HGS Bulletin
Houston Geological Society
Volume 56, Number 5
January 2014

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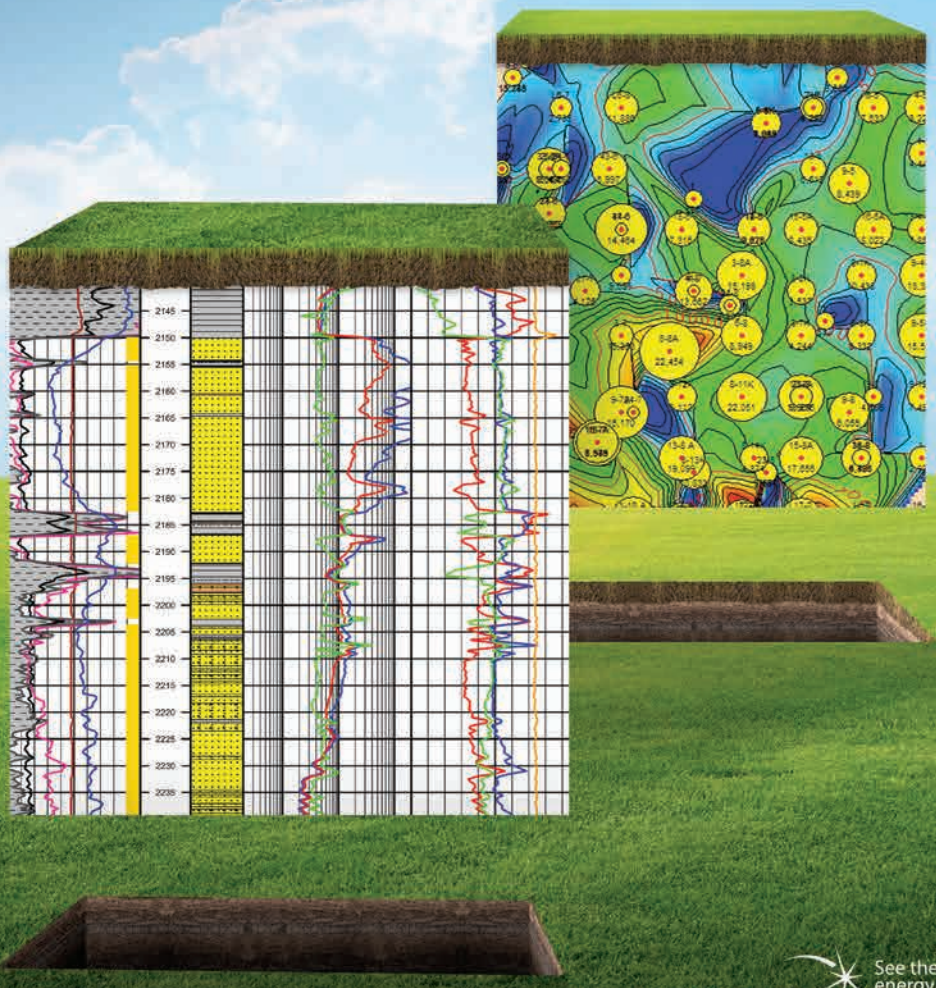

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The Bulletin
Houston Geological Society

Volume 56, Number 5 January 2014

In Every Issue

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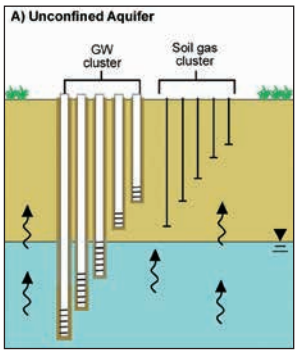

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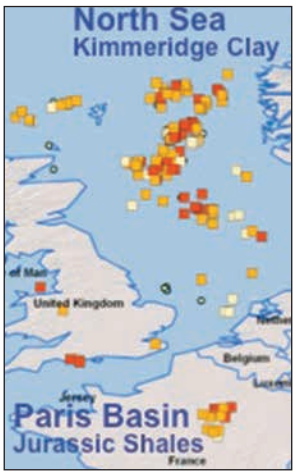

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About the Cover: The photograph shows the 40-foot high columns at "the Organ" at the Giant's Causeway, Antrim County, Northern Ireland. The columns formed during the cooling and contraction of the thick Middle Basalts known as the Causeway Tholeiite Member. The Causeway Tholeiite Member formed from a series of highly-fluidic, fine-grained, tholeiitic (olivine-poor) lavas of the Antrim Lava Group. The Antrim Lava Group, Europe's most extensive lava field and part of the Thulean Plateau, formed from eruptions in the Paleogene approximately 60 million years ago associated with to the opening of the Atlantic Ocean. The Thulean Plateau, a great basaltic lava plain which possibly extended over 700,000 sq mi, was broken up during the formation of the Atlantic Ocean leaving remnants in Northern Ireland, northwestern Scotland, the Faroe Islands, northwestern Iceland, eastern Greenland, and western Norway.

The vertical columns are also fractured horizontally into "biscuits." The size of the columns is primarily determined by the rate at which lava cooled. The Giant's Causeway was designated a UNESCO World Heritage site in 1986. *Photograph by Michael F. Forlenza, P.G.*

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A New Year's Resolution or Two

Let me begin by wishing Happy New Year to one and all! With the New Year we find ourselves making a series of resolutions and promises. As you assemble your list, I would like you to consider adding two items that I have included on mine, which relate back to themes that are often presented in my columns – volunteerism and continuous learning.

First, resolve to volunteer some time at a school and talk about geology in general, the energy business, and geology as a career. Each January and May, I volunteer at the elementary school where my older daughter teaches. I spend a day talking with the 5th grade students. It is amazing what a few slides, rock samples, and experiments can do! The kids seem to really enjoy learning about how rocks and oil are formed, why earthquakes happen, how mountains form, and where the dinosaurs went. At my daughter's request, this year I will be focusing on the formation of rocks. If you take me up on this challenge be prepared to answer all types of questions, because they always want to know more. Some of their questions are not technical but focus on how long I went to school and how much money I make. I answer the first question and defer the on the second.

I recommend that you consider presenting or publishing a paper. The preparation of a paper provides an opportunity not only for delving into a subject's background but allows one to move the science forward.

Second, resolve to learn something new this year. We are never too old to expand our knowledge. There are many ways we can approach learning, but this is not a passive process. HGS provides excellent opportunities through meetings, conferences, and short courses for its members. For example, consider attending next month's Mudrocks Conference (February 17-18) "Integrated approaches to unconventional reservoir assessment and optimization" or the Annual AAPG Convention and Exhibition in April, which the HGS will be hosting. At the convention, HGS will be sponsoring two short courses – "Shale Reservoir Evaluation" and "Introduction to Geohazards Assessment." Consider attending those as well. For more in depth learning, I recommend that you consider presenting or publishing a paper. The preparation of a paper provides an opportunity not only for delving into a subject's background but allows one to move the science forward. A paper also presents an opportunity for peer-review, which helps to clarify and strengthen one's thoughts. Personally, this year I plan on presenting at least one new paper on the anatomy of a source rock.

The New Year also represents the mid-point of my term in office and I would like to provide a brief look-back. There are a number of highlights to focus on. HGS in association with ARMA (American Rock Mechanics Association) held our first Geomechanics Conference – "Interdisciplinary Micro to Macroscale Geomechanics." The four oral sessions and three poster sessions were heard by over 250 attendees at the conference. HGS held eighteen dinner and luncheon meetings since September, with several filling the meeting room, including Art Berman's talk "Let's be Honest about Shale Gas" and the R.E. Sheriff Lecture by Cindy Yeilding's "What a Difference a Few Decades Makes: Exploration History of the US Gulf of Mexico Deepwater" where registration hit 200. Through mid-November there were more than 900 seats filled at these meetings. The HGS Golf Tournament was held at the Kingwood Country Club. The Outreach Committee held a series of successful events associated with Earth Science Week. The Board and office team also spent considerable time and energy dealing with membership rolls and what may be done to further increase the membership, including the conversion of student members to active members. As part of this process, inactive members were contacted and about 900 returned to active membership mid-way through November. Policies and procedures were also examined and we continue to make great strides toward a more business-like approach. Part of this has been a streamlining of the committee structure. The Society's finances have been better than expected. Our expenses have been less than projected and our revenue has been

From The President *continued on page 9*

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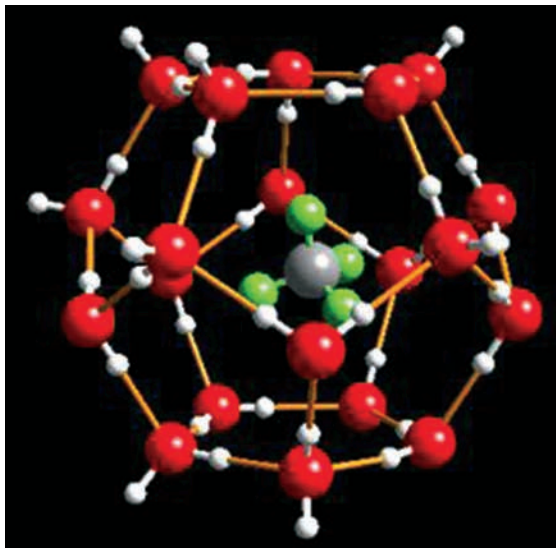
Fire and Ice: Gas Hydrates

In March 2013, the Japanese government announced that it had successfully produced methane from the icy gas hydrates within sediments underlying the Pacific Ocean. The effort, conducted from a drilling ship in the Nankai Trough about 100 miles east of Osaka, was the world's first hydrate production test in deep water. Japan, the world's largest importer of liquefied natural gas and a nation with few convention hydrocarbon reserves of its own, envisions a future powered in part by a constant supply of methane from the large undersea deposits of the "ice that burns."

The program to study the deep sea gas hydrate deposits is led by the Japan Oil, Gas and Metals National Corporation (JOGMEC) and Japan's National Institute of Advanced Industrial Science and Technology (AIST). The project is being conducted in collaboration with the United States Geological Survey (USGS) Gas Hydrates Project and researchers from the School of Civil and Environmental Engineering at Georgia Tech. This project is one component of an ongoing Japanese collaboration on methane hydrate research with the United States Department of Energy (DOE) and the Gulf of Mexico Gas Hydrate Joint Industry Project (JIP).



Water molecules (one oxygen atom (red) and two hydrogen atoms (white)) form a pentagonal dodecahedron around a methane molecule (one carbon atom (gray) and four hydrogen atoms (green)). This represents two of the eight parts of the typical Structure I gas hydrate molecule. Source: USGS.

The research team accomplished the technically difficult goal of recovering cores from the gas hydrate deposits for laboratory testing. Well-preserved samples are extremely rare. They are preserved as "pressure cores," with the gas hydrates kept as if they were still at the natural conditions in the subsurface where they formed. Gas hydrates are only stable at certain pressures and temperatures, and scientists have been working since the 1990s on sophisticated techniques to retrieve and preserve samples. The cores must be maintained under high pressures and low temperatures to prevent the hydrates from dissociating.

What are Gas Hydrates?

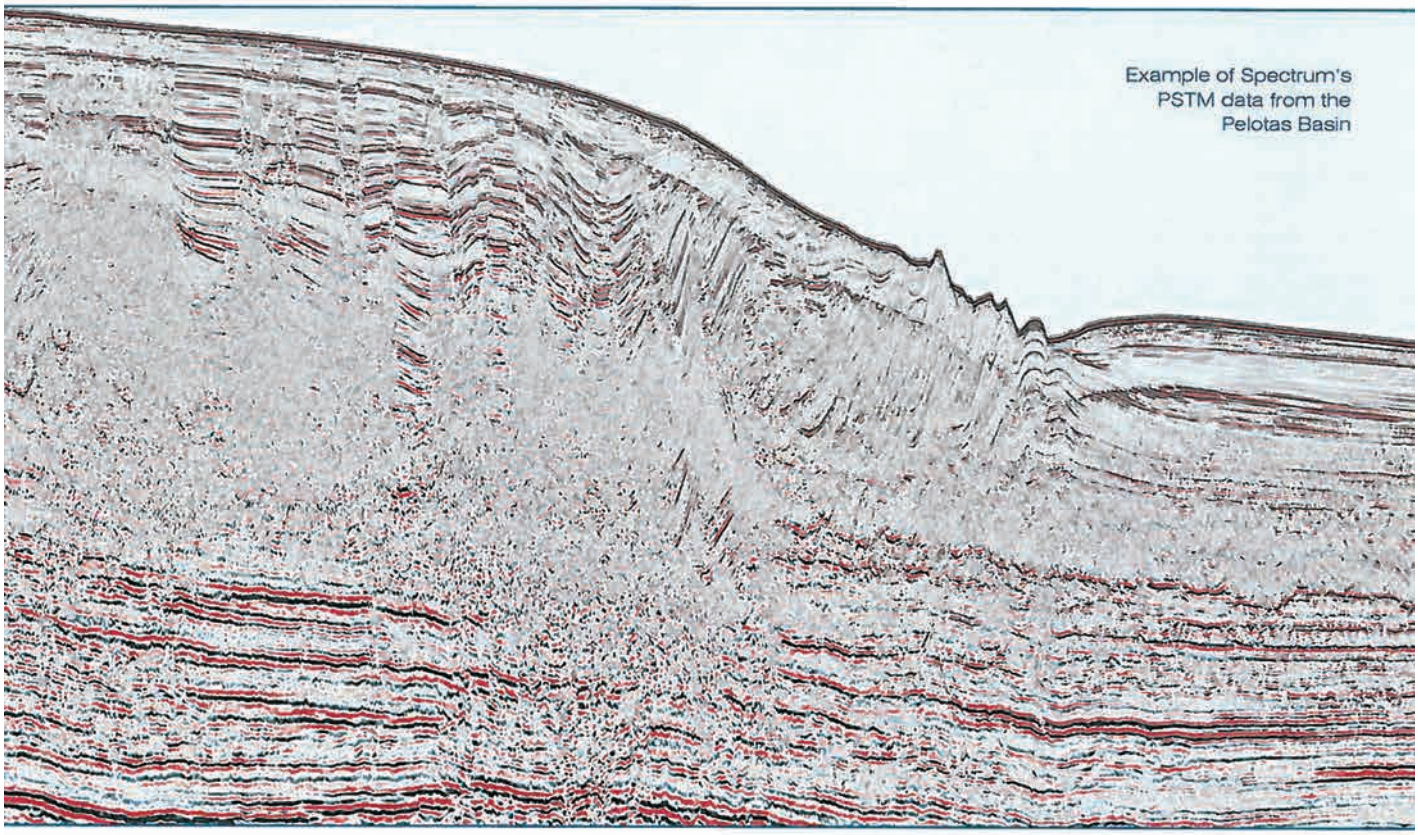
Gas hydrate, methane hydrate, or methane clathrate (CH_4•$5.75H_2O$), is a naturally-occurring, solid form of methane gas combined with water molecules. The solid material is an ice-like substance formed when methane combines with water under specific pressure and temperature conditions. Gas hydrates can also be formed with other gases such as ethane, hydrogen sulfide, or carbon dioxide.

According the USGS Hydrates Primer (http://woodshole.er.usgs.gov/project-pages/hydrates/primer.html), at the molecular level, gas hydrate consists of gas molecules surrounded by cages of water molecules. Each water cage encloses a space of a particular size, and only a gas molecule small enough to fit within this site can be hosted in that specific hydrate structure. Clathrate hydrates are not chemical compounds, as the sequestered molecules are

From The Editor *continued on page 9*

Pelotas Basin Brazil

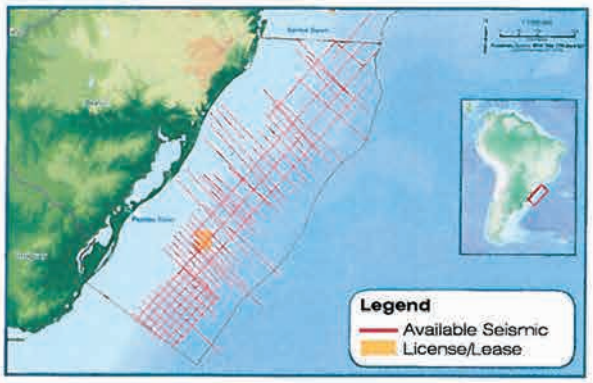
New 2D Multi-Client Seismic Available Q3 2013



Example of Spectrum's PSTM data from the Pelotas Basin

Pelotas Basin in the southern most part of Brazil has not previously seen the same level of exploration as other basins in the region. However, Spectrum's new long-offset seismic shows promising indications of an active petroleum system in the Pelotas Basin.

The processing flow includes both pre-stack time and pre-stack depth migration. Deliverables are expected to be available to clients Q3 2013.



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From the President continued from page 5

greater than expected. There was also considerable discussion on procedures for elections. The Board has approved some minor changes and these will be brought forward to the membership with the regular election ballot. The major change proposed dealing with the number of candidates for each office was not approved and will not be brought forward to the membership for a vote.

And now a look forward. There is still half a year left and things are lining up to ensure that it will also be quite a busy six months. In addition to the Society's regular monthly meetings, the second half of the year will include the Mudrocks Conference, the Annual AAPG Convention, and the Grand Canyon Field trip. "A Night at the Museum" will be held as part of the AAPG Convention and will be used as a fund-raising event for the two HGS scholarship funds. Please consider attending and/or sponsorship of the event. HGS will be publishing the "Field Guide to Late Cretaceous Geology of the Big Bend Region" by Roger W. Cooper and Dee Ann Cooper. Also on the calendar are several of the social activities that the membership has come to look forward to including Guest Night, the Tennis Tournament, and the Skeet Shoot. Look for more on these items and others as the year progresses. ■

Until next month…

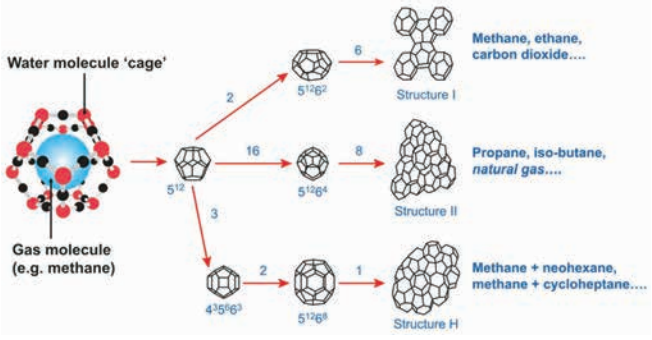
From the Editor continued from page 7

never bonded to the lattice. Structure I gas hydrate has 46 water molecules that enclose 8 sites where gas molecules may be hosted. Six larger gas sites are enclosed by water cages with 12 pentagonal and 2 hexagonal faces, while two smaller gas sites occur within pentagonal dodecahedral cavities. Without the support of the trapped molecules, the lattice structure of hydrate clathrates would collapse into conventional ice crystal structure or liquid water. Some researchers have likened the water cage structures to buckyballs.

…one cubic foot of solid hydrates will yield about 164 cubic feet of methane gas.

Methane molecules can fit within both the small and large sites in the Structure I lattice, the most common type found in nature. Thus, "gas hydrate" and "methane hydrate" are often used interchangeably by researchers.

Methane hydrate takes many forms in sediments. In fine-grained sediments, the methane hydrate can form in small pores and cement the grains, but may not be visible. Gas hydrate has also been recovered in chunks, in veins within sediments, and occasionally in large masses. According to the report "Energy Resource Potential of Methane Hydrate" dated February 2011 by the U.S. Department of Energy's National Energy Technology Laboratory, methane hydrate is a fairly concentrated form of natural gas. When dissociated at standard temperature and pressure, one cubic foot of solid hydrates will yield about 164 cubic feet of methane gas.



Experimental investigation and molecular simulation of gas hydrates, Lars Jensen, Ph.D. Thesis, 2010, Center for Energy Resources Engineering, Department of Chemical and Biochemical Engineering Technical University of Denmark

Gas Hydrate Occurrence and Distribution

Gas hydrates are widespread and found in large volume in marine sediments at, and beneath, the ocean floor and in sediments within and beneath permafrost areas. These pressure-temperature conditions keep the gas hydrate "stable," meaning the gases are contained in its solid form.

While gas hydrates can sometimes appear as clumps on the seafloor, researchers are most interested in the hydrates that form within sediments for potential energy production. Within the sediments, the source of the methane can be either microbial or from deeper thermogenic sources. The methane gas migrates upward until it mixes with water under specific conditions of temperature and pressure. Most of the gas hydrate occurs in the uppermost hundreds of feet of sediments at ocean water depths greater than approximately 1,500 feet and close to continental margins.

The spatial association of gas hydrates along continental margins is related to the availability of ample organic carbon from terrestrial sources or generated within the water column and incorporated into the sediments. Microbes use this carbon to generate methane. Microbial generation is the most common source for the methane observed in the studied natural gas hydrates. These observations may be biased by the relatively shallow sub-seafloor depths from which most of gas hydrate samples have been recovered.

From The Editor *continued on page 11*

AAPG 2014 Houston Convention Special Event

HGS "Night at the Paleontology Museum"

Featuring Dr. Robert T. Bakker

Tuesday, April 8, 2014

6:30pm -10:30pm

Morian Hall of Paleontology, Houston Museum of Natural Science

$65 per person for adults
$35 per person for students

Tickets sold online at the AAPG convention website http://www.aapg.org/houston2014/

Fee includes multi-course buffet dinner and IMAX theatre talk. Cash bar.

Free AAPG bus shuttle (leaving and returning) to the George R. Brown Convention Center.
Free museum garage parking for registrants driving personal cars.

Join the Houston Geological Society on Tuesday, April 8, and experience the world-class Houston Museum of Natural Science Morian Hall of Paleontology featuring over sixty huge fossil displays and 30 action-posed dinosaurs. Inspect a real T. rex skeleton featuring the best preserved and most complete hands and feet of any T. rex ever found! See a uniquely well-preserved Triceratops — "mummified" with preserved skin, plus fossil dinosaur eggs and a "prehistoric safari" that includes the grand saga of human evolution! There will be guided tours by volunteer experts inside the exhibit hall, plus time to meet Dr. Bakker and ask questions about the dinosaurs.

Your ticket buys you a delicious buffet dinner, drinks and amazement, as you sit next to the huge dinosaur, reptile and fossil displays. The HGS encourages AAPG convention registrants to bring spouses and young guests to this social event. This night at the museum will include a fascinating talk by Dr. Robert T. Bakker, ground breaking science author ("The Dinosaur Heresies") and authority on dinosaur evolution. Dr. Bakker is a world-famous lecturer, consultant and advisor to the movie Jurassic Park.

This event is sure to sell-out and space is limited to the first 400 people. Tickets for AAPG convention participants and guests will be sold online using the AAPG ACE convention website at http://www.aapg.org/houston2014/.

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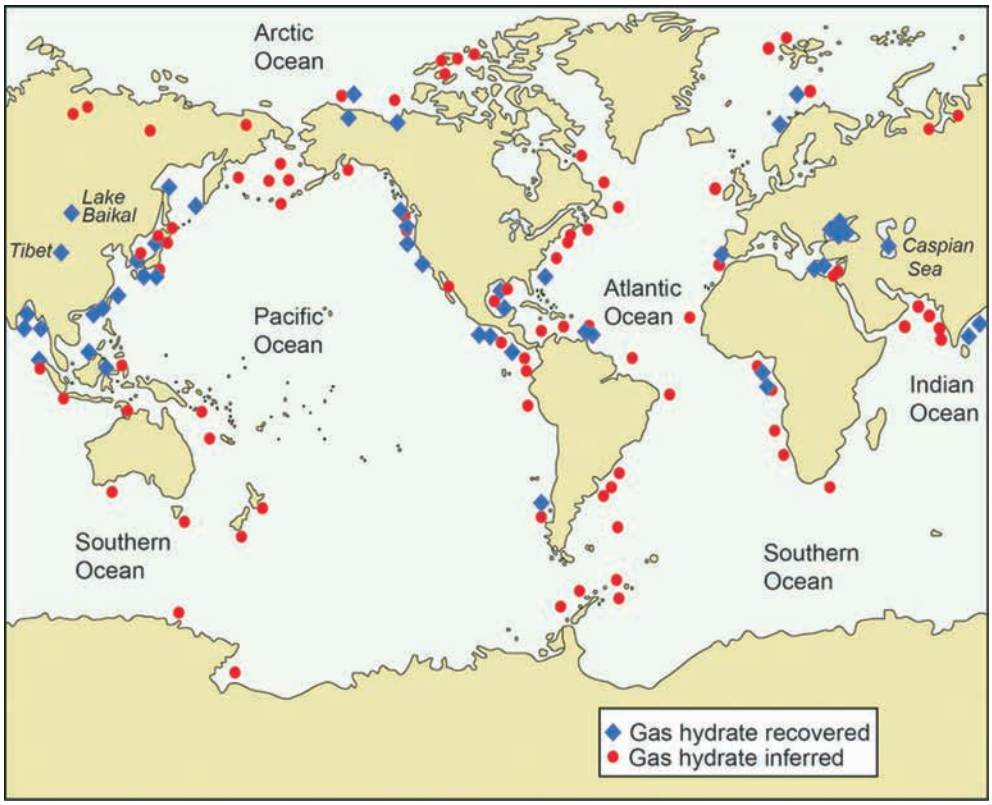

Gas hydrates have been discovered worldwide, and scientists predict that they may occur in many areas that have not yet been surveyed. Blue diamonds show areas where gas hydrates have been recovered in seafloor samples; red dots, areas where gas hydrates are inferred to be present from geophysical data. Source: USGS.

Prior to 1995, there had been no dedicated drilling of gas hydrate-bearing deposits, and estimates of the amount of methane in the gas hydrates ranged widely. Conventional natural gas volumes are most often cited in units of trillions of cubic feet (TCF). Most studies published in the past 15 years have concluded that between 100,000 and 5,000,000 TCF of methane is trapped in global gas hydrate deposits. While the low-end estimate is more than 4000 times the amount of natural gas consumed annually in the United States, only a fraction of the methane sequestered in global gas hydrate deposits is likely to be concentrated enough and accessible enough to ever be considered a potential target for energy resource studies.

Potential Development

The sedimentary methane hydrate reservoir probably contains two to ten times the currently known reserves of conventional natural gas. This represents a potentially important future source of energy. However, in the majority of sites deposits are thought to be too dispersed for economic extraction. Other problems facing commercial exploitation are detection of viable reserves and development of the technology for extracting methane gas from the hydrate deposits.

Current studies on the potential development of gas hydrate resources are focusing on better understanding on several key factors likely to affect success. Besides investigating the porosity and permeability in various hydrate-bearing sediments, laboratory studies are performed on cores to measure the sediments' thermal conductivity, that is, how quickly heat will flow through them. Additional areas of study are the mechanical properties like strength and stiffness of the sediment, both with hydrates and after the hydrates dissociate and the gas and water are removed.

The aim of the ongoing research is to develop innovative methods and gas recovery techniques, both for longer term tests and for eventual commercial production. For now, hydrate production calls for using conventional methods in which a well is drilled into sediments, lined with casing and kept filled with water. The water would be pumped out, lowering the pressure enough so the hydrates dissociate. Because water is produced along with the gas, the pumping would have to be continuous.

But the dissociation of hydrates is endothermic — it uses, rather than releases, energy — so when methane gas is produced, the sediments begin to cool. The cooling can slow or stop dissociation. To compensate for this production will probably have to involve the introduction of heat as well as pumping.

Conventional techniques would not work well in clays, which contain the vast majority of known hydrate reserves, because of the low permeabilities. In the research project headed by JOGMEC, where natural gas was extracted, specialized equipment was used to drill into and depressurize the hydrate deposits, causing the methane to separate from the ice. The gas was then collected and piped to surface.

In a September 2013 article in the *New York Times* by Henry Fountain, Dr. Carlos Santamarina, a professor at Georgia Tech, said, "Much of the current paradigm for production in methane hydrates is anchored around oil production. And probably with that paradigm we may not go very far." Despite the technical challenges, the potential for gas hydrates is huge. ■

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Letters to the Editor

To the HGS Editor:

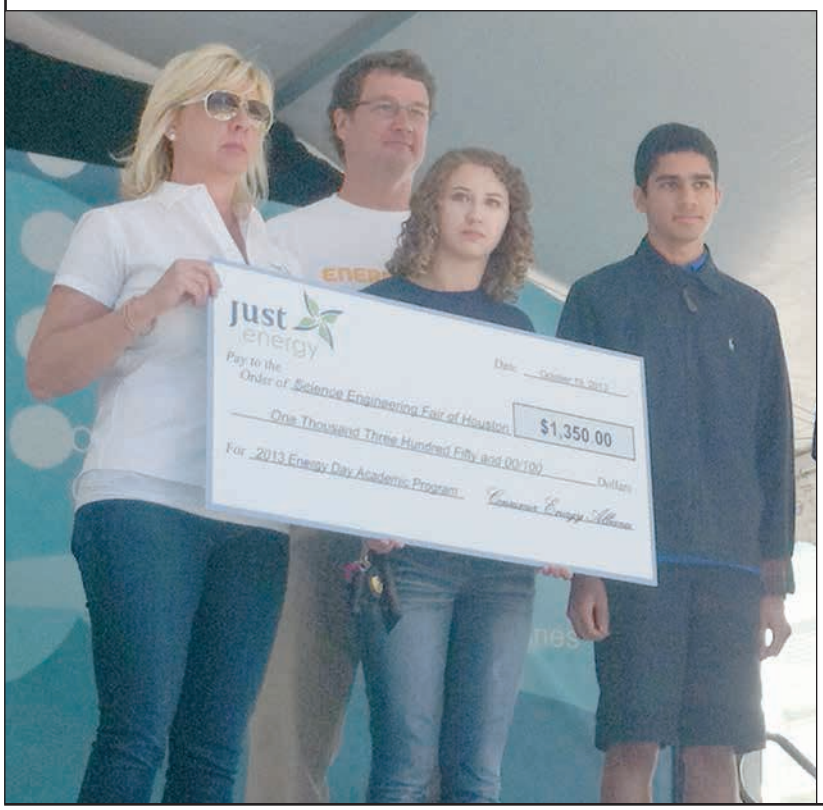
I greatly enjoyed your article in the November 2013 HGS Bulletin entitled "Forensic Geology: Paper Balloons and Sand." I was a student of Professor Raymond Murray at Rutgers University and knew about the use of geological techniques to identify the source of the ballast sand used in the Japanese balloon bombs during World War II. When I was a child I was told stories about my grandfather's involvement in protecting our nation from the Japanese balloon attacks.

My grandfather, Newell Rowlingson, served in the U.S. Merchant Marine early in World War II. His ship was sunk by a German U-boat and Rowlingson returned to the United States where he accepted a job in Oregon to man a fire tower in what is now the Willamette National Forest. The fire tower, named Tipsoo Butte, was located near the small village of Blue River approximately 40 miles east of Eugene, Oregon. When my father enlisted in the U.S. Navy my mother and older sister went to Oregon to live with my grandparents at the Tipsoo Butte fire tower. At that time there was a network of fire towers covering the forests of the Pacific Northwest and the fire tower crews were very much aware of the Japanese balloons and of the deaths of six Americans caused by a Japanese balloon near Bly, Oregon.

Another interesting story that few people have heard about is how a Japanese sea plane launched from a submarine dropped two 168 pound incendiary bombs near Brookings, Oregon on September 9, 1942. The Japanese plane was spotted by one of the fire towers. Fortunately, the forest was wet due to mist and heavy rain and the fire started by the incendiary bombs did little damage. This episode caused authorities to believe that some of the Japanese balloons may have been launched from submarines.

Allen Mattis
Houston, Texas

HGS Happenings



Houston Geological Society — Engineering Council of Houston Committee

Taylor Cubbage (second from left behind the check) and other Science and Engineering Fair winners shared the podium during the awarding of funding from the Consumer Energy Alliance.

The ceremony took place on Energy Day October 19, 2013. Taylor was the winner of the HGS-sponsored Museum of Natural Science internship by special award at the Science and Engineering Fair of Houston in 2013.

PESGB

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September 9-10, 2014

The Westin Houston, Memorial City, 945 Gessner Road, Houston, Texas

Call For Papers, Posters, Sponsors and Exhibitors

In twelve years this conference has become established as a leading technical E&P forum on Africa, with attendance that can exceed 400. Participants include operators, service companies, consultants, governments and academia. The two day program of talks, technical posters and vendors' exhibits will be held on September 9-10, 2014 in Houston, Texas.

The conference, which alternates annually between London and Houston, is organized by the Houston Geological Society (HGS) and Petroleum Exploration Society of Great Britain (PESGB). The HGS-PESGB African Conference covers all aspects of African E&P, with particular emphasis on new ideas for plays and prospects, the geology of the continent and its conjugate margins, and application of emerging technologies.

Abstracts (~200 words) should be submitted as soon as possible but no later than March 15, 2014 to the technical committee, Africa2014@hgs.org. The program will be finalized by the end of April.

Currently, volunteers are being sought to be proactive Session Chairs and anyone interested should contact the Technical Committee as soon as possible.

Details of sponsorship opportunities and display booths are available from the HGS office. To become a sponsor or inquire about exhibit space, contact sandra@hgs.org

Registration will be available from April 2014and Early Bird benefits will apply for a few weeks.

Further details will appear in the HGS and PESGB bulletins and on their websites, www.hgs.org and www.pesgb.org.uk.

Conference Committee for 2014:
Martin Cassidy (chair), Al Danforth, Ian Poyntz, Donna Davis and Sandra Babcock (HGS)
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TECHNICAL PROGRAM

2014 Applied Geoscience Conference
Westin Memorial City, Houston, Texas

MONDAY, FEBRUARY 17, 2014

7:00 am	Registration Opens.....Fourth Floor Cedar Room
Breaks & Social Hour	**Core Display**.....Fourth Floor, Pecan and Pine Rooms
	Selected Core from Emerging and Established Unconventional Reservoirs
8:00 am - 5:00 pm	Technical Talks (Oral)Sessions.....Fourth Floor, Azalea Room
11:35 am - 1:00 pm &	**Poster Sessions**.....Fourth Floor, Cypress Room
5:00 pm - 7:00 pm	Social Hour & Poster Sessions from Invited Academic Consortia

MORNING — *DAY 1*

OUTCROP TO SUBSURFACE CHARACTERIZATION / MESOZOIC — **SESSION 1**
SESSON CHAIRS: FRANK WALLES / JOHN BREYER

8:00 - 8:10	***Opening Remarks***
8:10 - 8:45	Integrating Chemostratigraphy, Lithostratigraphy, Biostratigraphy, and Sequence Stratigraphy of the Eagle Ford Formation ***Harry Rowe, BEG, The University of Texas at Austin***; *Stephen C. Ruppel, John Breyer, and Richard Denne*
8:45 - 9:20	Basin-Scale Controls on Oil Accumulations in the Niobrara Formation of the Denver-Julesburg Basin: Basement Tectonics, Stratigraphic Evolution, and Timing ***Bill Drake, Pioneer***; *Sarah J. Hawkins, and Scott G. Lapierre*
9:20 - 9:55	State of Stress in the Marcellus Based on Microfrac Tests ***Terry Engelder, The Pennsylvania State University***; *Thomas Johnston Yunhui Tan, and James Hnat*

OUTCROP TO SUBSURFACE CHARACTERIZATION / PALEOZOIC — **SESSION 2**
SESSON CHAIRS: MIKE CAMERON / ERIK KVALE

10:25 - 11:00	Regional Outcrop and Subsurface Sequence Stratigraphy, Depositional Environment, and Facies Distribution in the Middle Devonian Marcellus Formation, Central and Western Pennsylvania. ***Daniel Kohl, Chevron Appalachian/Michigan Business Unit***; *Rusty Gilbert*
11:00 - 11:35	Regional Upwelling During Late Devonian Woodford Deposition in Oklahoma and Its Influence on Hydrocarbon Production and Well Completion ***Erik Kvale, Devon Energy***; *Jamar Bynum*
11:35 - 1:00	***Lunch Provided — Third Floor***

Poster Sessions

Invited Presentations from Academic Consortia

View During
Lunch 11:35 am - 1:00 pm
Social Hour 5:00 pm - 7:00 pm

Cypress Room.....Fourth Floor

Core Display.....

Selected Core from Emerging and Established Unconventional Reservoirs Supporting the Oral Technical Presentations

Open during Coffee and Lunch Breaks

Pecan and Pine Rooms.....Fourth Floor

AFTERNOON — DAY 1

EMERGING PLAYS / MESOZOIC — SESSION 3 SESSION CHAIRS: MIKE VAN HORN / GRETCHEN GILLIS	
1:00 - 1:35	Bazhenov Shale of Russia - West Siberian Basin Geochemical Study ***John Curtis, CSM & John Zumberge, Geomark***
1:35 - 2:10	Characterizing Unconventional Resource Potential in Colombia; a Digital Rock Physics Project ***Dr. Joel D. Walls, Ingrain***
2:10 - 2:45	Saudi Aramco's Unconventional Journey So Far ***Brian Gratto, Saudi Aramco***
2:45 - 3:15	***Coffee Break***
EMERGING PLAYS / PALEOZOIC — SESSION 4 SESSION CHAIRS: OBIE DJORDJEVIC / ROB BEFUS	
3:15 - 3:50	Wolfcamp-Cline Potential – A Detailed Evaluation of Source Rock and Crude Oil Within the Permian Basin ***Jackie Reed, Reed Geochemical Consulting***; *John Zumberge, Stephen Brown*
3:50 - 4:25	The Devonian Duvernay Formation: Development and Assessment of a Hot Unconventional Play in Cold Western Canada ***Raphael Wust, Trican***
4:25 - 5:00	Controls on Mississippian Inner Ramp Heterozoan Carbonate & Biosiliceous Deposits in a Midcontinent Setting ***Dr. Evan K. Franseen, University of Kansas***; *Diana Ortega-Ariza*

SOCIAL HOUR

Monday 5:00 — 7:00 PM
With Posters from Invited Academic Consortia
FOURTH FLOOR

http://www.hgs.org

TECHNICAL PROGRAM

2014 Applied Geoscience Conference
Westin Memorial City, Houston, Texas

TUESDAY, FEBRUARY 18, 2014

7:00 am	Registration Opens.....Fourth Floor
Breaks & Social Hour	**Core Display**.....Fourth Floor, Pecan and Pine Rooms
	Selected Core from Emerging and Established Unconventional Reservoirs
8:00 am - 5:00 pm	Technical Talks (Oral) Sessions.....Fourth Floor, Azalea Room
11:35am - 1:00 pm	**Poster Sessions**.....Fourth Floor Cypress Room
	Invited Presentations from Academic Consortia

MORNING — *DAY 2*

MUDROCK SYSTEMS CHARACTERIZATION - RESERVOIR INSIGHTS FOR INTEGRATION — *SESSION 5*

SESSON CHAIRS: TARAS L. BRYNDZIA / WAYNE CAMP

8:00 - 8:10	***Opening Remarks***
8:10 - 8:45	Social Formation of a Common Microbial Fabric: Toward a Mechanistic Understanding of Microbial Facies ***Michael T. Tice, Texas A&M**; Jian Gong, and Zhirui Zeng*
8:45 - 9:20	Evolution of Pore Systems in Eagle Ford Mudstones: Influence of Texture, Diagenesis, and Thermal Maturity ***Aysen Ozkan, Shell**; Calum Macaulay, Kitty L. Milliken, Maxwell E. Pommer, Suzan M. Ergene, Daniel Minisini, James Eldrett, Steve Bergman, and Amy Kelly*
9:20 - 9:55	Total Organic Carbon Trends Within the Eagle Ford of South Texas: Sub-mesoscale Vortices and the Eddy Ocean Hypothesis ***Lowell Waite, Pioneer Natural Resources***
9:55 - 10:25	***Coffee Break***

MUDROCK SYSTEMS CHARACTERIZATION - NEW GEOPHYSICAL INSIGHTS — *SESSION 6*

SESSION CHAIRS: BRUCE HART / PAUL COLLINS

10:25 - 11:00	Rock Physics and Seismic Data Used in Characterization of Source Rock Reservoirs ***Marita Grading, Statoil**; Paul Collins, and Lars Wensaas*
11:00 - 11:35	Characterization of Hydraulic Fracture Treatments in the Barnett Shale: the Stocker Geophysical Experiment ***Anastasia Mironova, ConocoPhillips**; Baishali Roy, Changxi Zhou, Bruce Hart, and Ulrich Zimmer*
11:35 - 1:00	***Lunch Provided — Third Floor***

Poster Sessions

Invited Presentations from Academic Consortia

View During
Lunch 11:35 am - 1:00 pm

Cypress Room.....Fourth Floor

Core Display.....

Selected Core from Emerging and Established Unconventional Reservoirs Supporting the Oral Technical Presentations

Open during Coffee and Lunch Breaks

Pecan and Pine Rooms.....Fourth Floor

AFTERNOON — DAY 2

RESERVOIR CHARACTERIZATION TOWARDS OPTIMIZED STIMULATION AND PRODUCTION — SESSION 7

SESSION CHAIRS: RANDY LAFOLLETTE / JOEL GEVIRTZ

1:00 - 1:35	Well Performance in Unconventional Reservoirs — Perspectives on Analysis/Interpretation, Models, and Production Forecasting ***Dilhan Ilk**, DeGolyer and MacNaughton*
1:35 - 2:10	Duvernay vs. EagleFord ***Dr. Marc Bustin**, University of British Colombia*
2:10 - 2:45	Integrating Data to Optimize Horizontal Completions in Unconventional Reservoirs ***Brian Clark**, Schlumberger*
2:45 - 3:15	***Coffee Break***

RESERVOIR CHARACTERIZATION TOWARDS OPTIMIZED STIMULATION AND PRODUCTION — SESSION 8

SESSION CHAIRS: SUNIL GULRAJANI / GREG GETZ

3:15 - 3:50	Regional PVT Consideration for Unconventional Liquid Production ***Kevin Ferworn**, GeoMark*
3:50 - 4:20	A Multi-scale Discussion on Fluid Behavior under Confinement: Can Molecules in Nano-pores Influence Recovery from the Resource Shale? ***Yucel Akkutlu**, Texas A&M University*
4:20 - 4:50	Diagnostics for evaluating production within Unconventional Laterals ***Stuart Cox**, Reservoir Engineer*

2014 HGS Applied Geoscience Conference Technical Committee

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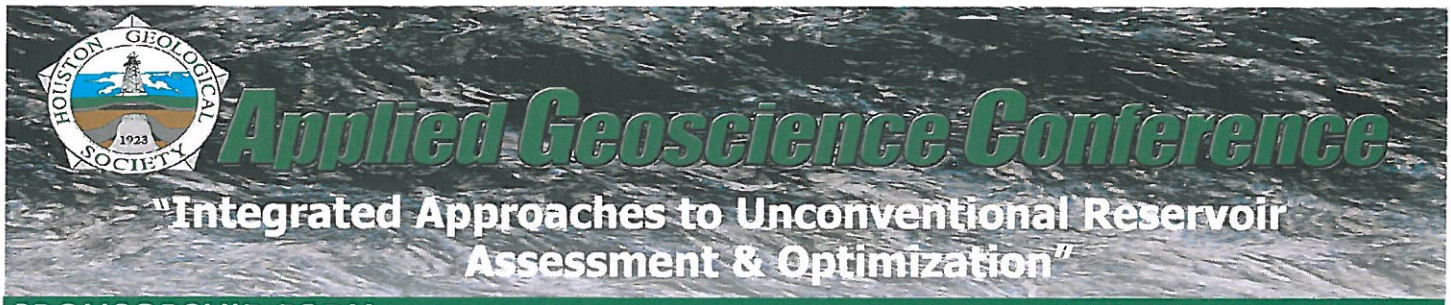

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Wednesday, January 8, 2014

Black Lab Pub, Churchill Room • 4100 Montrose Blvd.

Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $30 Preregistered members; $30 non-members/walk-ups

To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.
Pre-registration without payment will not be accepted.
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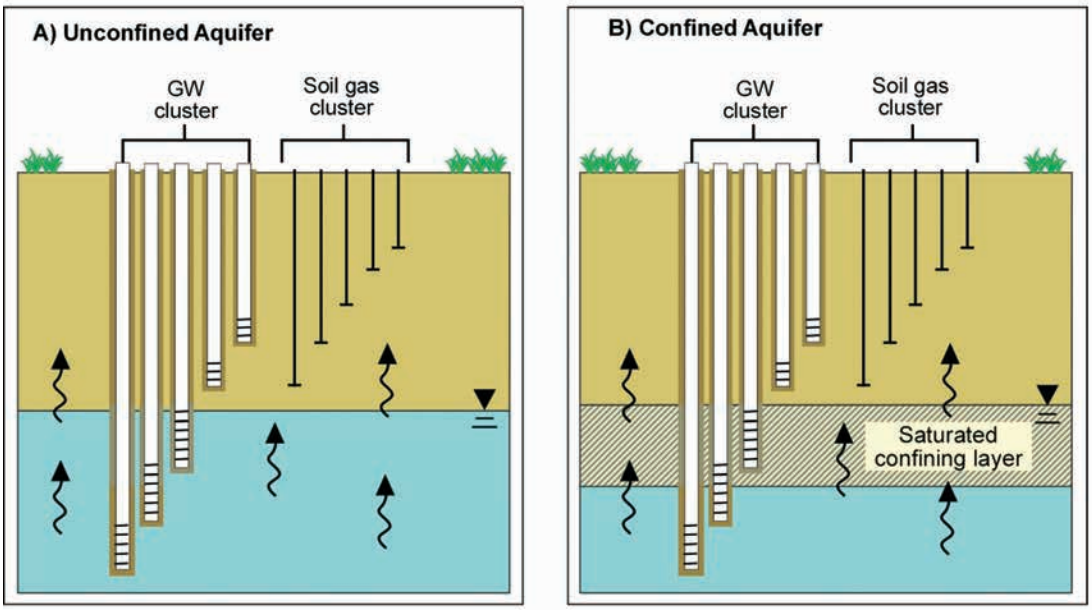
Lila Beckley, P.G.,
Danielle Bailey, P.G.
GSI Environmental, Inc.

Influence of Shallow Geology on Volatile Organic Chemical Attenuation from Groundwater to Deep Soil Gas



The main focus of our research was to better understand the effects of both physical and chemical processes on vapor migration in the subsurface, thereby obtaining a greater understanding of the vapor intrusion process. Vapor intrusion is the migration of volatile chemicals from contaminated soil or groundwater into overlying buildings. Evaluation of this exposure pathway is increasing across the country because of changing regulatory requirements. Additionally, vapor intrusion is increasingly being evaluated in the context of real estate transactions, and is now included in the American Society for Testing and Materials standard on Phase I Environmental Site Assessments.

Vapor intrusion pathway evaluations commonly begin with a comparison of volatile organic chemical (VOC) concentrations in groundwater to generic, or Tier 1, screening levels. These screening levels are typically quite low reflecting both a desired level of conservatism in a generic risk screening process as well as limitations in understanding of physical and chemical processes that impact vapor migration in the subsurface. To study the latter issue, we have collected detailed soil gas and groundwater vertical concentration profiles and evaluated soil characteristics at seven different sites overlying chlorinated solvent contaminant plumes.

The goal of the study was to evaluate soil characteristics and their impacts on VOC attenuation from groundwater to deep soil gas (i.e., soil gas in the unsaturated zone within two feet of the water table). The study results suggest that generic screening levels can be adjusted by a factor of 100 times at sites with fine-grained soils above the water table, as identified by visual observations or soil air permeability measurements. For these fine-grained soil sites, the upward-adjusted screening levels maintain a level of conservatism while potentially eliminating the need for vapor intrusion investigations at sites that may not meet generic screening criteria. ■

Biographical Sketch

Lila Beckley, P.G. is a geologist with GSI Environmental Inc. in Austin, Texas, with 19 years of experience in the environmental field. Her primary practice areas are vapor intrusion and regulatory support. In the area of vapor intrusion, she has conducted assessments using

HGS Environmental & Engineering Dinner *continued on page 23*

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HGS Environmental & Engineering Dinner *continued from page 21*

both conventional and innovative methods at sites around the United States, developed and tested investigation protocols as part of Department of Defense-funded research, developed guidance and training programs, and is a member of regulatory guidance development workgroups such as Interstate Technology and Regulatory Council (ITRC).

Since joining GSI in 2007, she has also been involved in groundwater monitoring optimization, regulatory and litigation support, and database and software development projects. Prior to joining GSI, Ms. Beckley worked in enforcement and remediation programs at the Texas Commission on Environmental Quality in various roles ranging from project to program management. Ms. Beckley earned a master's degree and a bachelor's degree in geological sciences from the University of Texas at Austin.

Danielle "Danny" Bailey, P.G is a hydrogeologist with GSI Environmental Inc. in Houston, Texas, with 8 years of professional experience in the environmental field. Her primary practice areas have included site investigations and risk assessments of several residential and commercial/industrial properties. These include chemical manufacturing plants, dry cleaning and oil and gas facilities, and military bases. She has provided technical support to expert witnesses and attorneys on a variety of environmental litigation projects in Ecuador, Texas, Louisiana, and Montana. She has overseen the design and installation of monitoring well networks, vapor intrusion investigations, soil sampling for environmental and geotechnical parameters, groundwater and outdoor air sampling programs, and implementation of enhanced in-situ biodegradation treatment programs in the Dominican Republic, Germany, Texas, Virginia, Mississippi, Alabama, and Montana.

She has designed, coordinated, and implemented large scale site investigations at international oil and gas facilities in Ecuador. She has conducted an environmental compliance audit and inspection of a heavy construction equipment rental facility in Texas. She has participated in several Department of Defense Environmental Security Technology Certification and Strategic Environmental Research and Development Program research projects in Texas, Oklahoma, Florida, Utah, Rhode Island, and California. Ms. Bailey received a Master of Science degree in hydrogeology from The University of Texas and a Bachelor of Science degree in geology from Texas A&M University.

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First Announcement

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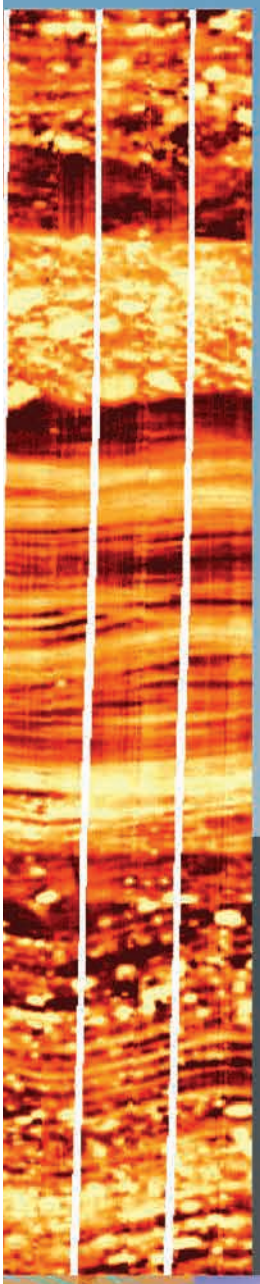
Sponsors and exhibitors: contact sandra@hgs.org

Early bird registration will start in April 2014

For more information, see the ads in the HGS and PESGB bulletins and web sites

BOREHOLE IMAGING COURSE

Houston, Texas – 5TH, 6TH & 7TH FEBRUARY 2014



Hundreds of image logs have been acquired by US Oil companies in recent years. There is currently an important resource of image logs sitting in data archives. Images can provide unrivaled information of the geological structure, stratigraphy and sedimentology from the wellbore. The application of image logs in our industry has long been undervalued or not fully appreciated. The interpretation of images is a skill that needs to be learned and the best way to do so is with some of the industries' leading interpreters. Borehole images, both wireline and LWD can fill a vital data gap between core and seismic data.

Course aims...

- Carry out QC of borehole image data: wireline and LWD
- Design a borehole image logging program
- Provide a brief structural interpretation
- Classify major lithofacies types and sediment dispersal indicators
- Describe fractures and faults
- Appreciate limits of borehole images

Overview...

- Image log technology and practice
- Quality control
- Structural analysis
- Horizontal well analysis
- In-situ stress analysis
- Sedimentological characterization - in clastics and carbonate rocks.

Who should attend...

- Geologists, Petrophysicists & Geophysicists working with integrated reservoir models

Date...

- **5th, 6th & 7th February, 2014**

Venue...

- **Houston, Texas.**

Price...

- **US$ 2,500** *per attendee. Price includes lunch, coffee and snacks, course notes and exercises. Spaces are limited to 20 attendees and will be filled on a first-come, first-serve basis.*

DAY 1: Introduction: Borehole Image, Dipmeter and LWD acquisition and processing techniques, Log quality and artefact image recognition. **Structural Interpretation:** Basic principles - quick-look interpretation, Structural dip identification, unconformities, Large scale fault deformation structures. **Practical Exercise** - tectonic tilt, faults, unconformities.

DAY 2: Structural Interpretation: Fracture analysis. **Practical Exercise** - fracture analysis. Integration with surface seismic and production data. **Practical Exercise** - integration with seismic and production data. Analysis of borehole images in horizontal wells. **Sedimentological interpretation:** borehole image and dipmeter data.

DAY 3: Sedimentological Interpretation *(continued):* borehole images - clastic sequences. **Practical Exercise** - clastics. **Sedimentological interpretation:** carbonate sequences. **Practical Exercise** - carbonates. Approaches to permeability classification - carbonates; Petrophysical applications of image logs, *in-situ* stress analysis. **Practical Exercise** - *in-situ* stress analysis.

TO BOOK, GO TO: **www.taskgeoscience.com** *for more details, or request a booking form today from* **nicola.capuzzo@taskgeoscience.com**

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Monday, January 13, 2014

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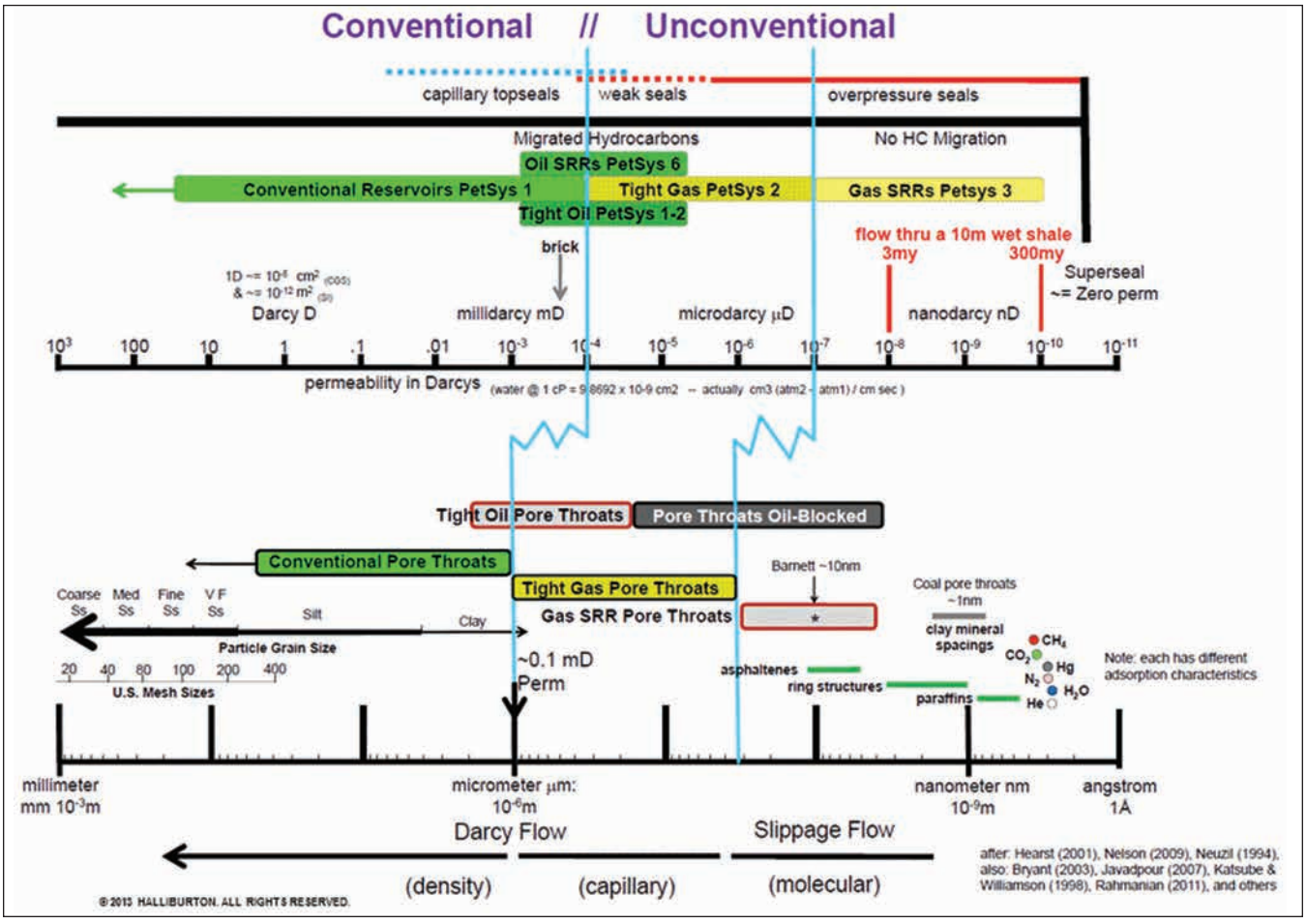
Kenneth E. Williams
ken.williams@halliburton.com

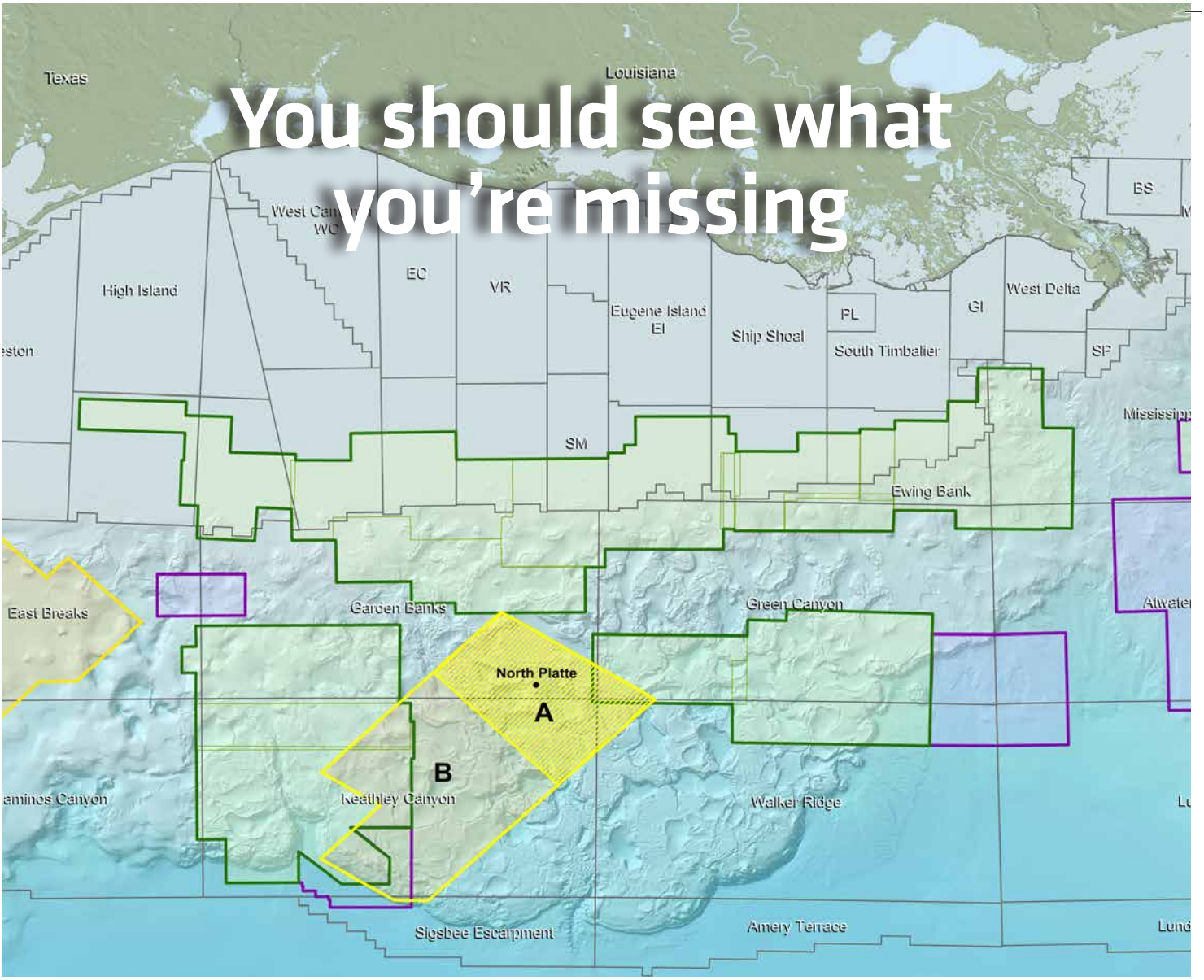
Source Rock Reservoirs are a Unique Petroleum System

Three distinct types of petroleum systems can be defined based on the difference in the basic physics of hydrocarbon accumulation. Conventional petroleum systems (Type 1) have the traditional components of source, seal, reservoir, trap, and timing that must be evaluated and that must be favorable for a hydrocarbon accumulation to be present. Hydrocarbons migrate from the source rock to the reservoir and trap based on the density difference between oil, gas, and water. Continuous basin-centered accumulations (Type 2) trap migrating hydrocarbons in tight rocks by relative-permeability conditions that develop between the hydrocarbons and interstitial water. Reservoir conditions, therefore, also define the seal and the trap. Source rock reservoirs (SRRs, Type 3) have a much lower permeability and much smaller pore throats than even continuous accumulations. The unexpelled and unmigrated hydrocarbons that remain in the porosity of the SRR are available to be produced if sufficient fracture conductivity is induced by hydraulic fracturing. Coal-bed methane, oil sands, and oil SRRs are variations on, and composites of, the three basic petroleum system end members.

Hydrocarbons migrate from the source rock to the reservoir and trap based on the density difference between oil, gas, and water.

HGS General Dinner *continued on page 27*





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HGS General Dinner continued from page 25

The physics of gas flow in SRRs are different from other petroleum systems at the small pore throat sizes that are present in the secondary oil or gas-wet pores within the kerogens and their associated microfractures, from in the water-wet portions of the SRR, or in the migration pathways. In the absence of water within the nanopores, gas is present in a number of diffuse systems. Adsorbed gas is present as a diffuse layer on the surface of the organic porosity. If there is a gradient along that surface, diffusion occurs in a linear fashion. The free gas in the pore space moves from high concentration to low concentration by slippage flow, as described by Knudsen diffusion. There is free interchange between the free and adsorbed gas molecules by "hopping" from one diffuse system to the other. Gas is absorbed within the kerogen matrix and diffuses out to become adsorbed. The relative contribution and rates of flux in these various systems are an active research topic, but the high deliverability of gas from SRRs is a result of the different physics of gas flow. ■

Biographic Sketch

Kenneth E. Williams got into the oil business back in the third quarter of the last century (1974) and spent 28 years with Texaco. Time at Texaco was well spent in various exploration and managerial roles including six years on the Worldwide Exploration Risk Committee. He got involved in basin modeling and petroleum systems analysis in the mid-1980s and used those tools in the study of basins around the world trying to follow the oil from source to reservoir. After retiring from Texaco, he worked for seven years using basin modeling for overpressure analysis for Knowledge Systems Inc. (KSI) before the company was bought by Halliburton. At that time, the focus of the modeling turned around and began looking back at the source rock to model what was retained and not expelled and trying to understand how that works. He has authored 22 publications and 37 abstracts and holds two patents (with seven pending).

The Houston Geological Society Continuing Education Committee Presents

Critical Assessment of Shale Plays: Bridging the Gap with Engineer

Speaker: Gary Citron, Rose & Associates

March 5, 2014

Watch for more details and registration information on the HGS Website and the February 2014 HGS *Bulletin*

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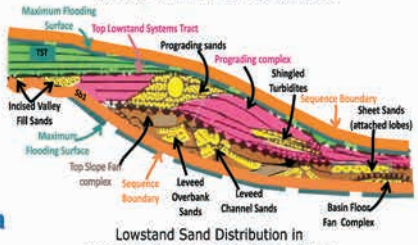

Lowstand Sand Distribution in Deepwater Basin with Shelf Slope Break

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425 North Sam Houston Pkwy E

Social 11:15 AM, Luncheon 11:30 AM

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HGS Northsiders Luncheon Meeting

Heather A. McGarity
Murphy Exploration and Production
Janok P. Bhattacharya and
Robert E. Lamond

An Interpretation of the Depositional Environment and Facies of the Eagle Ford Shale from Karnes-Maverick County, Texas

Development of shale reservoirs can be problematic due to internal heterogeneity. Areas or zones of higher clay content (such as swelling clays), variable lithology, total organic content variations, and changes in porosity and permeability, can all affect hydrocarbon recovery. These low porosity and low permeability reservoirs are now significant hydrocarbon producers so it is crucial to understand their architectural elements and reservoir properties in order to maximize hydrocarbon production.

Phase one of this study included six wells with whole core across the Upper Cretaceous Eagle Ford Shale in South and East Texas from Karnes to Maverick County. These cores were analyzed and interpreted to determine lithology, sedimentary structures, and parasequences. Eight separate facies, along with their depositional environments, were interpreted to have been deposited above storm-wave base along the inner and outer shelf in a moderate energy environment episodically interrupted by higher energy events, as opposed to a deeper-water setting. Identification of gently-inclined lamina and ripple cross laminations provide evidence of significant bedload transport in the form of floccule ripple migration, indicating a depositional environment above storm wave base.

Bioturbated marl and laminated marl facies were used to identify flooding surfaces. These flooding surfaces separate upward-coarsening facies from bioturbated and laminated marl facies, leading to the identification of parasequences. From this, we built a detailed sequence stratigraphic framework of the Eagle Ford Shale using the identification and correlation of parasequences and parasequences sets. From this work, a basin-wide cross section correlating these eight facies was constructed using private and public data.

This new model is being used to target and geo-steer our wells into the best quality rock, thereby reducing drill time, increasing completions effectiveness, and maximizing production. ■

Biographical Sketch

Heather McGarity is a geologist with Murphy Exploration and Production and is currently involved in operations and field development. Ms. McGarity received her bachelor's degree in geology from Texas Tech University in 2010, and a masters degree from the University of Houston in 2013. Her thesis work involved building a stratigraphic framework of the Eagle Ford Shale.

Imperial Barrel Award Committee

Looking for Volunteers

The HGS Imperial Barrel Award Committee is looking for people interested in becoming involved with the HGS IBA Committee. Whether you're an IBA Alum or just interested in learning more about the IBA program and HGS's involvement, please contact us at HGS.IBACommittee@gmail.com to find out more.


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Ian Davison
Earthmoves Ltd.
Camberley, UK
i.davison@earthmoves.co.uk

Hydrocarbon Potential of the North West African Margin

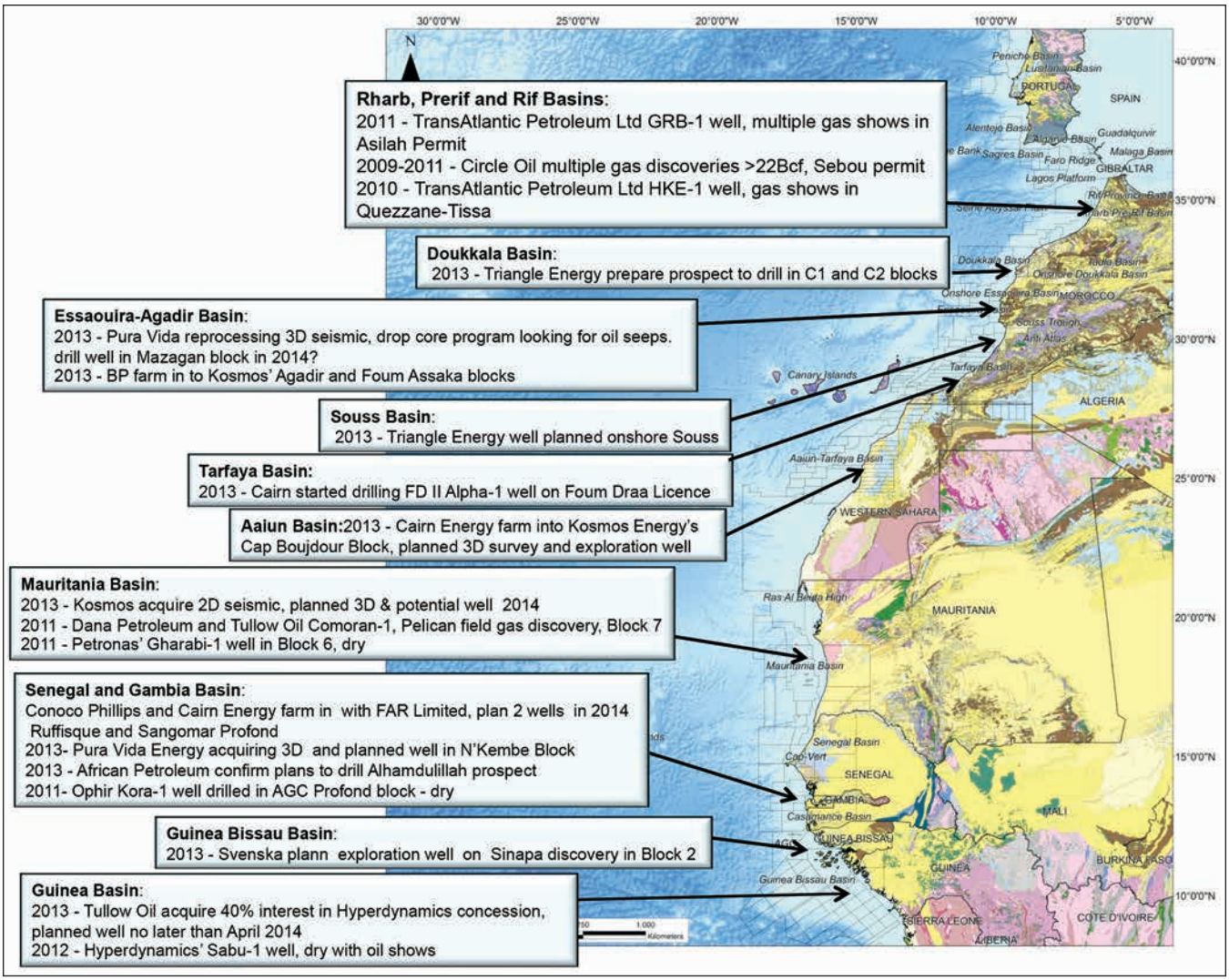

Figure 1. *Recent exploration, discoveries and future plans in NW Africa*

This talk will review the geology of the North West African margin and highlight some of the important factors controlling hydrocarbon potential. Although there has been a flurry of acreage acquisition in Morocco over the last three years, only one deepwater well has been drilled in the last decade along this margin (**Figure 1**, Kora-1, drilled by Ophir in 2011). However, an unprecedented 10 wells, which will test some of the ideas outlined below, are planned for the next two years.

Rifting History

Localized but widespread rifting began along the Central Atlantic margin, with the onset dated as Carnian (ca. 230Ma) in the southern United States rift basins. Red continental beds fill the onshore Moroccan rifts, such as Argana, with no evidence of source rocks (e.g. **Figure 2**). Farther south, there are no data available on the late Triassic rift, but the onshore conjugate Deep

HGS International Dinner *continued on page 33*

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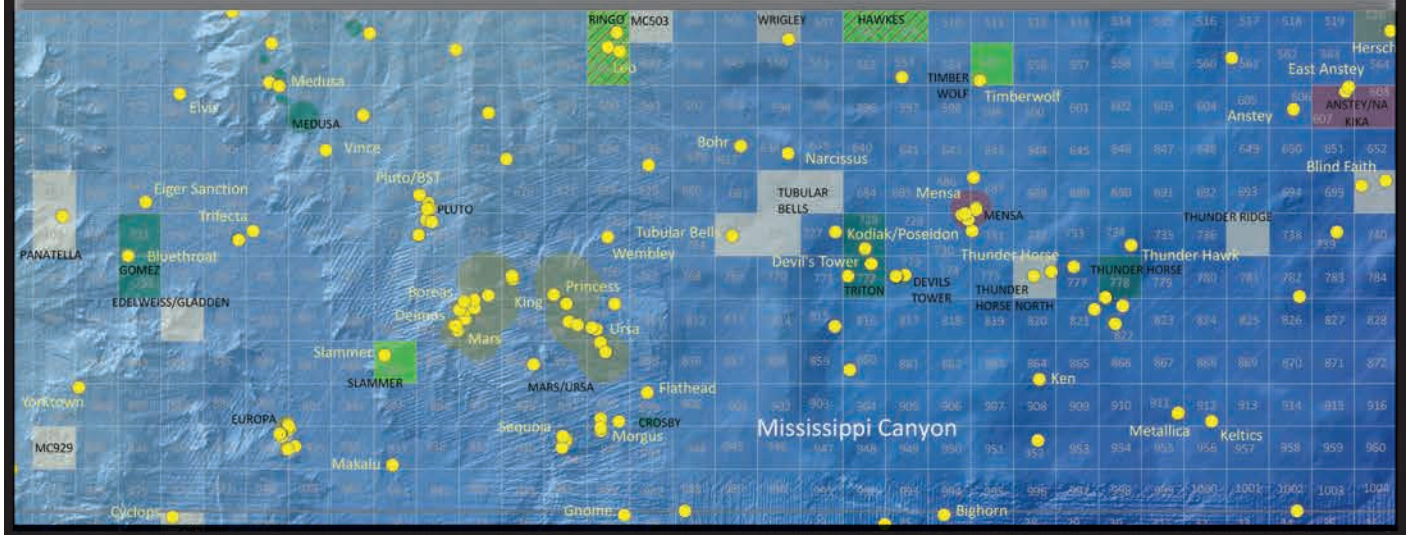

HGS International Dinner continued from page 31

River and Richmond basins in the United States, contain high quality oil-prone source rocks. These may also be present in the conjugate Mauritania and Senegal basins. The Triassic rifting period lasted for 30 million years but did not lead to continental breakup until the onset of widespread igneous activity (Central Atlantic Magmatic Province, CAMP) dated at 201+ 1 Ma. CAMP volcanics extend for 3000 kilometers along the Central Atlantic margins. There is no defined magmatic center or plume head. The thermal weakening along the Triassic rift system allowed the lithosphere extension to progress to oceanic spreading at approximately 180-190 Ma. CAMP magmatism is the likeliest cause for the largest faunal extinction event on Earth. The first marine incursion also occurred during the CAMP volcanism with deposition of salt in the developing rifts, as salt is found intercalated with the 201 (+ 1) M year old basalts in the Essaouira Basin.

Figure 2. *Triassic rift with rotated red beds deposited on Hercynian basement near summit of Tizi N'Test Pass, South of Marrakech*

Source Rocks

The marine incursion led to deepwater shale deposition in the Early Jurassic with laterally variable source rock potential. However, some excellent quality has been proven in the following locations:

- Sidi Fili, up to 5.5% total organic carbon (TOC) and 19.6 milligrams per gram (mg/g) mass of "live" carbon compounds (S_2)
- DSDP-547, up to 8.9 %TOC & 48.5 mg/g S_2
- TanTan-1 well up to 2.5 % TOC; 800 hydrogen index
- Middle Atlas up to 3.4% TOC & 19.6 mg/g S_2.

Early Jurassic source rock quality is considered one of the crucial factors controlling hydrocarbon potential, but there are still not enough well data to evaluate how widespread the source rocks are. Upper Jurassic (Oxfordian) source rocks are also locally present in Morocco: DSDP-547 up to 1.9 %TOC; Essaouira onshore TKM well, up to 4.3 % TOC; Fuerteventura Island, exposures of 80 meters of black shale.

Albian to Cenomanian deepwater source rocks were produced by upwelling cold currents along the African margin, which were preserved in paleowater depths greater than 200 meters. In the DSDP well Site 367, the Turonian interval is over 30 meters thick, with TOC concentrations averaging well over 20%. The Late Cretaceous source rocks are of excellent quality along the whole margin, but are only mature in localized areas where Late Cretaceous-Tertiary sedimentation is thicker in Mauritania, Senegal, and Guinea Bissau. The Dom Gea and Dom Flor heavy oil fields in Senegal were probably charged from Mid-Cretaceous source rocks.

Reservoir Rocks

A thick sequence (up to 6 kilometers) of carbonates developed from Hettangian to Hauterivian times with a predominantly ramp facies of fine-grained limestones. However, there are seismic indications of more porous shelf edge facies development in Morocco, Mauritania, Gambia, and Senegal. The Cap Juby oil discovery in the Early Cretaceous carbonates was probably sourced by Jurassic rocks and is estimated to contain 400 million barrels of biodegraded oil. Reservoir quality is highly variable due to variable fracturing and karstification of otherwise tight carbonates. The shelf-edge carbonate play is a well-defined fairway as the carbonates were resistant to erosion and the scarp is easily traced on the seismic data. Even at the present day, a 4 kilometer high carbonate scarp is preserved on the seafloor along the seaward edge of the Mazaghan Plateau. It is surprising that so few wells have targeted this play to date.

Carbonate production switched off in the Hauterivian times, and a large volume of Early Cretaceous clastics poured off the Moroccan and Western Saharan margin (**Figure 3**). Fission track data from Northern Morocco indicate a marked period of cooling in the Early Cretaceous which is interpreted to be caused by denudation following a period of uplift. The reason for this uplift is still not clear, but may be related to development of the Central African

HGS International Dinner *continued on page 35*

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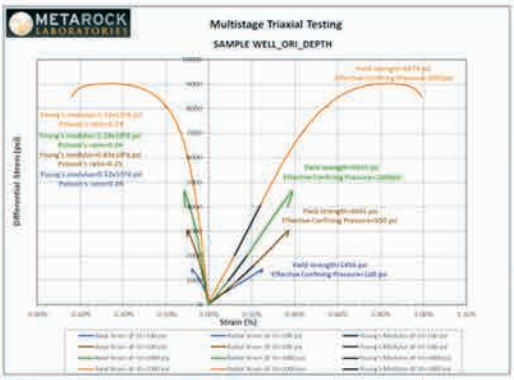
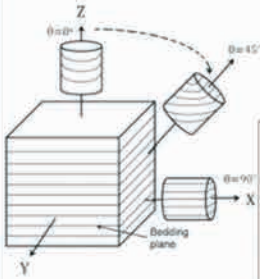
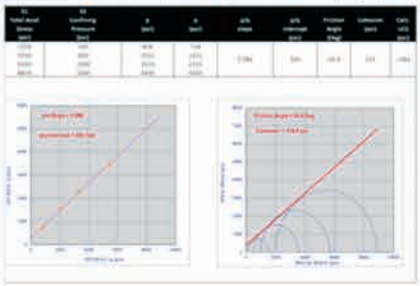
- Provide necessary inputs for Geomechanics Models
- Seismic Calibration

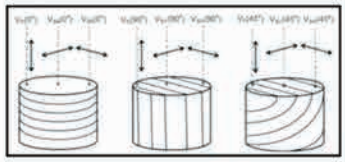
UNCONVENTIONAL RESERVOIRS

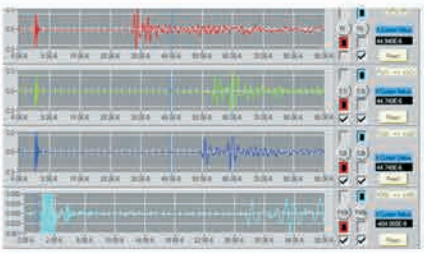
- Rock experimental studies of intact samples can provide insight into production mechanisms such as stress-dependent Porosity and Permeability
- Unconventional reservoirs should be simulated with dual porosity models to provide more realistic performance history match and provide useful insights into:
  - Well Spacing
  - Production policy (Maximum Depletion Pressure)
- Fracture simulation models that do not consider the presence of natural fractures may reduce the utilization of the stress profile to provide qualitative comparisons among zones of interest

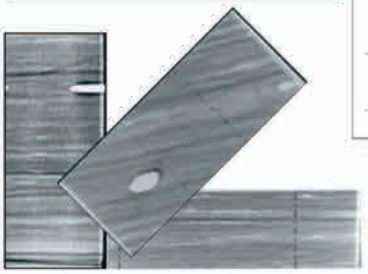


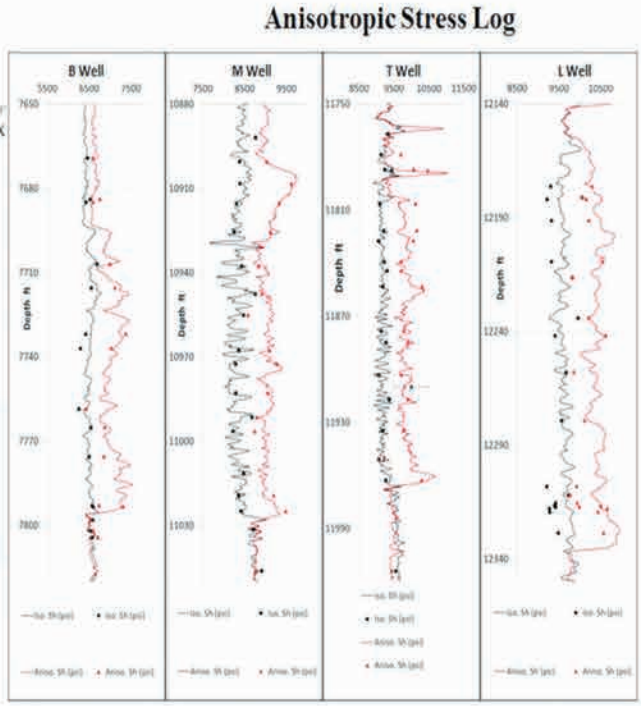












$$\sigma_h = \frac{E_h}{E_v}\frac{\nu_v}{1-\nu_h}(\sigma_v - \alpha_v p) + \alpha_h p + \frac{E_h}{1-\nu_h^2}\varepsilon_h + \frac{\nu_h E_h}{1-\nu_h^2}\varepsilon_H$$

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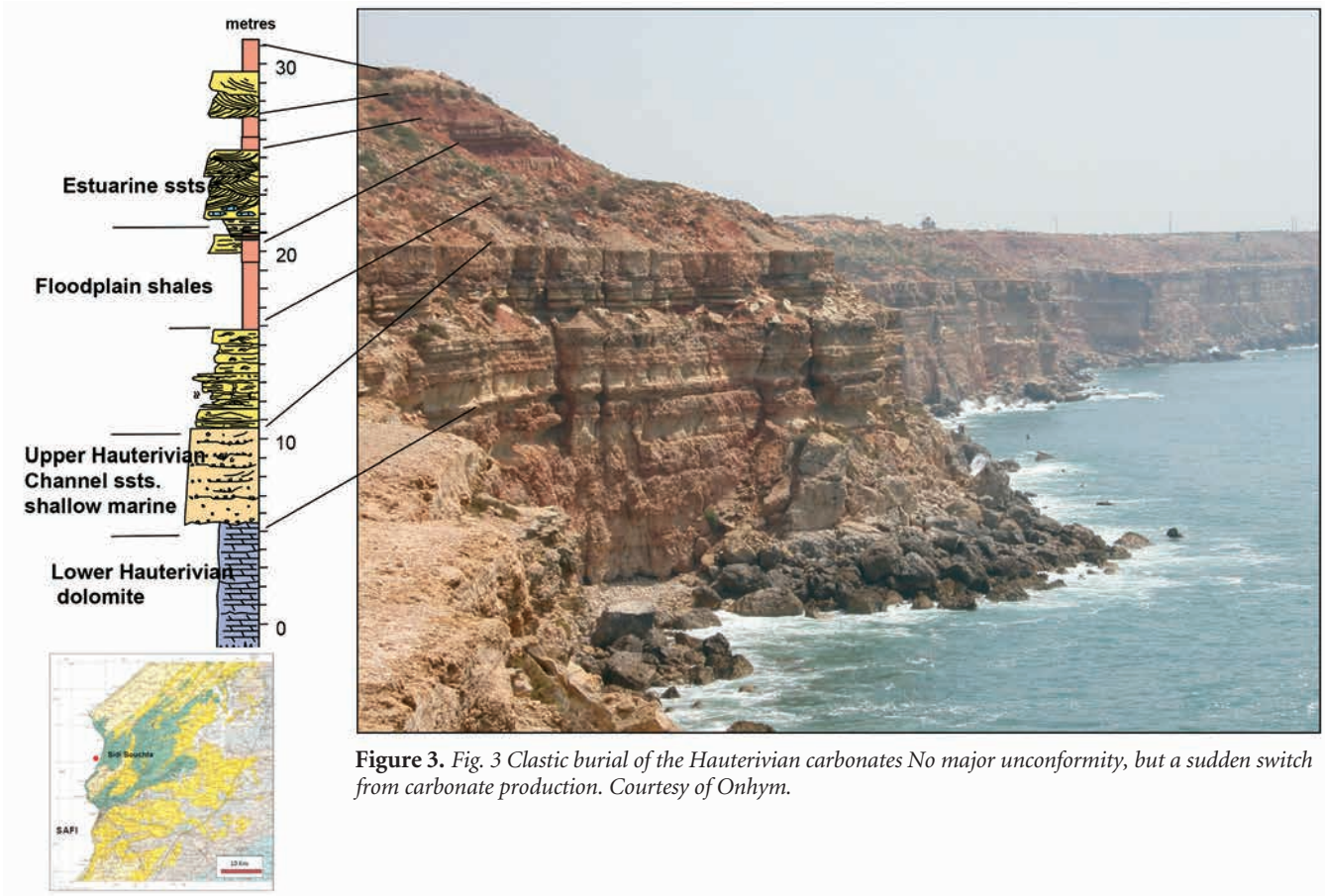

Figure 3. *Fig. 3 Clastic burial of the Hauterivian carbonates No major unconformity, but a sudden switch from carbonate production. Courtesy of Onhym.*

Rift in Chad and Mali at this time. Early Cretaceous sandstones can be found in dredge samples, onshore cliff exposures, and the DSDP well 547. Despite their well-documented presence, Early Cretaceous sandstones have never been specifically targeted by deepwater exploration wells.

Halokinesis was important in most of the North West African basins, and many salt diapirs penetrate to high levels in post rift fill, outboard of the carbonate edge. A few diapirs cut through the carbonates in Senegal and Guinea Bissau, but elsewhere the strong carbonate layer held back salt movement. Many salt structures have been drilled, but the only commercial discoveries over salt–cored structures are in Mauritania. Allochthonous salt sheets are present in the Mauritania and Essaouira basins with possible sub-salt traps developed at Early Cretaceous level . These remain to be tested and defined using better quality sub-salt seismic imaging. The few wells that have been drilled in the deepwater have mainly tested salt-cored structures at Tertiary level. However, reservoir intervals have not been encountered because the turbidite flows were deviated around sea bed highs created over the growing salt structures. The Late Cretaceous to Tertiary section is also perceived to be mainly shale prone in Morocco; however more wells are required to confirm whether this is indeed the case. ■

Biographical Sketch

Ian Davison is currently Managing Director of Earthmoves Ltd. and GEO International Ltd. exploration consultancy companies which he co-founded in 1999. He has consulted for over 100 exploration companies since this time.

Dr. Davidson received a BSc degree in earth sciences from the University of Leeds before completing his PhD on Malian Precambrian mobile belts at Montpellier and Leeds Universities. After this, he joined the British National Oil Company in Glasgow for three years where he was involved in international exploration in North Western Europe. He then decided to take a break from the routine and moved to Salvador in North East Brazil where he lectured in Basin Dynamics, Tectonics and Precambrian Geology for five years. During this time, he consulted extensively for Petrobras.

He returned to the United Kingdom in 1989 and became a Senior Lecturer in Structural Geology at Royal Holloway, University of London, where he directed the Salt Tectonics Group. Dr. Davidson has published over sixty papers in scientific journals and books.

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HGS North American Dinner Meeting

John E. Zumberge, Stephen W. Brown
GeoMark Research, Ltd., Houston, TX
John B. Curtis (speaker), *jbcurtis@mines.edu*
Colorado School of Mines, Dept. of Geology and Geological Engineering, Golden, CO

Comparison of North American and European Shale Gas and Oil Resource Systems

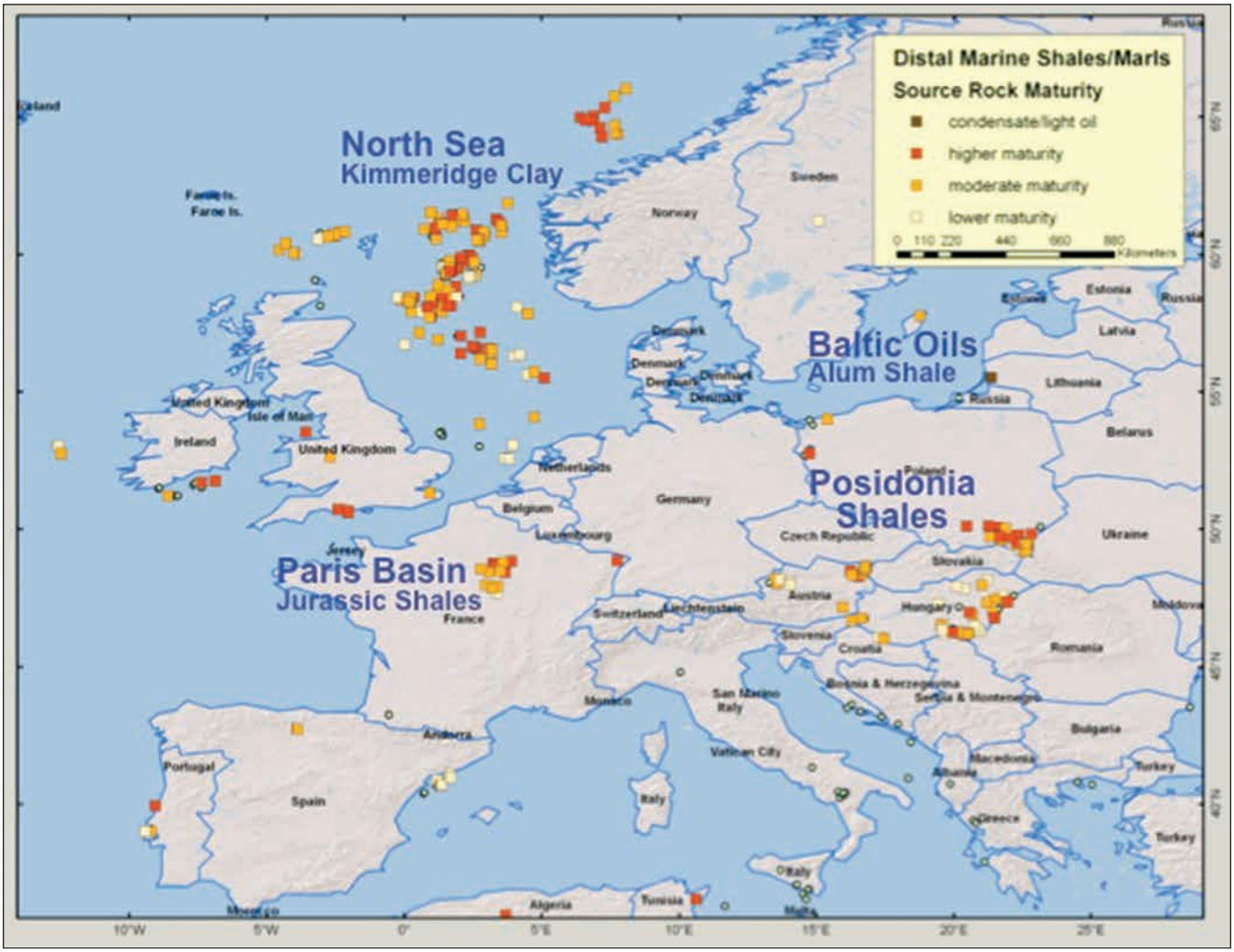

Figure 1. *Europe oil markers – based on biomarkers*

The first natural gas well completed in North America was drilled into a Devonian shale formation near Fredonia, New York in 1821. Shale gas production comprised only a small percentage of United States gas production for the next 180 years. Recently, a combination of technologies — primarily horizontal drilling improvements and development of multi-stage hydraulic fracturing for such wellbores — allowed what was predominantly gas-in-place to become economic production. Shale gas accounted for approximately 35% of United States gas production and 45% of technically recoverable resource in 2012.

A model for shale gas and shale oil producibility requires sufficient shale thickness, organic content (ideally hydrogen-rich), and an

HGS North American Dinner *continued on page 39*

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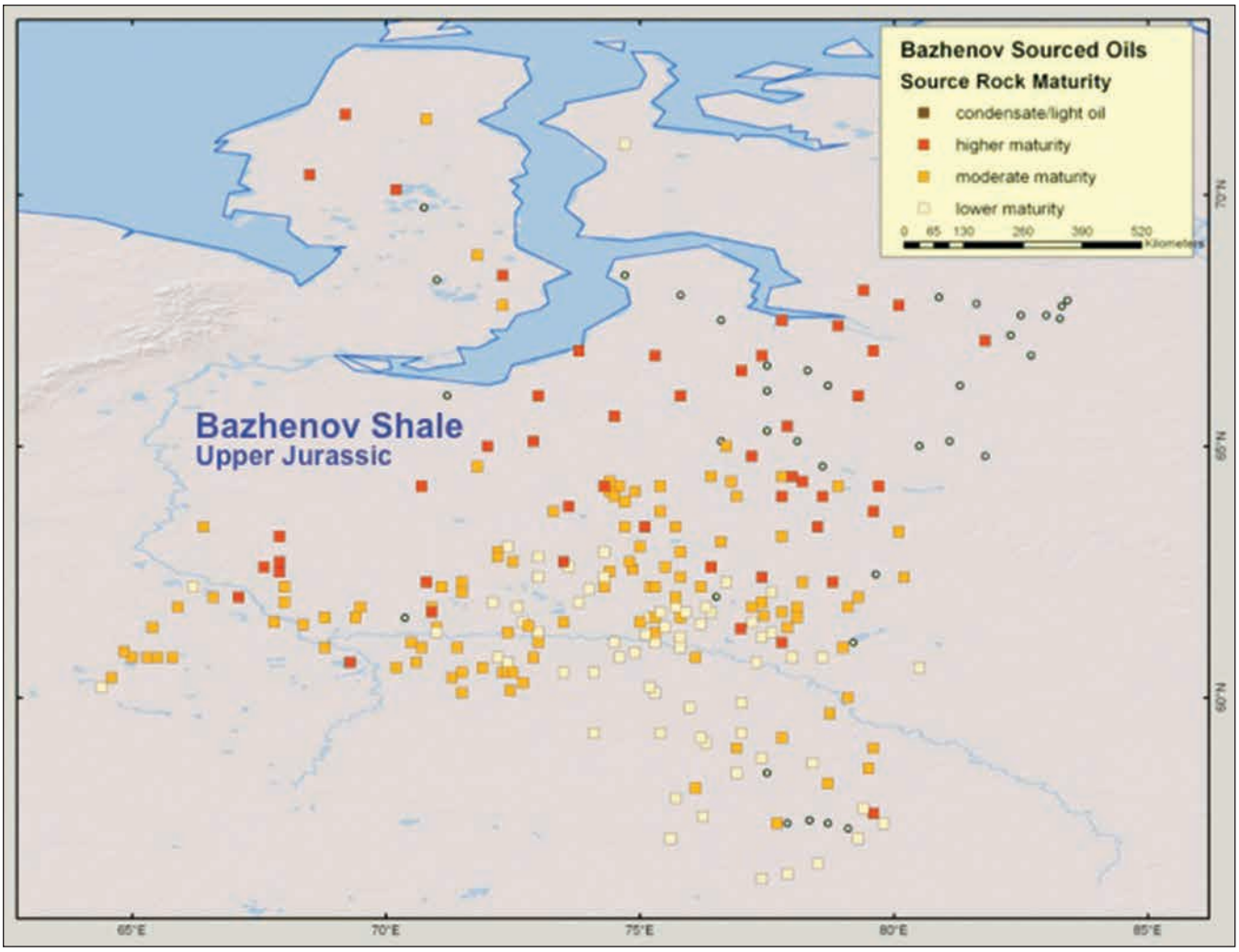

Figure 2. *West Siberia oil maturity – based on biomarkers*

adequate level of thermal maturity to generate economic volumes of gas or oil. Additionally, the mineral composition of the rock matrix (ideally silica-rich and clay-poor) must impart sufficient brittleness to enhance the effectiveness of stimulation treatments. Increased pore pressure (e.g., almost twice hydrostatic in the Jurassic Haynesville Formation of east Texas and north Louisiana) will also enhance the nano- to micro-Darcy matrix permeability.

To begin any shale gas or oil resource evaluation, detailed information about hydrocarbon generation through time is required. This information has historically been derived through source rock analysis. However, another method using information on oil samples, depositional settings, and thermal history is equally effective.

This study utilized a large oil database covering North America and Europe, excluding Eastern Europe, to compare and contrast the potential of shale gas and shale oil resource plays in each of these regions. The technique effectively identified basins with deepwater marine source rocks (type II kerogen) and measured the level of thermal conversion. The oil geochemistry and ancillary geological data analysis correctly identified known North American basins with shale gas/oil production or potential. The oil and gas play fairways were mapped for the North American basins and prospective European basins were identified. Comparisons to North American plays indicated relative resource potentials to the sub-basin scale. As oil samples are commonly more available (and at times more stratigraphically representative) than source rock information from outcrop, cores, or cuttings, this approach can provide a deeper geochemical understanding of shale resource systems. ■

Biographical Sketch

John B. Curtis is Professor Emeritus of Geology and Geological Engineering and Director, Potential Gas Agency at the Colorado

HGS North American Dinner *continued on page 41*


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HGS North American Dinner continued from page 39

School of Mines. He received a Bachelor of Arts in 1970 and a Master in Science in 1972 in geology from Miami University and a Doctor of Philosophy in geology in 1982 from the Ohio State University. He holds a Professional Geologist license from Wyoming. Dr. Curtis was a Minuteman Missile Launch Officer and Instructor Launch Officer in the United States Air Force from 1972 to 1975.

Dr. Curtis has been at the Colorado School of Mines since July 1990. He had 15 years of prior experience in the petroleum industry with Texaco, Inc., SAIC, Columbia Gas, and Brown & Root Laboratories/Baker-Hughes. He serves on and has chaired several professional society and natural gas industry committees, which previously included the Supply Panel, Research Coordination Council, and the Science and Technology Committee of the Gas Technology Institute (Gas Research Institute). He co-chaired the American Association of Petroleum Geologists (AAPG) Committee on Unconventional Petroleum Systems from 1999-2004 and is an invited member of the AAPG Committee on Resource Evaluation. He was a Counselor to the Rocky Mountain Association of Geologists from 2002-2004.

He was an Associate Editor of the *AAPG Bulletin* from 1998 – 2010. Dr. Curtis has published studies and given numerous invited talks concerning hydrocarbon source rocks, exploration for unconventional reservoirs, and the size and distribution of U.S., Canadian and Mexican natural gas resources and comparisons of resource assessment methodologies. As Director of the Potential Gas Agency, he directs a team of 100 geologists, geophysicists and petroleum engineers for the Potential Gas Committee's biennial assessment of remaining U.S. natural gas resources. Prior to beginning transitional retirement, he taught petroleum geology, petroleum geochemistry and petroleum design at the Colorado School of Mines, where he continues to supervise graduate student research.

Dr. Curtis has worked with GeoMark Research, Ltd. in a consulting capacity since 1996. He is currently responsible for their Rocky Mountain petroleum system/resource potential studies in the U.S. and Canada.

HGS Happenings

HGS Participates in the Annual Sally Ride Festival

The annual Sally Ride Science Festival, a daylong science and engineering fair aimed at interesting middle school girls in science, was held on October 12, 2103 at Rice University's Engineering Quad. The festival featured a talk by former astronaut Barbara Morgan, discovery workshops led by scientists and engineers, workshops for parents and teachers on ways to support students' interest in science and math and a street fair with booths, hands-on activities, food and music. The HGS Outreach Committee volunteers Jim Tucker, Huw James, Kevo Richard, and Aubrey Waddail staffed a booth providing students interesting displays and information on the geological sciences.
Photographs by Huw James.

Jim Tucker with the umbrella standing next to Kevo Richard at the table. Aubrey Waddail is in the orange UT shirt.

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To guarantee a seat, pre-register on the HGS website & pre-pay by credit card. Pre-registration without payment will not be accepted. Walk ups may pay at the door if extra seats are available.

W.C. Rusty Riese
Adjunct Professor at Rice University and the University of New Mexico
rusty.riese@gmail.com

AAPG Distinguished Ethics Lecture, 2011-2013

Oil Spills, Ethics, and Society: How Do They Intersect and Where are the Responsibilities?

Global demand for energy has forced societies the world over to look for and use ever more diverse and expensive forms of energy to fuel their economies. Oil is a key part of this energy - cost balance, particularly in the arena of transportation fuels, and the corporations who supply those fuels have been pressed into increasingly challenging environments to meet public and governmental demands for inexpensive energy. Unfortunately, as we are reminded by the Gulf of Mexico Deepwater Horizon incident, accidents can happen, the environment can be damaged, and people can lose their lives when we operate on technology horizons.

So, when accidents occur what should our responses be? Who is to blame: individuals? corporations? regulators? or the public whose demand for cheap energy spurs exploration in new, more challenging frontiers? And how are public opinions on this subject shaped: by self education? or by fulminating politicians and aggressive, sensational journalism?

This presentation is a discussion of all these questions. It then goes further to explore more than societal interests at a national level: it puts our pursuit of inexpensive energy into context with the competing demands of developing countries seeking ever increasing shares of the world's resources. This will be contrasted with the broader elements in all nations that are worried that continued dependence on energy-dense fossil fuels causing runaway global warming and climate changes will destroy the earth's ecosystems.

Ultimate responsibilities for oil spills lie somewhere in this mix of competing demands and expectations — a mix far more complicated than most people are aware of or consider. ■

Ultimate responsibilities for oil spills lie somewhere in this mix of competing demands and expectations — a mix far more complicated than most people are aware of or consider.

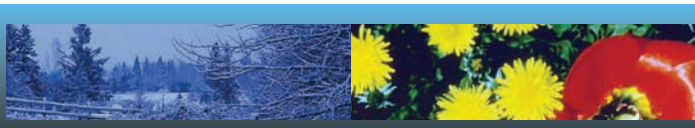
Biographical Sketch

W.C. Rusty Riese is a geoscientist based in Houston, Texas. He is widely experienced having worked in both minerals and petroleum as a geologist, geochemist, and manager during more than forty years in industry. He participated in the National Petroleum Council evaluation of natural gas supply and demand for North America which was conducted at the request of the Secretary of Energy; in the more recent analysis of global supply and demand requested by the same agency; and in the National Research Council analysis of coalbed produced waters and their management in the western United States. He is currently a member of the American Association of Petroleum Geologists Committee on Resource Evaluations, and a member of the House of Delegates, and past Sections Vice President.

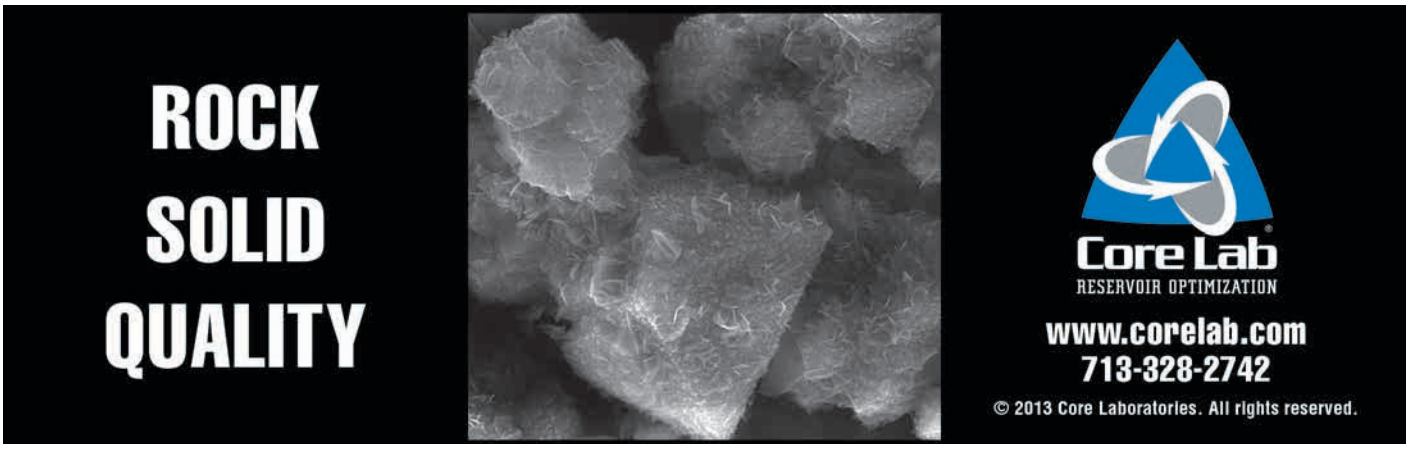
Dr. Riese has written extensively and lectured on various topics in economic geology including biogeochemistry, isotope geochemistry, uranium ore deposits, sequence stratigraphy, and coalbed methane petroleum systems; and he holds numerous domestic and international patents. He has more than thirty years of teaching experience including twenty eight years at Rice University where he developed the curricula in petroleum geology and industry risk and economic evaluation, as well as several other courses. He is currently an Adjunct Professor at Rice University and the University of New Mexico. He is a fellow in the Geological Society of America and the Society of Economic Geologists; and a member of the American Association of Petroleum Geologists and several other professional organizations.

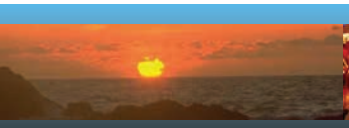
He earned his PhD from the University of New Mexico in 1980; his M.S. in geology from the same university in 1977; and his B.S. in geology from the New Mexico Institute of Mining and Technology in 1973. He is a Certified Professional Geologist, a Certified Petroleum Geologist, and is a Licensed and Registered Geologist in the states of Texas and South Carolina, respectively.

January 2014

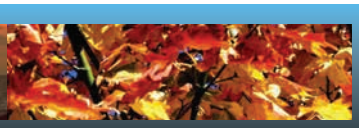


Sunday	Monday	Tuesday	Wednesday
	Reservations: The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476. **Reservations for HGS meetings must be made or cancelled by the date shown on the HGS Website calendar, normally that is 24 hours before hand or on the last business day before the event.** If you make your reservation on the Website or by email, an email confirmation will be sent to you. If you do not receive a confirmation, check with the Webmaster@hgs.org. Once the meals are ordered and name tags and lists are prepared, no more reservations can be added even if they are sent. **No-shows will be billed.**		**1** HGS office closed 12/23/13-1/3/14
5	**6**	**7**	**8 HGS Environmental & Engineering Dinner Meeting** *"Influence of Shallow Geology on Volatile Organic Chemical Attenuation from Groundwater to Deep Soil Gas," Lila Beckley, P.G., and Danielle "Danny" Bailey, P.G., GSI Environmental, Inc., Houston, Texas, Page 21*
12	**13 HGS General Dinner Meeting** *"Source Rock Reservoirs are a Unique Petroleum System," Kenneth E. Williams Page 25*	**14 HGS Northsiders' Luncheon** *"An Interpretation of the Depositional Environment and Facies of the Eagle Ford Shale from Karnes-Maverick County, TX," Heather A. McGarity, Janok P. Bhattacharya, & Robert E. Lamond, Page 29* **HGS Board Meeting** *6 p.m.*	**15**
19	**20 HGS International Dinner Meeting** *"Hydrocarbon Potential of the North West African Margin," Ian Davison, Earthmoves Ltd. Camberley, UK Page 31*	**21**	**22 Industry-Rice Earth Science Symposia (IRESS) - Vision for IRESS**
26	**27 HGS North American Dinner Meeting** *"Comparison of North American and European Shale Gas and Oil Resource Systems," John Curtis Page 37*	**28 Fifth Annual AAPG-SPE Deepwater Reservoirs Geosciences Technology Workshop** *Norris Conference Center – CityCentre, Houston, Texas*	**29 HGS General Luncheon Meeting** *"Oil Spills, Ethics, and Society: How Do They Intersect and Where are the Responsibilities?", W.C. Rusty Riese, Adjunct Professor at Rice University and the University of New Mexico Page 43*





GeoEvents



Thursday	Friday	Saturday
2	3	4
9	10	11
16	17	18
23	24	25
30 **Jan. 29 – ConocoPhillips: Recognizing Value by Unleashing the Independent E&P** *SPE Gulf Coast Section, Four Seasons Hotel, Houston, TX*	31 **You can make your reservations NOW online at ww.hgs.org**	**Members Pre-registered Prices:** General Dinner Meeting..... $30 Nonmembers & walk-ups..... $35 Env. & Eng. ..... $30 Luncheon Meeting ..... $30 Nonmembers & walk-ups ..... $35 International Explorationists ..... $30 North American Explorationists $30

February 10-12, 2014
Arctic Technology Conference
Houston, TX

February 15-18, 2014
10th North American Paleontological Convention
Gainesville, FL

February 17-18, 2014
HGS Applied Geoscience Conference
Integrated Approaches of Unconventional Reservoir Assessment and Optimization, Houston, TX

February 19-20, 2014
55th Anniversary Science Engineering Fair of Houston
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February 24-25, 2014
SPE/EAGE European Unconventional Resources Conference and Exhibition
Vienna, Austria

March 22-23, 2014
Natural Gas Hydrate Systems — Occurrence and Dynamic Behavior
Gordon Research Seminar, Galveston, TX

April 6-9, 2014
AAPG Annual Convention & Exhibition
Houston, TX

April 8, 2014
HGS Night at the Houston Museum of Natural Science
Houston, Texas

May 5 –8, 2014
2014 Offshore Technology Conference
Houston, Texas

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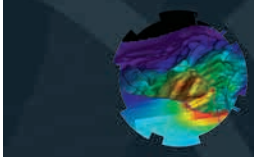

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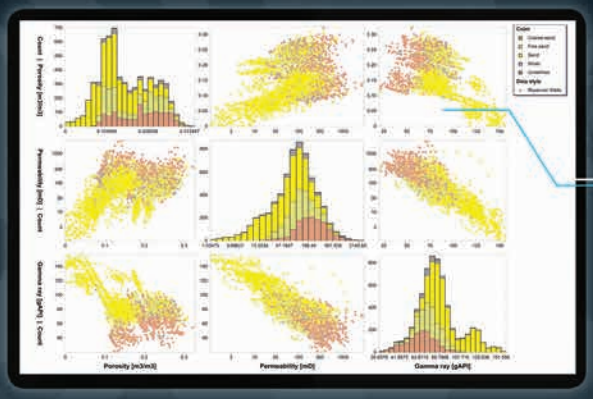

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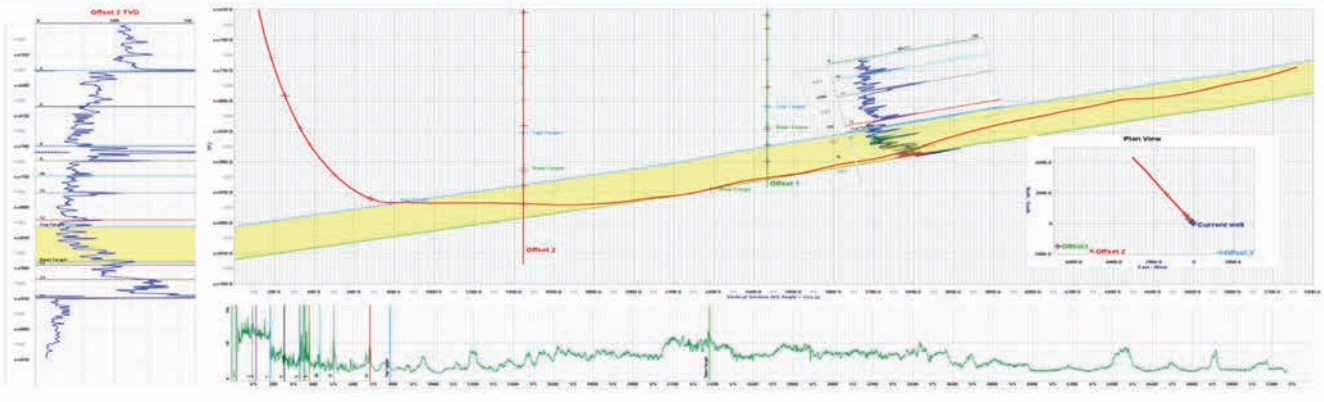

HGS Leads Public Earth Science Week Field Trip

Houston Geological Society volunteers lead the Earth Science Week field trip to Whiskey Bridge on October 20, 2013. The trip was open to the public and well attended on a day of perfect weather. A troop of girl scouts were among the participants. Whiskey Bridge outcrop on the Brazos River, famous for being the "most fossiliferous site in Texas," is Eocene-aged rocks of the Crockett Formation (Stone City Member) near Bryan, TX. HGS geologists were on hand to identify marine fossils and provide information on the environment, stratigraphy, and marine fossils found at this site. ■

Photographs by Martha McRae (co-chair of the ESW Committee)

Heading down to the outcrop

Dr. Yancy, Texas A&M University, describing the geology

Girl Scout group reviews map

Volunteers: Marc Fagelman and Ken Thies

Claudia Ludwig and Inda Immega

Group listening to overview

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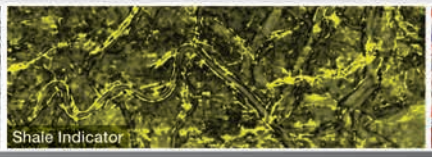

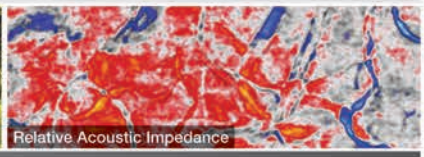

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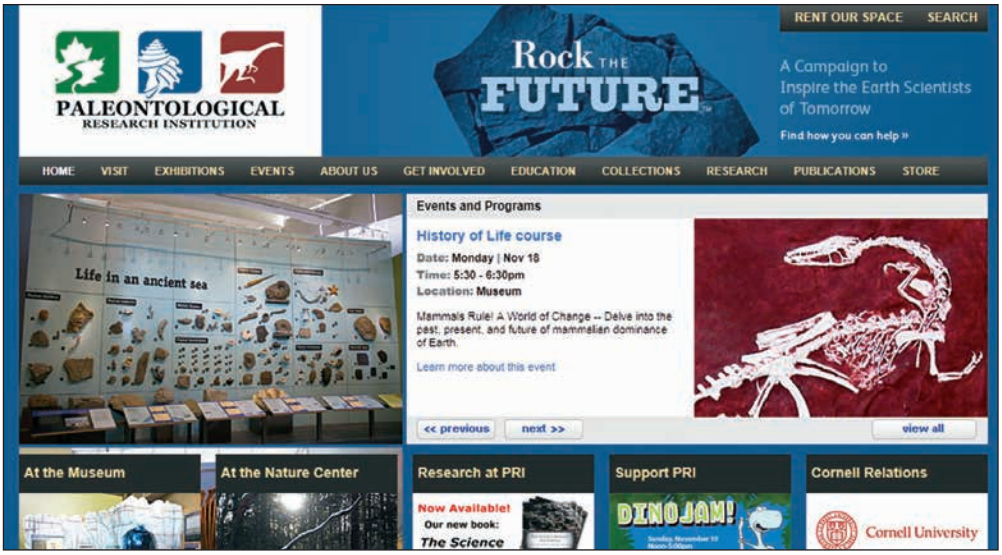
Geological Website of the Month

Museum of the Earth

www.museumoftheearth.org • www.priweb.org

By Michael F. Forlenza, P.G.



It is wonderful that places like the Museum of the Earth exist. The Museum of the Earth is a regional museum and education venue operated by the Paleontological Research Institution and established to provide the general public with an opportunity to explore earth's history through curated collections of fossils and a mixture of scientific exhibits and interactive natural history displays.

The Museum of the Earth website is a sharp looking affair in blue and white with crisp, clean graphics. The structure of the website is rather flat, that is, there are many pages, but most pages are brief. The homepage has a bar of topics running across the top. However, here the interactive topics bar does not have the pull down menus that are familiar to most web surfers. Each topic must be clicked on to open a new page where the sub-topics are listed down the left side. The website visitor will have to do some poking around to find interesting geological information. Spend some time looking at the pages under the topics "Collections," "Research," and "Publications."

Drill down under Research, Publications and Presentations to find a list of dozens of original papers and publications developed in association with the Paleontological Research Institution. In 2012, 18 peer-reviewed papers and more than 90 other papers, articles, and posters were prepared by staff, students, and researchers. Many of the references have links to the published material. You can open and read "Understanding naturally occurring radioactive material in the Marcellus Shale" from The Marcellus Shale Papers, no. 4, or "The Teacher-Friendly Guide to Evolution Using Bivalves as a Model Organism."

The Museum of the Earth, located in Ithaca in upstate New York, opened in September in 2003 and is the physical presence and repository of the Paleontological Research Institution (PRI). According the website, the mission of the PRI is to serve "society by increasing and disseminating knowledge about the history of life on Earth." The museum's 8,000-square-foot permanent exhibition takes visitors on a journey through 4.5 billion years of history, from the Earth's origin to the present day. Through hands-on, visual exhibitions and outreach, the Museum of the Earth encourages critical thinking about life on Earth in the past and today, and how our species is affecting the natural world.

Founded in 1932, the Paleontological Research Institution has outstanding programs in research, collections, publications, and public education. The Institution holds a collection of nearly three million specimens, making it one of the ten largest in the United States, and publishes *Bulletins of American Paleontology*, the oldest paleontological journal in the Western Hemisphere, begun in 1895. PRI is a national leader in the development of informal (i.e., outside the classroom) Earth science education resources for educators and the general public.

The PRI was born out of professional frustration and can trace its genesis back to Cornell University professor of geology Gilbert Dennison Harris (1865-1952). During more than 40 years of research from 1895, Dr. Harris established himself as one of the most important American invertebrate paleontologists of his generation. After becoming exasperated at delays in getting some of his research published, Dr. Harris established his own scientific printing enterprise when he started the *Bulletins of American Paleontology* in 1895. He oversaw the printing himself on a press located in McGraw Hall on the Cornell University campus.

Later, Dr. Harris, concerned that Cornell would not care for his legacy after he retired, urged university administrators to provide new space on campus for his fossil collections and printing enterprise with guarantees that these would be maintained in perpetuity. Perhaps understandably, Cornell rebuffed him. This led him to found his own separate scientific

Geological Website of the Month *continued on page 51*

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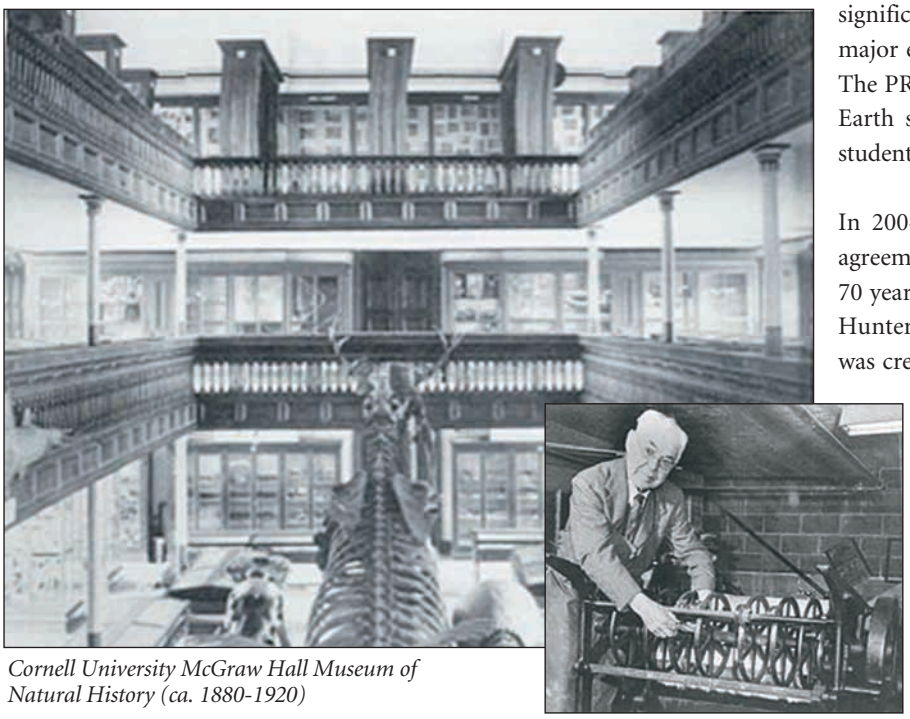
Geological Website of the Month continued from page 49



Cornell University McGraw Hall Museum of Natural History (ca. 1880-1920)

significant regional tourist attraction as well as a major educational resource for central New York. The PRI has become a national leader in informal Earth science education, providing resources to students and teachers across the country.

In 2004, PRI and Cornell University signed an agreement of formal affiliation, ending more than 70 years of estrangement. In 2008, the position of Hunter R. Rawlings III Professor of Paleontology was created in Cornell's Department of Earth and Atmospheric Sciences, a professorship that can only be held by the PRI's Director. The Museum of the Earth and its fossil collection are on-going resources for Cornell undergraduate courses in biology, geology, anthropology, and art. PRI's scientific staff conducts original research in evolutionary biology, paleontology, global climate change, paleoceanography, and sedimentary geology.

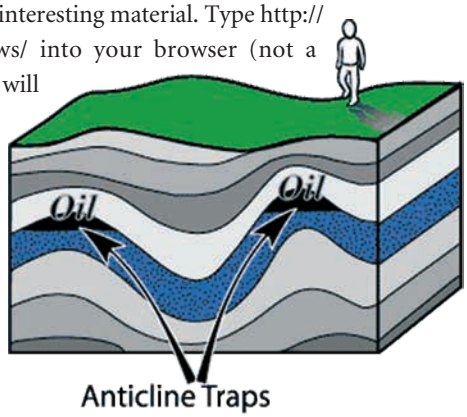
organization. On June 28, 1932, Dr. Harris held a simple but formal ceremony with family, friends, and former students to lay the cornerstone for a building on a small plot of land adjacent to his home behind Cornell's north campus. He called his new organization the Paleontological Research Institution and received a provisional charter for it from New York State in 1933. PRI was envisioned as, and for decades largely remained, an enclave for Dr. Harris and people like him — who wanted to study fossils.

When Dr. Harris died in 1952, his former student and protégé, Katherine Palmer, became PRI's Director. Dr. Palmer was herself a highly accomplished paleontologist, and the first woman to receive American paleontology's highest honor, the Paleontological Society Medal. As the director, serving well into her eighties, she continued to publish the *Bulletins* and grow the collections. By the 1960, the PRI outgrew its home and in 1965, purchased a large stone building and 6.3 acres on Ithaca's West Hill. The 10,000 square-foot Tudor-style structure had been built in 1926 as an orphanage. The new building allowed for an area to be devoted solely to public education and a display area on the first floor.

Subsequent directors greatly expanded PRI's educational outreach, obtained new funding sources such as from the National Science Foundation, and rebuilt connections with Cornell.

The Museum, in its new home, welcomes approximately 30,000 visitors a year. The Museum and its exhibits and programs are a

A shadow website of the Museum of the Earth exists at the web address of www.priweb.org. This was probably an earlier website for the organization that was abandoned for www.museumoftheearth.org which now links to the museum home page. However, some of the priweb.org sub-pages can still be accessed and have some interesting material. Type http://www.priweb.org/ed/pgws/ into your browser (not a search engine) and you will come to a petroleum education page. The petroleum education page, made possible by grants from Chevron, ExxonMobil, and the AAPG, has links to discussions and illustrations related to "Petroleum Systems," "Paleontology and Oil," "Oil in Your Backyard," "Geology Basics," "Oil History," "Energy Links," and "Tools of the Trade." Side trips here can lead to animated illustrations of basin modeling and instructions on how to make a stratigraphic column.



The Museum of the Earth is available for rental for receptions and events. So, keep that in mind for any upcoming weddings. Before you leave the website, check out the Store. Where else are you going to find a Eurypterid plush toy? And, if you are ever in New York's Finger Lakes region, try the outstanding Riesling and set aside some time to visit the Museum of the Earth. ■

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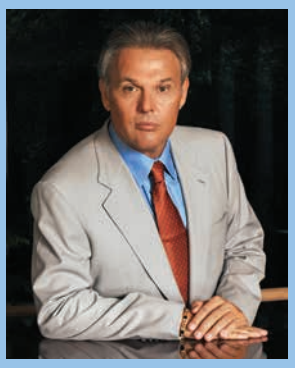
Cheated, Mistreated, Pushed Around?



Have you been cheated, mistreated or somehow deprived of your share of a deal, working interest or royalty? If so, give me a call. I have twenty five years experience as a working interest and royalty owner in the oil and gas business to go along with thirty five years of court room experience. You do not pay anything unless I win.

Robert A. Chaffin
THE CHAFFIN LAW FIRM
4265 San Felipe, Suite 1020
Houston, Texas 77027
(713) 528-1000
robert@chaffinlawfirm.com

Playmaker 2.0 – DPA Does It Again!

Charles A. Sternbach, Past President DPA 2012-2013

The Playmaker 2.0 Forum will be held on Thursday January 23, 2014, in west Houston (Norris Conference Center, City Centre, adjoining Hotel Sorella, SE corner of Beltway 8 and I-10). Mark your calendars, register online. The AAPG forum, organized by its Division of Professional Affairs (DPA) and co-hosted with the AAPG Education Department, is a great opportunity for HGS members http://www.aapg.org/forum/2014/playmaker/index.cfm

What attendees will learn: Explorers will travel to Houston from far and wide to hear some of the best oil finders in our business talk about prospecting skills, the art of exploration, work flows, successful and emerging plays by those who know them well. HGS members are in the center of the action so please make plans to join us! Forum topics include the art of exploration, prospecting workflows, and marketing approaches from 16 confirmed speakers. Discussions will include:

- Seeing the "big picture" in terms of petroleum systems,
- How to cultivate exploration creativity, key ingredients to success,
- Tools for practical prospecting, marketing (and screening) prospects at expos,
- Examples how data integration of logs, oil shows, DST's can identify bypassed pays and bypassed plays,
- How geochemistry can "seal the deal" and support your ideas, and
- AAPG/DPA Resources available to explorers already on the web, future programs.

After a networking lunch, we will learn about major discoveries and plays:

- Barnett, Fayetteville, Haynesville, Marcellus, Bakken, and Woodford shale

Last year's Playmaker speakers (Jan 24, 2013)

Morning speakers (left to right) Ted Beaumont, Dan Tearpock, Richard Stoneburner, Steve Brachman (Bill Maloney, not shown)

Afternoon speakers (left to right) Rick Fritz, Kirk Barrell, Tom Bowman, Susan Nash, Ken Mariani, Bill Zagorski, Ted Beaumont (Shane Matson, not shown)

- Dr. Scott Tinker, Director of the Texas BEG will discuss shale plays, sweet spots, production insights
- Brad Berg, Anadarko and SPE distinguished lecturer, will discuss "what you need to know"
- Emerging plays in the Tertiary Gulf Coast and major deep water discoveries in the Gulf of Mexico
- Giant new discoveries along the Atlantic margins
- Extending North American plays into Mexico and Canada, new rules for Mexico.

Headliners: Jim Bob Moffett and Bud Brigham will share lessons from illustrious careers. Both legendary explorers have succeeded greatly and will receive DPA Heritage Awards at Playmaker 2.0 Forum. You will have opportunity to meet, ask questions, and congratulate these courageous explorers. Please see the full listing of all the speakers and topics in the program detail. http://www.aapg.org/forum/2014/playmaker/schedule.cfm

Attendees will receive a copy of the program book AND the popular DPA publication "Heritage of the Petroleum Geologist" (also available to all new DPA members or from AAPG bookstore). Events like Playmaker can be the front line for mentoring Young Professionals. DPA welcomes new members with registration discounts at this and future events, plus a lot of useful professional information online. http://dpa.aapg.org/join.cfm

DPA initiatives: DPA has formed a Playmaker Ad Hoc Committee, chaired by Charles Sternbach. Other members of this committee include Rick Fritz (co chair for Playmaker 2.0), Greg Hebertson (sponsorship chair), John Hogg, Marty Hewitt, Bill Haskett, David Dolph, Mike Party and Tom Bowman. Prospect expos are popular events around the globe and programs providing professional skill sets are greatly needed. The committee is looking for ways to 1) meet this need in multiple venues and 2) welcome proactive members to the Playmaker committee.

From good to great*: I believe professional geoscientists, HGS and DPA members are the best in the world at creating prospects and turning them into discoveries. We are passionate about providing global energy while pursuing professional excellence. This success drives economic engines of our world, our stakeholders, personal

Playmaker 2.0 – DPA Does It Again! *continued on page 55*

Learn Skills Today
You Can Put to Use Tomorrow

It's all about practical application, and **AAPG's 11th Annual Winter Education Conference** in Houston offers five enlightening days of geoscience courses led by today's most renowned experts—*at one outstanding price*. With four concurrent sessions each day, you choose the topics that interest you.

What's more, if you become an AAPG member, you'll save $300 off the regular non-member price through January. 13. With buffet lunches and refreshments included every day, there's never been a better opportunity to expand your knowledge and reveal your inner explorer.

The right source for the right education, right now. That's AAPG. Register today.

Courses Include:

- Exploration for Deep-Water Sands Using Seismic Sequence Methodology
- Carbonate Reservoir Geology
- Carbonate Seismic Sequence Stratigraphy
- Carbonate Depositional Systems
- Quick Guide to Carbonate Well Log Analysis
- 3D Seismic Attributes for Prospect Identification and Reservoir Characterization
- Seismic Amplitude Interpretation
- Geophysical Methods for Estimating Geomechanical Properties
- Integrating Data to Evaluate Shale Resources
- Exploration in the Bakken Petroleum System
- Exploration in the Niobrara Shale

AAPG | Winter Education Conference 2014

February 10-14, 2014 • Houston, Texas

AAPG | Winter Education Conference 2014

February 10-14 • Houston, Texas

Hosted by:

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Houston, Texas 74024
V: 713.590.0950
F: 713.590.0961

(Special AAPG Group Rates at Nearby Hotels)

Registration and Information
Call AAPG toll free in the U.S. and Canada at 888.338.3387 or 918.560.2650
F: 918.560.2678
E: educate@aapg.org
W: www.aapg.org

Tuition for the week	Price through Jan. 13	Price after Jan. 13
AAPG Members	$1795	$1995
Non Members	$2095	$2295
Individual Courses	$500/day	$550/day

Playmaker 2.0 – DPA Does It Again!

continued from page 53

fortunes and yes professional societies (see July 2013 EXPLORER column http://www.aapg.org/explorer/2012/07jul/dpa0712.cfm) *Recommended reading: "Good to Great", by Jim Collins (2001).

Showcasing bright spots and a legacy of relevancy: Want to see "The 10 Habits of Highly Successful Oil Finders", "Creativity in Exploration", "How to Market Your Prospect"? Speakers from the original Playmaker Forum are ready to coach you at a computer near you. These and other useful talks are available on the DPA webpage. Special thanks to Linda Sternbach for recording, editing, producing, and making the videos available http://dpa.aapg.org/

Programs like Playmaker showcase bright spots in what Divisions can offer all AAPG members and help fulfill DPA's goal to "empower geologists to discover energy and excel in business". These days AAPG's Divisions are striving more than ever to be content engines for the good of all AAPG members. For DPA, programs like Playmaker help fulfill that mission. ■

From Prospect to Discovery AAPG Playmaker 2.0 Forum

Organized by its Division of Professional Affairs
Charles A. Sternbach DPA past president (2012-13), Rick Fritz, DPA president-elect (2014-2015)
1-day Program, Thursday January 23th, 2014, Norris Conference Center, Hotel Sorella, Houston

Session 1:	**The Art of Exploration**
8:00– 8:10	Welcome Val Schulz (DPA President 2013-2014)
8:10 – 8:30	Introduction to Playmaker Forum, Charles Sternbach "DPA: resources for Explorers" and Rick Fritz "What professional Societies can offer: Geoscouts"
8:30 – 9:00	Harris Cander, BP, Unconventional Plays: It's all about the Petroleum System
9:00 – 9:30	Paul Basinski, The Golden Age of Shale: Thoughts from onset of the Eagle Ford
9:30 – 10:00	Break
Session 2:	**Prospecting Workflows and Marketing Approaches**
10:00 – 10:30	Tom Bowman, "Practical Prospecting"
10:30 – 11:00	Robert Pledger, Marketing Your Prospect at Prospect Expos
11:00 – 11:30	Bill DeMis, Bypassed Pays, Bypassed Plays Importance of integrating well data of all types: logs, shows, DST's
11:30 – 12:00	Chris Laughrey, GEOCHEM seals the deal: Data to support your ideas
12:00 – 1:00	Networking Playmaker Lunch
Session 3:	**Established Plays: Discovery of New Fields and Sweet Spots**
12:30 – 1:00	Keynote Speaker: Scott Tinker Bottoms Up Integrated Shale Gas Reserve and Production Forecasting: Comparison of the Barnett, Fayetteville, Haynesville Shales (maybe also Marcellus).
1:30 – 2:00	Bud Brigham, Brigham Oil and Gas Bakken Shale Play *(To include Presentation of AAPG/DPA Heritage Award, 2013 to Brigham)*
2:00 – 2:30	Brad Berg, Anadarko Petroleum Corporation, *Distinguished Lecturer* Topic: "Characterizing Shale Plays — The Importance of Recognizing What You Don't Know"
2:30 – 3:00	Coffey, Bill, Devon, Recent Exploration success in the Woodford Shale, Payne Logan Counties: finding 1,000+ BOPD wells in an area peppered with dry holes
3:00 – 3:20	Break
Session 4:	**Emerging Plays**
3:20 – 3:50	Jim Bob Moffett, ultra deep play on the Shelf and onshore Louisiana. *(To include Presentation of AAPG/DPA Heritage Award,* 2013 to Moffett)
3:50 – 4:30	John Dribus, Three Important Conventional Reservoirs Receiving Exploration Focus in the Deep Water Today
4:30 – 5:00	Alfredo Guzman, Mexico s new legal reform, what can be expected: possible extension of US Deep water GOM and onshore Eagle Ford shale
5:00 – 5:30	John Hogg, Observations on recent exploration success in Canada's Frontier Regions, with comments on Playmaker Calgary planned for April 2014
Reception:	5:30 to 7:00 PM Wildcatter Corner, refreshments served

Registration OPEN, seats going fast: http://www.aapg.org/forum/playmaker/index.cfm
Includes: course notes, "Heritage of Petroleum Geologist" DPA publication (free), continuing education credit, luncheon, 2 networking breaks, reception

$395.00	DPA Member (AAPG Young Professional, HGS Neo Geo, student)
$395.00	NeoGeo (<32 years old professional)
$425.00	AAPG or Affiliated Society Member
$475.00	Non members

Sponsorship Opportunities:

Contact Norma Newby, nnewby@aapg.org ph. 918-560-2613

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2013 – 2014 Houston Open Enrollment Course Schedule

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October 27 – 30, 2014

Risk Analysis, Prospect Evaluation and Exploration Economics

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April 21 – 25, 2014
September 22 – 26, 2014

Evaluating Tight Oil and Gas Reservoirs

May 5 – 8, 2014
January 27 – 31, 2014
April 21 – 25, 2014
September 15 – 18, 2014

www.roseassoc.com 713/528-8422

Transferring E & P Risk Assessment Expertise

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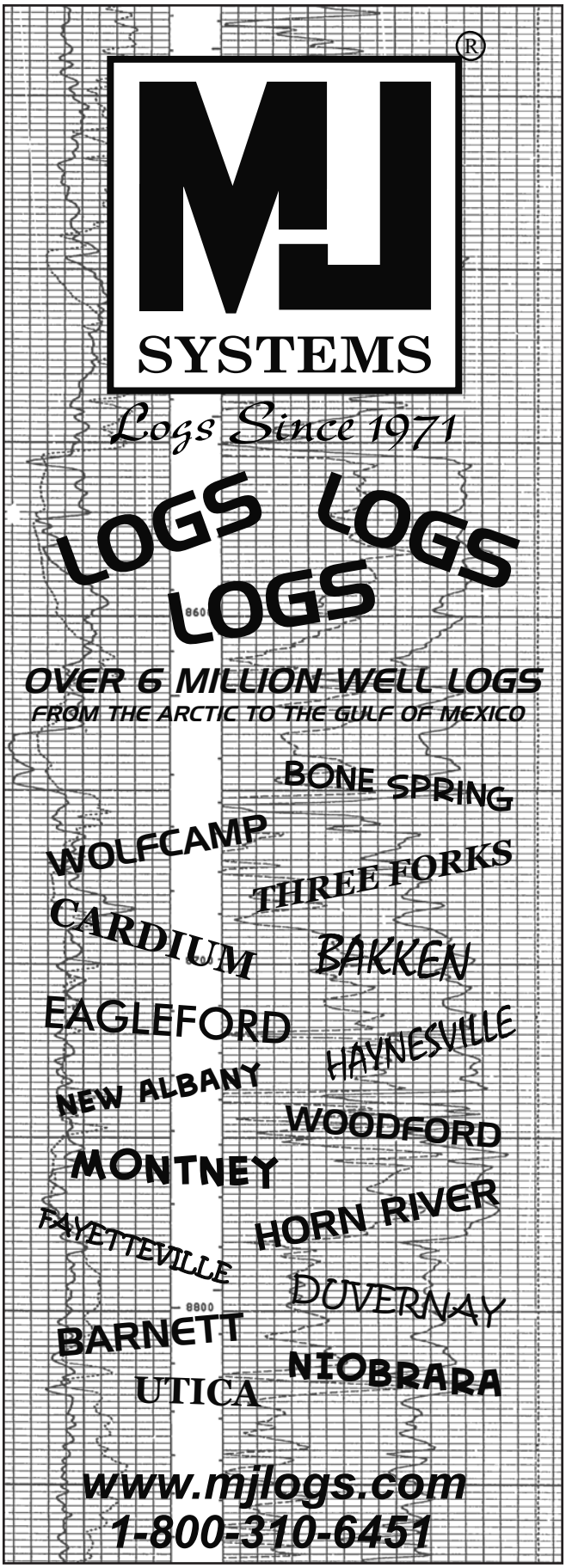
Candidate Search Underway

The nominations committee of the Houston Geological Society has begun its search for candidates in the two spring elections, one for delegates for the AAPG House of Delegates, of which a number of candidates are needed, and the other to elect a new HGS Board. To be considered for either of these you must be an active member of the HGS. Additionally, to run for the AAPG House of Delegates you must be a member of the AAPG.

If you are interested in running for an HGS office or for the AAPG House of Delegates, please contact Nominations Committee Chair **Martin M. Cassidy** at mcassidy.hgs@gmail.com or by phone at 713-503-8331. If you have any questions you may direct them to Martin. Information about the AAPG House of Delegates is also available from **Martha Lou Broussard** or **Bonnie Milne,** immediate past chair of the House of Delegates. Join the leadership, help guide the ship!



Government Update

*by **Henry M. Wise, P.G.** and **Arlin Howles, P.G.***

If you'd like the most up-to-date Texas rules, regulations, and governmental meeting information, we direct you to the HGS website to review The Wise Report. *This report, which comes out as needed but not more often than once a week, offers the most up-to-date information that may be of interest to Texas geologists.*

Geoscientist Building Whole-Earth Model for Long-term Climate Clues (AIPG eNews, 11/5/2013)

A Rice University-based team of geoscientists is going to great lengths — from Earth's core to its atmosphere — to get to the bottom of a long-standing mystery about the planet's climate. "We want to know what controls long-term climate change on Earth, the oscillations between greenhouse and icehouse cycles that can last as long as tens of million years," said Cin-Ty Lee, professor of Earth science at Rice and the principal investigator on a new $4.3 million, five-year federal grant from the National Science Foundation's Frontiers in Earth-System Dynamics Program. For more information go to: http://phys.org/news/2013-11-geoscientists-whole-earth-long-term-climate-clues.html

Changes Suggested to Wyoming Draft Rule on Groundwater Sampling (NGWA Newszine, 11/1/2013)

The Billings Gazette in Billings, Montana, reports environmentalists, landowners, and the oil and natural gas industry all had changes to propose for Wyoming's draft rule for testing nearby groundwater before drilling oil and gas wells.

The written comment period for the proposed Sampling and Analysis Procedures for Groundwater Baseline Sampling, Analysis and Monitoring Program expired on October 11, 2013. The state received 136 pages of comments, and nearly 50 people attended a hearing on October 15, 2013 at the Wyoming Oil and Gas Conservation Commission in Casper to talk about the proposed rule.

Although the oil and gas industry insists that drilling and hydraulic fracturing are safe, Governor Matt Mead and other members of the Oil and Gas Conservation Commission believe the testing will protect companies and landowners who depend on the water around drilling sites. The proposed rule came after residents outside the central Wyoming town of Pavillion said their water was contaminated as a result of hydraulic fracturing, which the industry denies.

The proposed rule would require testing once before drilling begins, but Jill Morrison of the Powder River Basin Resource Council, a Sheridan-based landowner group, questions even the title of the rule and why it has the word "baseline" in it. She said it contradicts other state agencies' requirements of four tests to establish a baseline.

"A year's worth of quarterly testing is what a real baseline testing is," she said.

The Oil and Gas Conservation Commission will review the written comments. They may suggest changes to the proposed rule for the commission to make at its November 12, 2013 meeting, said Grant Black, Wyoming oil and gas supervisor.

The commission could adopt the rule sometime after that, but Black said the adoption date will be different from the implementation date. It could take the staff some time to figure out how they are going to make the testing data public, which is required in the proposed rule, and implement other aspects of the rule.

Draft EPA Study Could Expand Clean Water Act Scrutiny of Groundwater NGWA Newszine, 10/18/2013)

Inside Washington Publishers reports the U.S. Environmental Protection Agency's draft study for determining whether smaller waters can be regulated due to their "connectivity" to downstream waters includes a focus on groundwater connections to surface water, driving concerns that the agency may seek to expand its policy for using a groundwater nexus as the basis for regulating smaller, more isolated waters.

One industry source says the language in the draft report could be especially helpful for the EPA or environmentalists seeking to regulate discharges that may reach wetlands, which tend to be more "groundwater-driven systems" than streams or other waters.

Concerns are being exacerbated by growing litigation from environmentalists seeking to regulate discharges that flow via groundwater to jurisdictional waters. For example, a citizen suit filed September 27 in the U.S. District Court for the District of Connecticut, Connecticut Fund for the Environment, Inc., et al. v. P.C. Metals, Inc., et al., is seeking to require a scrap metal recycling facility in Bridgeport, Connecticut to obtain a discharge permit for contaminated stormwater runoff that enters Long Island Sound via direct groundwater connections.

"Defendants discharge polluted stormwater into Johnsons Creek in Bridgeport Harbor by, including but not limited to, channeling

Government Update *continued on page 59*

HGS Welcomes New Members

New Members Effective December 2013

ACTIVE MEMBERS

Rebecca Horne
Christopher Johnson
Thomas Lacombe
Paul Mann
Leslie J. Bonnie Snyder
Jason Stouffer
Andrew Thorne
Leiaka Welcome
Rami Salman
Michael Nosiara
Daniel Ziegler

ASSOCIATE MEMBERS

Lee Prejean
Neal Wingenbach

EMERITUS MEMBERS

David Haglund
Ian Poyntz

STUDENT MEMBERS

Venkatesh Anantharamu
Hanah Bayer
Meagan Depugh
Eddit Hargrove
Yessenzhan Issenov
Vida Minaeian
Sarah Owen
Ben Richards
James Schlenker
Jonathan Stephens
Keyao Xia
Kenan Yazen

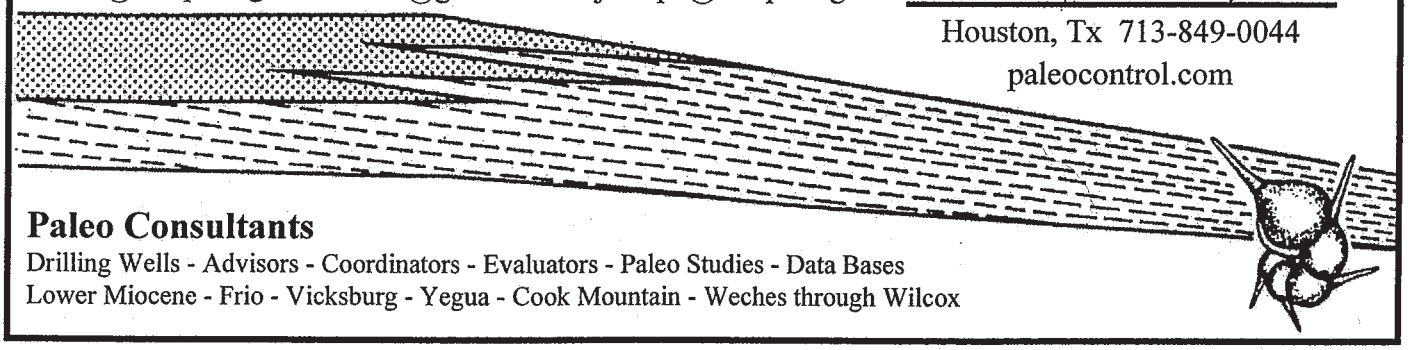
Welcome New Members

Loyd Tuttle
ltuttle@hal-pc.org

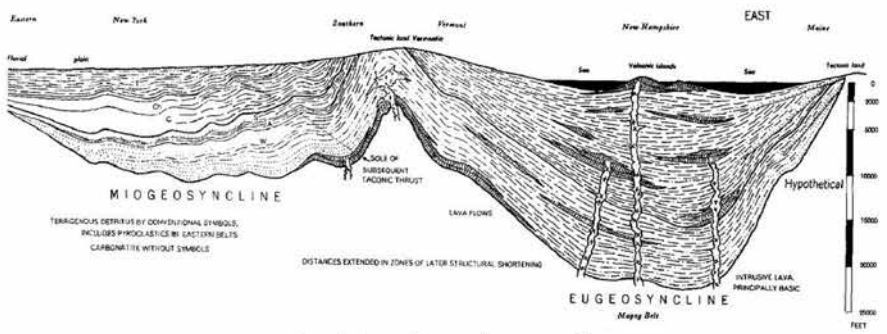
Bob Liska
liska.bob@gmail.com

Jim Thorpe
jthorpe@hal-pc.org

Paleo Control, Inc.
Houston, Tx 713-849-0044
paleocontrol.com



Paleo Consultants
Drilling Wells - Advisors - Coordinators - Evaluators - Paleo Studies - Data Bases
Lower Miocene - Frio - Vicksburg - Yegua - Cook Mountain - Weches through Wilcox



Look how far we've come!

(Kay, Marshall [1951], *North American Geosyncline*: Geological Society of America Memoir 48)

Sedimentary Basins:
Origins, Depositional Histories, and Petroleum Systems

33rd Annual GCSSEPM Foundation
Bob F. Perkins Research Conference
Houston, Texas
January 26-28, 2014
OMNI Hotel

More Information and Registration:
www.gcssepm.org

Government Update continued from page 57

and conveying polluted stormwater from the surface of the Facility into on-site catch basins and/or drywells that are directly hydrologically connected to Johnsons Creek in Bridgeport Harbor through the groundwater," the complaint said.

The plaintiffs said their claim is consistent with EPA's long-standing view that receiving waters that are hydrologically connected via groundwater are subject to regulation. For example, in a February 2012 letter to Congress, the EPA said the Clean Water Act "may cover discharges of pollutants from point sources to surface water that occur via groundwater that has a direct hydrologic connection to the surface water."

In the letter, the EPA cites a number of factors that it considers in evaluating groundwater connections, including geology, flow, and slope, saying that a fact-specific analysis could support a decision on whether a permit is required.

In the draft connectivity study, the agency notes that "geographically isolated wetlands can be connected to the river network via nonchannelized surface flow (e.g., swales or overland flow), groundwater, or biological dispersal" and that geographic isolation should not be used to infer that a waterbody lacks hydrologic, chemical, or biological connectivity.

While the industry source says there has always been a "limited component" in what is necessary to establish a "significant nexus" with groundwater, EPA's draft connectivity study appears to expand options for making such determinations. "Here we're talking about virtually everything connecting to groundwater," particularly with the majority of wetlands, the industry source said.

The draft study, "Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence," which EPA released for review September 17, seeks to create a scientific basis for the EPA and U.S. Army Corps of Engineers' determinations on when smaller waters such as intermittent or temporary streams, nontidal wetlands, and certain open-waters are connected to navigable waters and are potentially jurisdictional.

The EPA is also using the study as support for its draft rulemaking

Government Update *continued on page 60*

Come See What's New

Fifth Annual AAPG-SPE Deepwater Reservoirs Geosciences Technology Workshop

28-29 January 2014 • Houston, Texas
Norris Conference Center – CityCentre

Determining reservoir connectivity, calculating pore pressure, understanding the structural subtleties, identifying hazards, and developing accurate images (including subsalt), are deeply affected by new multi-disciplinary discoveries in science and technology. While new discoveries in the Gulf of Mexico, West Africa, East Africa, Brazil, and the Mediterranean grab headlines, what is going on behind the scenes affects everyone who works in deepwater offshore.

Exciting developments in our understanding of deepwater structure and reservoirs, along with new developments in technology, have helped propel the industry to a new level.

www.aapg.org/gtw/2014/houston/index.cfm

Are Shales Still Exciting?

Third Annual AAPG/STGS GTW: Eagle Ford + Adjacent Plays and Extensions

February 24-26, 2014 • San Antonio, TX

This workshop focuses on prospectivity and producibility, with an emphasis on the conditions and characteristics of successful wells, and the technologies and techniques used in achieving success.

The productive extent of the Eagle Ford has expanded, thanks to new information and understanding of the factors that make the formation producible in a particular prospect or location. The same is true of adjacent formations such as the Buda and the Austin Chalk, along with Cretaceous extensions of the Eagle Ford, which extend from the Eaglebine to the Tuscaloosa Marine Shale.

Topics:
- Geophysics, regional geology, and Eagle Ford Extensions
- Sweet spots, reservoir quality, and the Eagle Ford
- Petrophysics
- Geomechanical considerations
- Drilling the "new" zones: Lessons learned and "Must-Know" facts
- Completions: Hydraulic fracturing, proppant selection, understanding reservoir behaviors
- The right kind of frac: How can geologists help? What can engineers explain?
- Decline curves: Seeking and finding answers

www.aapg.org/gtw/2014/houston/index.cfm

AAPG | Geosciences Technology Workshops 2014

Government Update continued from page 59

to clarify when smaller waters are subject to the Clean Water Act, a proposal which the agency submitted for White House Office of Management & Budget Review on September 17.

AGI Geoscience Policy Monthly Review (October 2013)

Keystone XL Southern Portion Construction May Begin in November

The U.S. Court of Appeals for the Tenth Circuit ruled not to grant the Sierra Club, Clean Energy Future Oklahoma, and the East Texas Sub Regional Planning Commission a temporary injunction to stop the construction of the Gulf Coast pipeline, the southern extension of Transcanada's Keystone XL tar sands export pipeline. In October 2011, the Sierra Club, Clean Energy Future of Oklahoma, and the East Texas Sub Regional Planning Commission sued the Army Corps of Engineers for approving construction of the pipeline, which is to run from Cushing, OK to the Gulf Coast. According to multiple sources, the expansion of the southern leg of the Keystone XL is set to begin on November 1, 2013.

Hearing on the Transboundary Hydrocarbon Agreement

On October 1, 2013 the Senate Committee on Energy and Natural Resources held a hearing to discuss proposed energy legislation. The legislation in question would approve an agreement between the U.S. and Mexico to develop oil and gas reserves that cross the international maritime boundary in the Gulf of Mexico. Witnesses and committee members discussed the United States' goals of energy independence, as well as prospective jobs and safety standards proposed by the hydrocarbon agreement. For more information, please read the hearing summary located on the AGI website (http://www.agiweb.org/gap/legis113/energy_hearings.html).

Tax Code Overhaul Could Spell Bad News for Oil and Gas

House Ways and Means Committee Chairman Dave Camp (R-MI) has acknowledged that tax credits normally enjoyed by the oil and gas industry are not off the table when it comes to overhauling the United States' tax code. In an effort to balance the budget and reinvigorate the economy, lawmakers are looking to reform the tax code, which currently sets the majority of corporate tax rates at approximately 40 percent and marginal federal corporate income tax rates at 35 percent. Chairman Camp and other members of Congress hope to lower the corporate tax rate to around 25 percent; however, in order to do so they are setting their sights on limiting targeted tax breaks for companies, including the oil and gas industry.

Among other benefits, the oil and gas industry can currently deduct "intangible drilling costs" (IDCs), as well as deductions from being classified as "manufacturers" when filing taxes.

Supreme Court to Review GHG Rule

The Supreme Court agreed to hear six cases challenging the regulations set forth by the Environmental Protection Agency (EPA) regarding greenhouse gas (GHG) emissions from stationary sources this October. The court agreed to examine whether EPA, under the Clean Air Act, rightfully determined that GHG emissions from new motor vehicles should require permits. Those challenging the regulations state that the agency's conclusions about the dangers from greenhouse gases were not supported by adequate evidence, that the tailpipe regulations were flawed, and that the agency was not authorized to regulate emissions from stationary sources. The Supreme Court's review of the GHG rule is a sequel to the 2007 Massachusetts v. Environmental Protection Agency, a ruling that required the EPA to regulate emissions of GHG from new motor vehicles if EPA concluded that the emissions endangered public health or welfare.

National Strategic and Critical Minerals Production Act of 2013 (H.R. 761)

Status: Passed the House on September 18, 2013 with a bipartisan vote of 246-178. Awaits consideration by the Senate.

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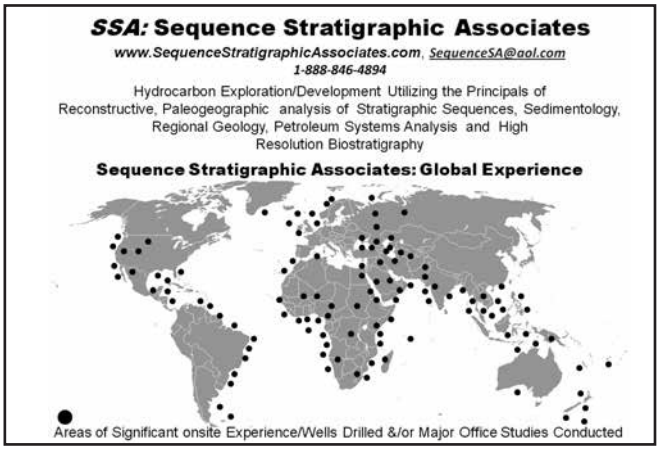

- The National Strategic and Critical Minerals Production Act, sponsored by Rep. Mark Amodei (NV-02), allows the United States to more efficiently develop our Nation's strategic and critical minerals, such as rare earth elements, that are vital to job creation, American economic competitiveness and national security.
- Currently, the United States is nearly 100 percent reliant on foreign countries, such as China, for rare earth elements and other critical and strategic minerals that are vital components to America's manufacturing sector.
- Due to onerous government red-tape, frivolous lawsuits and a burdensome permitting process, good-paying mining jobs have disappeared overseas and put American manufacturing jobs at the mercy of foreign sources.
- This bill is a bipartisan action plan that cuts red-tape by streamlining the permitting process for mineral development to create jobs and develop rare earths and critical minerals in America — rather than allowing our dependence on foreign countries to threaten our economy and the jobs that depend on these vital raw ingredients.
- H.R. 761 sets the total review process for permitting at 30 months. Currently, it can take over a decade to acquire all the government permits for a mineral production project. According to one report, currently, the United States ranks last with Papua New Guinea out of twenty-five major mining countries in permitting delays, and towards the bottom regarding government take and social issues affecting mining.
- Without critical mineral ingredients, entire sectors of our economy, from construction and manufacturing to high-tech to national defense to medical care, are put at risk.
- Critical and strategic minerals are fundamental components of technologies and everyday items ranging from cell phones, computers, medical equipment, renewable energy products, high-tech military equipment, building materials, and common household products.
- The timely and environmentally responsible development of our Nation's vast supplies of strategic and critical minerals will create good-paying mining jobs, boost local economies and provide security to America's economy.
- The act respects and upholds all environmental laws while setting timelines that ensure these laws do not become tools for lawsuits or bureaucrats to block or delay responsible projects.
- This legislation is similar to H.R. 4402 that passed the House last Congress with bipartisan support.

New U.S.-Russia International Park Sparks Concerns

This October, the United States and Russia agreed to a memorandum of understanding (MOU) regarding stewardship of the Bering Strait region. The two international superpowers hope to create an International Park connecting the Beringia National Park in Chukotka, Russia, with the Bering Land Bridge National Preserve and the Cape Krusenstern National Monument on Alaska's Seward Peninsula. However, Alaskans, including Senator Lisa Murkowski (R-AK) and Representative Don Young (R-AK), are concerned that the agreement could negatively impact their constituents.

The deal, originally proposed by Russian Foreign Minister Sergey Lavrov and Secretary of State at the time, Hillary Clinton, is intended to promote conservation and scientific research.

The MOU, however, has not been signed, and National Park Service (NPS) officials explain that there are no immediate plans to create an international park. For more information please visit the NPS website at: http://www.nps.gov/akso/beringia/about/IPA/Q&A.cfm. ■

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All materials are due by the 15th of the month, 6 weeks before issue publication. Abstracts should be 500 words or less; extended abstracts up to 1000 words; articles can be any length but brevity is preferred as we have a physical page limit within our current publishing contract. All submissions are subject to editorial review and revision.

Text should be submitted by email as an attached text or Word file or on a clearly labeled CD in Word format with a hardcopy printout to the Editor.

Figures, maps, diagrams, etc., should be digital files using Adobe Illustrator, Canvas or CorelDraw. Files should be saved and submitted in .ai (Adobe Illustrator) format. Send them as separate attachments via email or CD if they are larger than 1 MEG each, accompanied by figure captions that include the file name of the desired image. DO NOT EMBED them into your text document; they must be sent as separate files from the text. DO NOT USE POWERPOINT, CLIP ART or Internet images (72-DPI resolution) as these do not have adequate resolution for the printed page and cannot be accepted. All digital files must have 300-DPI resolution or greater at the approximate size the figure will be printed.

Photographs may be digital or hard copy. Hard copies must be printed on glossy paper with the author's name, photo or figure number and caption on the back. Digital files must be submitted in .tif, .jpg or .eps format with 300-DPI or greater resolution at the printing size and be accompanied by figure captions that are linked by the file name of the image. The images should be submitted as individual email attachments (if less than 1 MB) or on CD or DVD.

Advertising

The *Bulletin* is printed digitally using InDesign. Call the HGS office for availability of ad space and for digital guidelines and necessary forms or email jill@hgs.org. Advertising is accepted on a space-available basis. **Deadline for submitting material is 6 weeks prior to the first of the month in which the ad appears.**

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revised 8/6/10

Houston Petroleum Auxiliary Council News

Edie Bishop, *HGS Liaison* 713-467-8706 or ewbishop@bishorb.com

Ringing out the old year and welcoming in the new one brings reflections. Overall, the oil industry found 2013 a good year but 2014 promises to be an even better one especially for the Houston Geological Community as it prepares to host the AAPG annual convention in April.

Many people have been hard at work planning an event that will showcase Houston and its many fine venues. HPAC is pleased to be very involved with the Spouses' Activities. **Winona LaBrant** and I have the pleasure of Co-Chairing this committee. To make an endeavor such as this really work is the effort of the many wonderful folks who are chairing the various aspects of the activities.

Sally Blackhall and **Norma Jean Jones** are the Hospitality Room Chairs which both have done before with great success. Utilizing their gracious manners, sophistication, and expertise, they will provide a top notch Hospitality Room with great food, fun times, and the best of fellowship. Among their plans for the enrichment programs will be a presentation by an expert helping attendees identify their color types. Later **Penny Nelson** will show how she weaves her yarn grown from her own alpacas, llamas, and angora goats (mohair). She will also bring a loom for individuals to try their hand at weaving. **Harriett Brittenham** will be bringing her Antique Button Road Show to Houston by popular demand, and Sam Houston (aka **Charlie Fogerty**) will speak of his part in history of our state. Just thinking about these opportunities should make one ready to attend everything!

Maura Brachman and **Suzanne Howell** will be our Co-Chairs for the tours and, with the guidance and experience of **Jean Reynolds** from AAPG Headquarters, attendees will be able to see a new and exciting side of Houston and the surrounding area. Leading off a day of wine and roses, Monday's tour will start with a stop in Brenham to visit the Antique Rose Emporium plus the Blue Bell Creamery, a photo op with the Bluebonnets capped with a lunch and visit to the Saddlehorn Winery. The Saddlehorn Winery is special not only for its wine but also because it is owned by the daughter and son-in-law of a Past President of HGS and AAPG, our beloved **Jim Lewis**. The excursion on the next day will be a uniquely Houston tour of the Project Row Houses lead by a local artist and the Latino Culture Center with a Mex-Tex lunch. Rounding out this tour will be a stop at an outstanding Indian Temple. Also, keep your time open for a possible cooking class, lunch and seminar.

Sara Howell and Suzanne Howell at a recent HPAC luncheon

Co-Chairs **Sandra Babcock** and **Ann Koster** have been on a mission to find the perfect gift for our spouses to remember this convention. Having viewed their selections, everyone agreed that they succeeded. Thanks to these two talented ladies for the many hours they invested in this search!

HPAC Exploring Houston leaders **Martha Lou Broussard** and **Linnie Edwards** are making the final arrangements for the January HPAC trip. If you have not attended one of these trips, you are really missing a grand opportunity. If you are interested in the final plans, please give **Martha Lou** a call at 713-665-4428 or **Linnie** at 713-785-7115 for more details.

Remember that in addition to our regular luncheon programs and this special interest group, we have other interest groups: **Bridge: Audrey Tompkins** 713-868-0005 or **Daisy Wood** 832-581-3231, and **Book Club: Phyllis Carter** 281-397-9888 or **Anita Weiner** 713-572-9874.

Geologists, please encourage your spouses to join HPAC, where they will have an opportunity to meet other spouses of geologists, geophysicists, engineers, and landmen. They will participate in informative and entertaining programs, delicious lunches and welcoming fellowship. The HPAC membership form is included in the HGS *Bulletin*. Contact **Edie Bishop** at 713-467-8707 or ewbishop@bishorb.com for more information.

John and Jennifer Biancardi, Vicky Pickering, Winona LaBrant, Marvin Smith, Roshan Agarwal, and Linnie Edwards enjoy the tour of the Co-Cathedral of the Sacred Heart.

You are invited to become a member of

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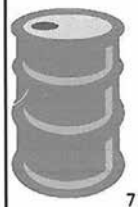

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