edwards
Oboho Okon Eminue
Emosivwe Evwodere
William L. Fisher
James A. Gibbs
In memory of Johnny Bill Hailey
Domingo Lorenzo Graneros
George C. Hale
Cam Philip Hanna
Carlos Garcia Herrera
Kjell Lindbo
Dion R. Lobreau
Michael Joseph Mellin
Peter Morris
Kazuo Nakayama
James C. Phelps
William D. Pollard
Jason William Robinson
Peter Robert Rose
Eugene Merle Shearer
Yuriy Yakymchuk

Awards Fund
Carlos Arturo Dengo
For the Gabriel Dengo Award, Best International Paper

K-12 Fund
Robert Fiore
John McCamey Sweet
In memory of Anna Drew Agatston

Digital Products Fund
Bruce Norman Atkins

Grants-In-Aid
Charitable Gift Fund

Ken Stanley Named Grant
Kevin T. Biddle
Richard S. Bishop
Tammy Suter Christopher
James W. Flannery
Phillip Neil Goss
Ronald W. Miller
David Pitcher
William F. Threlfall

James Hooks Named Grant
Paul H. Dudley Jr.

R.E. McAdams Named Grant
Lawrence Gordon

Donald O'Nesky Named Grant
William L. Fisher

Weimer Family Named Grant
Robert J. Weimer ❑

continued from previous page

Applications of Structure and Stratigraphy in the Montana/Alberta Foothills
July 15-21
Begins, ends in Calgary, Canada

Submarine Fan and Canyon Reservoirs, Calif.
Sept. 29-Oct. 4
Begins in San Francisco
Ends in Bakersfield, Calif.

A Geotour
* Grand Canyon Geology via the Colorado River, Ariz.
May 4-11
Begins in Marble Canyon, Ariz., ends in Marble Canyon or South Rim, Ariz., or Las Vegas (preceding the AAPG annual meeting in Salt Lake City) ❑

CALL FOR ABSTRACTS

Guidebook and Oral Session

WYOMING GEOLOGICAL ASSOCIATION
2003 FIELD CONFERENCE

WYOMING OIL: RESOURCES & TECHNOLOGY
REVERSING THE DECLINE

September 7 - 8, 2003
Casper, Wyoming

- Subjects should be related to Wyoming and Rocky Mountain oil exploration, production, and enhanced recovery projects; past and future.
- Abstract length: 250 words.
- Abstracts can be emailed to the WGA office at: **wyogeo@trib.com**

Abstract Deadlines
Guidebook: March 15, 2003
Oral Session: April 15, 2003

2003 General Chairman: Chris Mullen, Wold Oil Properties, (307) 265-7252

Guidebook Chairwoman: Martha Horn, Wyoming Oil and Gas Commission, (307) 234-7147, mhorn@state.wy.us

Program Chairman: Mark Milliken, Critique, Inc.
(888) 599-2200 Ext. 5162, milliken@coffey.com

The Saskatchewan Geological Society

invites you to attend a

CORE WORKSHOP

in conjunction with the

Eleventh Williston Basin Horizontal Well and Petroleum Conference
(April 27 - 30, 2003)

April 27, 2003
Saskatchewan Industry and Resources Core Laboratory
201 Dewdney Ave. East
Regina, Saskatchewan, Canada

***Registration*: $75 (includes Core Workshop Volume)**
$30 - Students (Core Workshop

For more information, please call:
(306) 787-7662 Canada or (701) 328-8000 United States
or visit: http://www.gov.sk.ca/enermine/about/semnew.htm
http://www.gov.sk.ca/enermine/about/semnew.htm

The workshop will follow an informal presentation format with the emphasis on providing a forum to exchange ideas and concepts.

MEMBERSHIP AND CERTIFICATION

The following **candidates** have submitted applications for membership in the Association and, below, certification by the Division of Professional Affairs. This does not constitute election, but places the names before the membership at large. Any information bearing on the qualifications of these candidates should be sent promptly to the Executive Committee, P.O. Box 979, Tulsa, Okla. 74101. (Names of sponsors are placed in parentheses. Reinstatements indicated do not require sponsors.)

For Active Membership

California

Acord, John W., Occidental of Elk Hills, Tupman (R.L. Countryman, W.E. Gray, W.T. Long)

Colorado
Belanger, Kelly Sue, Anschutz Exploration, Denver (E.D. Dolly, M.R. Thomasson, D.W. Bean)

Louisiana
Carmody, Thomas G., Mallard Drilling, Shreveport (reinstate); **Catchings, Robert Franklin**, independent, Baton Rouge (reinstate); **Craig, Peter Andrew**, Shell E&P, New Orleans (S.A. Waters, T.V. Wilson, K.W. Bramlett); **Schneider, Robert Vincent**, University of Louisiana at Lafayette, (R.R. Blackburn, B.E. Lock, G.L. Kinsland)

Nebraska
Birge, Bruce Paul Jr., Saberprobe, Omaha (reinstate)

Texas
Chaboudy, Louis R. Jr., Veritas Exploration, Houston (reinstate); **Coterill, Katrina**, Vanco Energy, Houston (G. Tari, G.D. Cummins, E.P. Moldovanyi); **Dolan, Michael P.**, ExxonMobil Exploration, Houston (R.S. Bishop, W.W. Knaup, R.J. Powell); **Moretti, George Jr.**, consultant, The Woodlands (J.F. Thompson, G.C. Veeder, J.W. Huggins); **Pillar, John Edwin**, Exxon Exploration, Houston (E.D. Goodman, A.N. Foster, T.A. Queffelec); **Strassner, David Barse**, Strassner Oil & Gas, Houston (reinstate); **Thomas, Gregory Scott**, Delta Oil & Gas, Breckenridge (B.N. Shepherd, J.D. Thomas, G.A. Norman)

Utah
Bon, Roger Lee, Utah Geological Survey, Salt Lake City (T.C. Chidsey Jr., B.T. Tripp, C.D. Morgan)

Argentina
Borbolla, Maria Claudia, ChevronTexaco, Buenos Aires (M.E. Lara, I.A. Orchuela, L. Legarreta)

Bulgaria
Kovachev, Veselin Vasilev, Sofia University, Sofia (G.K. Ajdanlijsky, W.P. Grun, R.R. Gries); **Petrov, Ivan Pavlov**, REXIMseis Ltd., Sofia (G.K. Ajdanlijsky, W.P. Grün, F. Picha)

Canada
Arts, Astrid E., ConocoPhillips Canada, Calgary, (G.E. Reinson, P.M. Lulman, S.E. Lavender); **Bauman, Peter E.**, Burlington Resources, Calgary (R.J. Joy, C.W. Evert, R.B. Owens); **Lau, Thieng (Tim)**, Primewest Energy, Calgary (P.A. Bower, B.R. Spence, P.L. Churcher)

Czech Republic
Krejci, Oldrich, Czech Geological Survey, Brno (F.J. Picha, J. Francu, G. Wessely)

England
Staffurth, Joseph Hugh, JSI Services, Leigh (M.J. Lakin, S.L. Veal, C.P. Moyes); **Taylor, Gordon Robertson**, Hydrosearch Associates, Woking (C. Murray, D.W. Paterson, M.J. Lester)

Egypt
Saoudi, Ati Abdel, Devon Energy Egypt, Cairo (reinstate)

Germany
Wagner, Karen, Wintershall AG, Kassel (J.E. Clever, E. Oehms, P. Schwans)

India
Bhaumik, Biswanath, Oil & Natural Gas, Mumbai (D.K. Dasgupta, M.S. Srinivas, A.M. Chitrao); **Chatterjee, Himadri Sekhar**, Oil & Natural Gas, Dehra Dun, (R. Husain, P.M. Lloyd, J. Kaldi); **Doppalapudi, Surendra Mohan**, Oil & Natural Gas, Chennai (R.N. Mishra, V. Venkatesh, A. Chaudhuri); **Patel, Sushil Kumar**, Oil & Natural Gas, Gujrat (M.K. Ghosh, G. Lahiri, D. Das); **Pattabhiraman, C.**, Oil & Natural Gas, Dehradun (K. Palakshi, P. Mohapatra, K.V. Ajay); **Sheikh, Anis Ahmed**, Oil & Natural Gas, Mumbai (D. Gupta, M.S. Srinivas, R.K. Upadhyay); **Singh, Shailendra Kumar**, Oil & Natural Gas, Dehradun (P.M. Lloyd, J. Kaldi, S.K. Das); **Thakore, Avinash B.**, Oil & Natural Gas, Mumbai (reinstate)

Netherlands
Schmiermann, Ignace G.W., Shell China E&P, The Hague (A. VanVliet, A.M. Brandenburg, J. Yu)

Nigeria
Akin-Odidi, Adebola O., Chevron Nigeria, Lagos (A.O. Akinpelu, V.A. Onyia, A.R. Adejobi)

Norway
Darke, Gillian, Statoil ASA, Forus (S.N. Ehrenberg, B.A. Tocher, P.H. Nadeau)

People's Republic of China
Zongquan, Hu, China Petroleum & Chemical, Beijing (S. Li, C. Lin, L. Qi)

Peru
Carpio, Alvaro, University Nacional San Aagustin, Arequipa (F. Porturas, I. Kristoffersen, F. Overdal)

Russia
Tarasova, Elena Vasilyevna, PF KubanGasGeophysics, Krasnodar (E.A. Ablia, A.M. Gumen, A.A. Kitchka)

Saudi Arabia
Sakloua, Aboud M., Saudi Aramco, Dhahran (I.A. Al-Ghamdi, M.O. Alamoudi, C.J. Heine)

Certification

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

Petroleum Geologist

Oklahoma
Amruthapuri, Gopal Renganatha, consultant, Tulsa (L.F. Baie, B.R. Mills, I.C. Thomson)

Texas
Clayton, Chris B., Guinn Investments, Graham (T.L. Boyd, R.L. Harding, R.H. Springer); **Metzgar, Craig Robert**, ChevronTexaco, Bellaire (B.E. Toelle, R.W. Blake, M.W. Campbell); **Pignone, Thomas Joseph**, Gaffney, Cline & Associates, Houston (J.R. Weston, R.E. Curtis, W.A. Lau); **Schneider, William Joseph**, consultant, Katy (J.R. Dungan, M.C. Hanna, B.K. Reitz); **Simpson, Jimmie Darrell**, consultant, Cedar Hill (T. Mairs, J. Wyszynski, A.J. Moherek)

Petroleum Geophysicist

Louisiana
Heppermann, Jeffrey Joseph, Ocean Energy, Lafayette (K.A. Bowker, C.M. Smith, R.K. Woidneck)

Texas
Falkenstein, Bruce Anthony, Transmeridian Exploration, Houston (G.R. Bole, K.P. McNeill, P.R. Manoogian) ❑

PROFESSIONAL NEWS BRIEFS

Thomas C. (Tom) Anderson, to vice president-services, Landmark Graphics, Houston. Previously operations director, Landmark Graphics.

Patrick M. Bouisset, to exploration manager, TotalFinaElf E&P Borneo B.V., Bandar Seri Begawan, Brunei Darussalam. Previously exploration assets manager, Total Austral, Buenos Aires, Argentina.

Christopher H. Bradley, to senior geological specialist, Kerr-McGee, Houston. Previously geological advisor, Conoco, Houston.

Richard T. Buffler has retired from the University of Texas at Austin after 28 years. He will continue his professional activities from his home base in Berkeley, Calif.

Charles Burshears, to senior geologist, XTO Energy, Fort Worth. Previously exploration manager, GMX Resources, Oklahoma City.

Paul D. Ching, to director SepTAR (Shell Exploration Production Technology Application and Research), Shell International E&P, Rijswijk, The Netherlands. Previously general manager-Sarawak business unit, Shell Malaysia E&P, Miri, Malaysia.

Steve Conger, to Shell Deepwater Services, Houston. Previously with TotalFinaElf, Houston.

Andrew L. Evans, MBA class, Stanford Business School, Stanford, Calif. Previously manager of international exploration and new ventures, Canadian Hunter Exploration, Calgary, Canada.

Tom Feldkamp, to lead geologist, North American onshore new ventures, Kerr-McGee, Denver. Previously chief geologist, Geotrace Reservoir Services, Denver.

Kevin P. Guilbeau, to senior vice president and general manager-offshore, Dominion Exploration and Production, New Orleans. Previously vice president-offshore exploration, Dominion E&P, New Orleans.

Rog Hardy has been appointed to the technical leadership group, Coeur d'Alene Basin Environmental Improvement Commission, representing Beneway County, Idado. He is an international exploration consultant, Harrison, Idaho.

Rick E. Hart, to exploration geologist, Brigham Exploration, Austin, Texas. Previously chief geologist, Contour Energy, Houston.

Don Harville, to manager-Canadian rocks, Core Laboratories Canada, Calgary, Canada. Previously reservoir geology manager, Core Laboratories, Houston.

John Hooper, to general manager-geophysical analysis, Fusion Geophysical, Norman, Okla. Previously senior geophysical advisor, Conoco Seismic Imaging Technology Center, Ponca City, Okla.

Brent Hopkins, to exploration manager, GEDD Inc., Corpus Christi, Texas. Previously independent, Corpus Christi.

Rick Ippolito, to exploration manager, Quintana Minerals Resources, Calgary, Canada. Previously senior geologist, Marathon Canada, Calgary.

Jim Lantz, to development geologist-Jurassic and Cretaceous gas reservoirs, BP Amoco Production, Houston. Previously development geologist, BP Amoco UK.

David Reinkemeyer, to senior geoscientist, eSeis Inc., Houston. Previously consultant, Houston.

Pete Rushworth, to senior GIS consultant, Delinea, Houston. Previously GIS consultant, Katy, Texas.

Chris Stamm, to geological advisor, Devon Energy, Oklahoma City. Previously senior staff geologist, Mitchell Energy and Development, The Woodlands, Texas.

Mark T. Sunwall, to exploration manager-Gulf of Mexico shelf, Woodside Energy, Houston. Previously exploration manager-deepwater Gulf of Mexico, Texaco, Houston.

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

Cairo Meeting Awards Announced

Technical award winners have been announced for the 2002 AAPG international meeting in Cairo, Egypt.

The awardees will receive their honors during the opening session of the AAPG Annual Meeting May 11 in Salt Lake City.

The Cairo winners are:

Gabriel Dengo Memorial Award

The award for best paper goes to Robert Francis Martin, with BP Egypt, Cairo, for "The Future of 4-D in the Nile Delta."

Martin's co-authors are James A. Keggin and Giles F. Watts, both also with BP Egypt, Cairo.

Ziad Beydoun Award

The award for best poster goes to co-authors Philip D. Heppard, Daniel Ebrom, Michael Mueller and Leon Thomsen, all with the upstream technology group, BP Amoco, Houston; and Toby Harrold, upstream technology, BP, Sunbury, England, for "Using Shear and Vp/Vs to Predict Overpressure in Petroleum Basins."

READERS' FORUM

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

Ethics

Dan Smith's President's Column (January EXPLORER) on reacting to ethics issues should not be necessary except for a few blemished corporations. Corporate culture is a thing of the past as mergers continue. In the early 1960s an article in *Heritage Magazine* was titled "What Happened To Personal Ethics," and was a discussion topic by a group that got together.

In my opinion the areas of engineering and geology have been one of ethical practice. Since Roman times, schemes to lighten another's pocket have existed by a few unethical persons.

I think many a driller's comment that "the drill bit does not lie" was used to question why a well was being drilled. Experienced professionals could spot a scheme in the making – and if necessary know how to obtain the necessary information. Maybe the 1970s and 1980s brought forward participation arrangements to have inexperienced investors who were questionable – and have ended up in litigation ...

A course on ethics must include the origin of the subject and should not be limited to western ecclesiastical thought. The phrase, "there is nothing new under the sun" applies to this subject, as the principles have an origin with the beginning of civilization.

An ethical practitioner may not be rich, but successful as an oil finder.

Harry L. Siebert
Dolores, Colo.

Mediterranean Impact?

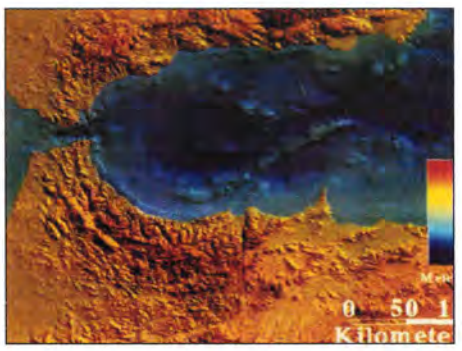
Regarding Michael Stanton's commentary (December EXPLORER) on the possible origin of the Gulf of Mexico as a gigantic impact crater: This may be one of many so far unrecognized events in the geologic past. Whether he be right or wrong I cannot comment – however, I'd like to bring the members' attention to a more recent impact crater that also had some devastating effects and explains another anomaly in plate reconstructions.

The image (at right) shows the western end of the Mediterranean Sea, the Alboran Sea to be precise. In the north lies Spain and to the south, Morocco. The Straits of Gibraltar are clearly visible. It does not take a genius to recognize the familiar circular pattern both in the sea floor and in the surrounding mountains.

As a geologist working in Morocco in the mid-1980s one of my tasks was to attempt to balance sections through the Rif Mountains. I was never satisfied with the results, as I just could not make it work.

I hypothesize that the reason for this is not due to my incompetence, but rather to the effects of a gigantic meteor impact in the western Mediterranean.

Like the scenario painted by Stanton's picture in the Permian Gulf of Mexico, I see a parallel in the Miocene in the western Mediterranean, where a major event gave rise to thick salt deposits of Messinian age (throughout the Mediterranean basin), as the basin's connection to the Atlantic was catastrophically closed by the uplift of the crater rim.



From the image shown, it is also possible to hypothesize that the object impacted from east to west, leaving a huge gouge mark in the sea floor and ejecting the sea floor sediments preferentially towards the west, where the Pre-Rif Nappes and their counterparts in Spain are presently preserved.

Like in the Gulf of Mexico in the plate reconstruction scheme, this model obviates the requirement for the rotation of Iberia and its collision with North Africa to produce this peculiar circular chain of mountains with an equally circular hole in its center.

The conventional plate tectonic model has the Alboran Plate gradually moving west-southwest in relation to Morocco. I suggest that this movement, if indeed it took place, was catastrophic rather than gradual. This explains the chaotic nature of the geology of both the Rif Mountains in Morocco and the Betic Alps in Spain and the numerous, apparently exotic blocks therein. It also explains the chaotic mass of the Pre-Rif Nappes which consist of a huge mass of deepwater Miocene shales lying on a Pre-Miocene subaerial erosional unconformity.

I suggest that these shales were originally deposited on the Mediterranean (Tethyan?) sea floor and were later totally ejected by the impact and over the crater rim, following which they then spread gravitationally and radially outwards from their Mesozoic substrata in the now topographically high Rif Mountains.

It is interesting to note that Messinian and later strata in the subsurface of the offshore Moroccan Mediterranean shelf display excellent seismic continuity, while the pre-Messinian section displays no seismic continuity and effectively marks the seismic basement. Unfortunately true (crystalline) basement has never been drilled and therefore there is no evidence of thermal alteration in the area of the impact itself.

I am a specialist neither in metamorphic facies nor in the geology of the Rif Mountains, but from what I understand there are unexplainable variations in the thermal maturity of the different tectonic units, which perhaps could be explained by this model.

At present this is merely my personal hypothesis, and I welcome any comments or relevant data that could throw light on the subject. However, if the hypothesis is correct it could have significant bearing on the hydrocarbon prospectivity of the Rif-Betic region.

Stuart E Munro
Copenhagen, Denmark

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DIRECTOR'S CORNER

Three 'Don't-Miss' Opportunities

By RICK FRITZ

I visited a local bookstore looking for an extra 2003 calendar but the selection wasn't great in early February. I finally gave up in my search when I realized my only two choices were a calendar with dogs standing around in men's clothing or a calendar that featured recipes based on astrology.

(Maybe we should make an AAPG calendar that features some of our geologists and geophysicist in field garb, or some of our explorationists finding energy.)

I was looking for a calendar because my thoughts have been on the new year and its possibilities. Now that we are well into 2003, it is time to start thinking about some of AAPG's major events.

In addition to a lineup of exceptional schools, sectional and regional conferences, AAPG has three main events this year that you must put on your calendar.

❒ Event No. 1: **The 2003 AAPG Annual Meeting**, May 11-14, at the Salt Palace Convention Center, Salt Lake City.

The theme for this meeting is "Energy – Our Monumental Task." Each year the technical program committee is challenged to develop an exceptional program. The organizing committee for Salt Lake City has risen to the task. The technical program for the Salt Lake City meeting is exceptional. Salt Lake City is known as "The Crossroads of the West" and the technical program committee accomplished a monumental task in preparing a program that is a crossroads of global energy resources and technical issues for finding and developing those resources.

Each offers its own unique set of opportunities, and each is important in building and developing our profession.

Items of note include:

✓ A special "Discovery" session has been added, to introduce a few new exploration discoveries.

✓ Monday is "Executive Day," with special presentations and events by and for top leaders in the petroleum industry.

✓ AAPG started the International Pavilion a decade ago, and this year it will be better than ever. AAPG is working with petroWEB to provide online access and services for the International Pavilion.

✓ Of course, the field trips held around Salt Lake City are remarkable events, and there will be short courses to meet many of your training needs.

You can view the technical session themes, field trips, short courses and other events on AAPG's homepage at www.aapg.org. Also, you can use our new registration system to register online.

If you have not been to Salt Lake City lately, I strongly recommend a visit. This always beautiful city has been made "new and improved" as a result of its preparations in hosting the 2002 Winter Olympics.

There are still good prices on airline tickets to Salt Lake City, so register now and don't miss this event.

❒ Event No. 2: **APPEX 2003**, Sept. 9-11, in Houston.

This year AAPG Prospect & Property Expo will be held for the first time in mid-September. Many APPEX participants have asked for this date, and we plan to make the post-Labor Day time frame permanent.

APPEX is the only geological and geophysical exposition of its kind, in that attendees have the opportunity to meet with many of our industry's explorationists to market and screen prospects and properties.

This year we'll be building on the success of last year's meeting with many innovations, including both a "Deep Water Pavilion" and an "International Pavilion."

Exhibition booths already are beginning to fill, so make your reservation early.

This year AAPG, in conjunction with Petris, has developed a new Web site where exhibitors can list their prospects and properties as soon as they register. Interested buyers will be able to view the prospects and properties prior to the show.

During the show exhibitors will be able to use an electronic road map to plan each day.

❒ Event No. 3: The **2003 AAPG International Conference and Exhibition** in Barcelona, Spain, Sept. 21-24.

Barcelona is also a "crossroads," and the theme for this meeting is "Crossroads of Geology, Energy and Cultures."

Barcelona is a great venue, and we are expecting one of the largest turnouts we have had for an international meeting. The organizing committee is developing a great program and exhibition, and the technical program committee has had tremendous response to the call for abstracts.

Also, like Salt Lake City, Barcelona is one of the premier locations in the world to launch spectacular field trips. In fitting with the charm of the city of Barcelona, many spouse activities, special programs and innovative, simultaneously run guest and technical field trips are planned.

Registration will be available both via hardcopy and through AAPG's new convention registration system. If you ever considered attending an AAPG international conference, this is the one.

* * *

These three meetings are the primary networking events for AAPG members for 2003. Each offers its own unique set of opportunities, and each is important in building and developing our profession.

This year, especially, there are many changes developing in the industry and the profession. We need members to meet, discuss and share. You need to be there.

Please check your calendar now – and don't miss these important opportunities.

Rick

Division at a Crossroads

DEG Looks to Define Next Decade

By STEVEN P. TISCHER
DEG Vice President

The Division of Environmental Geosciences (DEG) began as a division of AAPG in 1992 – through the diligence and insight of Bernold M. "Bruno" Hanson and others – to address the affects of environmental compliance and regulation on the oil and gas industry.

Bruno's guidance and stewardship of the division in the formative years set a strong foundation for the leadership that followed.

To celebrate 10 years as an AAPG division, Marvin Carlson (DEG Advisory board member to the Mid-Continent Section) made a recommendation to the DEG Executive Committee that a White Paper Committee be created titled "DEG – Defining Our Next Decade." Carlson recommended the committee consist of past DEG presidents and selected adjuncts. The DEG Executive Committee approved Carlson's recommendation and appointed this writer as White Paper Committee chair.

A report from the committee will be presented during the DEG luncheon at the 2003 annual meeting in Salt Lake City.

Comments were solicited from the majority of the DEG past presidents. Six former presidents responded with their thoughts on the accomplishments and setbacks of our first 10 years, and suggestions for the success of the division into the future. Respondents included Lee Gerhard, William Harrison, Susan Kiser, William Murray, Steve Veal and Michael Weathers.

The accomplishments ranked by our respondents were as follows:

1. *Environmental Geoscience* Journal.
2. Energy and environment conferences.
3. The Bernold M. "Bruno" Hanson Environmental Grant-in-Aid.
4. *Geological Perspectives of Global Climate Change.*
5. DEG sessions at the annual and international conferences.

The respondents ranked our setbacks as follows:

1. Ineffective DEG committees.
2. Too much emphasis on the global warming issue.
3. Leadership divided between broadening (all industries) versus narrowing (E&P only) the environmental focus of the DEG.

Please note that the rankings for both accomplishments and setbacks are based on the writer's interpretation of the wide range of comments received from the six respondents. Unless there were at least two respondents that commented on an accomplishment and/or setback, the suggestion is not mentioned here.

The most passionate comments from the respondents dealt with broadening versus narrowing the focus of the DEG:

❒ Two respondents suggested a need to "broaden the focus of the DEG to include environmental geosciences outside the petroleum industry."

❒ Two other respondents suggested that the DEG focus on becoming the voice for the environmental practice within the petroleum industry to separate us from other environmental organizations.

Initially, the DEG membership primarily consisted of displaced petroleum geologists who had made the career change to environmental consulting, existing environmental consultants with petroleum clients, and academicians with a connection to the oil and gas industry. Through the years DEG membership swelled with geoscience students and international geoscientists interested in environmental geoscience.

The DEG is at a crossroads. The opinions and suggestions from the former leadership of our division reflect the varying beliefs of the DEG membership.

The DEG – Defining Our Next Decade Committee has many issues to consider for the forthcoming report in Salt Lake City. ❒

DEG Names Kiser as New Treasurer

The Division of Environmental Geosciences Executive Committee has appointed Susan C. Kiser as secretary-treasurer following the resignation of William Sarni, of Denver, who served in the position since 2001.

Kiser, special projects director at Mesa County Health Department, Grand Junction, Colo., was a founding member of DEG and served as president in 1997-98.

Kiser assumes the post immediately, according to DEG President Robert J. Menzie. She will serve the remaining term through June.