HGS Bulletin
Houston Geological Society
Volume 60, Number 2
October 2017

Distribution and Detachment Level of Salt Keels in the Deep Water Northern Gulf of Mexico: Insights into Canopy Advancement, Salt Sediment Interplay, and Evidence for Unrecognized Mass Sediment Displacement

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Petroleum Systems and Prospects in the Deepwater Mozambique Channel

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HGS Golf Tournament

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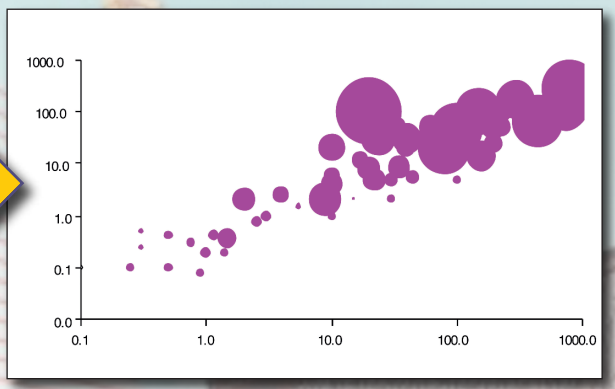
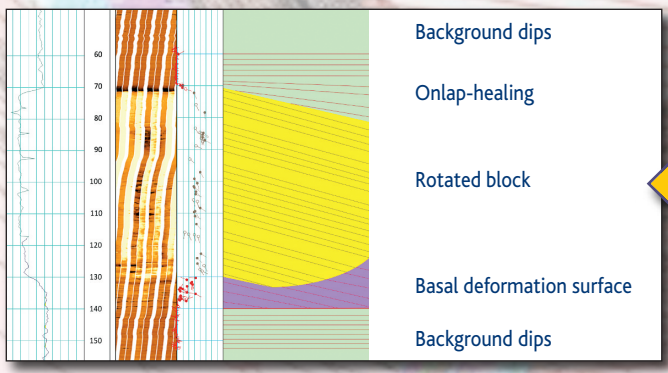
Getting into Deep Water

RECOGNISING MASS TRANSPORT COMPLEXES (MTC) are part and parcel of any exploration or development in continental margin, abrupt margin and submarine canyon plays. Based on hundreds of kilometres of image and cores studies, **TASK FRONTERRA** has determined that at least 12% of deep marine deposits are deformed by creep, failure or rotational slumping. We have conducted numerous studies in the Gulf of Mexico, West Africa, Brazil, West of Shetlands, Nile Delta, Australia: North West Shelf and Malaysia.

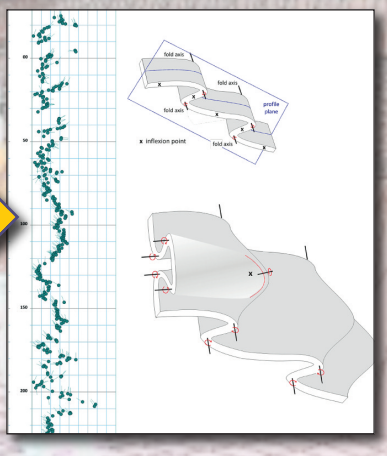
Scale and dimension?
Centimetre to regional scale

1 centimetre





Recognising Complex Geometries



Talk to the people who know what they are looking at on image logs.

Are your laterals in the Permian exhibiting variable results? It could be due to large scale sedimentary variation.

VAST EXPERIENCE IN CONVENTIONAL AND NON-CONVENTIONAL RESERVOIRS

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A GLOBAL FOOTPRINT WITH OFFICES IN LOCATIONS IN EUROPE, NORTH AMERICA AND ASIA PACIFIC. COMPLIMENTARY EXPERTISE TO ASSIST CLIENTS IN THEIR UNDERSTANDING OF MATURE RESERVOIRS, CARBONATES, DEEP-WATER FIELDS AND UNCONVENTIONAL HYDROCARBONS.

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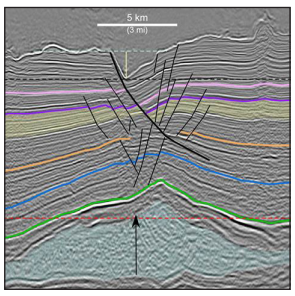

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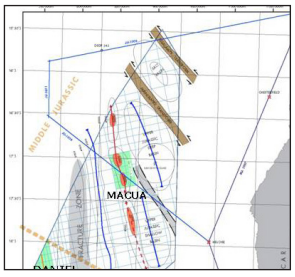

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The Houston Geological Society Continuing Education Committee Presents

Introduction to Drones (UAVs) for Surveying in the Energy Business

Workflows and Demonstration

A Half-Day Short Course
by Mike Allison, Raptor Aerial Services LLC and Kwasi Perry, UAV Survey Incorporated
Friday, October 6, 2017 • 11 am – 4 pm

Drones seems to be everywhere these days. They are here to stay and are very useful tools being utilized in many industries. This course will provide you a basic understanding of the types of drones, how drones work and how they are being utilized to solve business problems in a more efficient and safe manner. We will cover how to plan, acquire and process the drone data into georeferenced ortho-photomosaics, digital surface models (DSM), 3D models and other products. We will also demonstrate how to import the data into Geographical Information Systems (GIS) systems for further map construction. The last part of the course will involve laying out ground control points (GCPs) and flying a couple of drones to acquire some small aerial surveys.

- History and Types of Drones
- Characteristics of Mapping Drones
- Flight Planning
- Pre-Flight Checks
- Flight Operations
- Return-To-Home (RTH)
- Cloud vs Desktop Processing
- Products & Formats
- Data Product Examples
- Importing Data into GIS Systems
- Taking Measurements in 3D
- Drones vs Traditional Surveying/LiDAR
- 3D Model Accuracy: Drones vs LiDAR
- Ground Control Points (GCPs)
- Demos and Field Exercises

Pricing

NO WALK-UPS ACCEPTED

HGS Member:	$50.00
HGS Student Member:	$50.00
Non-Member:	$90.00

Non-members can save $10 and receive the Member registration price IF they apply for any category of HGS membership online (https://www.hgs.org/membership_overview), submit the application, including payment, then register for the course by calling the HGS Office (713-463-9476) before receiving formal acceptance.

Seating is limited to 30. Online Registration closes when Full. There may be no walk-ups

Notebook, Certificate of Attendance, Networking Lunch, Continental Breakfast, Coffee and Break Refreshments are included in the Registration price.

Doors open at 10:30 AM, Lunch begins 11 AM. Presentation and field exercises 12 Noon – 4 PM.

Post-class happy hour and pool party 'til 6 PM.

Registrants will receive an email with additional details.

By way of introduction, you may view Mr. Perry's videotaped half-hour presentation to a Texas A&M entrepreneurial startup incubator program (SDC): https://vimeo.com/221823367

Date: Friday, October 6, 2017 • 11:00 am – 4:00 pm (Doors open at 10:30 am)

Location: Star Creek Ranch • 25801 Stockdick School Road, Katy, Texas 77493 (north of Clay Road and west of Highway 99)

Please make your reservations on-line through the Houston Geological Society website www.hgs.org

For more information about this event, contact HGS Office 713-463-9476 • office@hgs.org

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It's Time to Renew Your HGS Membership

Your membership expired June 30, 2017

Annual dues are only $30.00
Emeritus members pay $15.00 • Full-time students – Free

Check your email for a reminder notice and renew online at www.hgs.org

Please complete and return this portion with your remittance.
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Year Graduated_____
Degree Name & (BS MS or PH.D)_____
(required)

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Would you like to volunteer? ____ (Y/N) Committees of Interest: _____

Annual dues $30.00 Active or Associate: _____
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Signature: _____ **Date:** _____

The Calvert Memorial Fund *is a scholarship program for U.S. students enrolled in earth science graduate programs in our region. It is managed by a 5 member HGS board of trustees that provides annual support for* **graduate** *studies.*

The HGS Foundation Fund *is a scholarship program designed specifically for* **undergraduate** *geoscience students from area universities.*

John A. Adamick
john.adamick@tgs.com

The Spark…

What first made you interested in geology? I have asked a lot of people this question over the years and received many different answers. For me, my 7th grade science teacher Mr. Vela gave me the spark of interest that led to my career in geology. Over the summer Mr. Vela visited a diamond mine in Arkansas and brought back a pickup truck load of kimberlite. He was not required to do this by the school district, he simply thought it would be a good way to introduce his students to geology. One of our lab projects that year was to break the kimberlite down and look for garnets, olivine, and, of course, diamonds! From that moment on, I was hooked and made up my mind to become a geologist. Thank you, Mr. Vela!

I am sure that each of you has similar stories and many of you probably developed your interest in science and geology at a young age. Young kids are very open-minded and receptive to learning about just about anything. This month I want to make you aware of some of the HGS programs and volunteers that are working hard to help youngsters develop a "spark" for geology. These include:

Family Outdoor Campout: One of the newer HGS programs is the Outcrop Family Campout. As we all know Houston is not the greatest place in the USA to view outcrops or collect rocks or fossils. The HGS has partnered with the YMCA to let HGS members and their kids visit Camp Cullen, a YMCA camp located on Lake Livingston near Trinity, TX. The camp has recently been renovated and the bunkhouses and other facilities are first rate. It just so happens that there is an abandoned quarry on the camp property with very good exposures of channels and their lag deposits, cross-bedded sandstones, petrified logs, and assorted other geologic goodies. Geology students from nearby universities work for the "Y" and lead the kids on field trips in the quarry. There is also a geology lab building where kids can get hands-on experience with rock samples and also pan for "gold." The geoscience education is age appropriate in addition to many other fun camp activities for the kids (zip lines, archery, riflery, arts & crafts, basketball, Gaga ball, and campfires). This is a fun overnight event for families and I highly encourage you to give it a try if you have elementary or middle school ages kids and you'd like to share your enthusiasm for geology with them. You can get an idea of what the quarry section is like by watching a recent Channel 13 News report at http://abc13.com/society/kids-explore-at-camp-built-around-rock-quarry-/2234048/. This year's campout will be November 10th-12th. For more information contact **Shannon Lemke** at Shannon.lemke@gmail.com.

Earth Science Week: The HGS, in partnership with the American Geosciences Institute (AGI) and local community colleges hold events related to earth science each October. Hundreds of Houston area middle school and high school students along with their teachers schools participate in the event. The theme of the program this year is *Earth and Human Activity* and two special events are planned locally. The first will be an earth science celebration at the Houston Museum of Natural Science on Saturday October 14. This popular program guides students through hands-on activities and interactive science demonstrations. The second event is a free family-friendly outdoor geology field trip to Panther Creek in the Montgomery County Preserve, south of the Woodlands. The field trip is scheduled for Sunday, October 22 and will teach kids about meandering stream processes like meander bends, point bars, delta bar deposits, and cut banks. Local flora will also be identified. Both events are coming up very soon so if you are interested in either event please contact **Sharon Choens** right away at Sharon.choens@sjcd.edu.

Educational Outreach: The Educational Outreach Committee works with middle school and high school students to give them a taste of geology. At the middle school level, this involves HGS members going to local schools with mineral and fossil samples for the kids to learn about geology in a fun, hands-on way. The "Bones in Schools" program is particularly popular. At the high school level the committee is active with four Houston ISD Petroleum Academy magnet schools in partnership with the Independent Petroleum Association of America (IPAA) and multiple private company sponsors to teach kids geoscience and engineering at a more advanced level. These kids are already interested in science, they just need exposure to learn more about geoscience! Schools in the program include Westside High School, Milby High School, Young Women's College Preparatory Academy, and the Energy Institute. The Educational Outreach

From the President *continued on page 17*

The Houston Geological Society Continuing Education Committee Presents

A Practical Guide to Hydrocarbon Volumetric Calculations and Risking

A One-Day Short Course
by Erik Scott, PhD, E&P Geoscience, LLC
Friday, October 13, 2017 • 8:00 am – 5:00 pm

Who should attend: Geologists and geophysicists working in exploration, development and production: Junior to Advanced Level

You will learn

- Different methods, from simple to more complex, of calculating in-place hydrocarbons
- Ascertaining appropriate input ranges for rock and fluid properties
- Understanding what the outputs of volume calculations represent
- Relating risk to volumes

This course will cover the considerations needed when calculating in-place hydrocarbons and the chance of finding it. The mechanics of calculating volumes will be covered, however; the focus of the course is on understanding how to determine appropriate rock and fluid property input ranges, implications of the different methods of volume calculation and how the output volumes are modified. We will also relate the output range of hydrocarbon volumes with different types of risk involved with the oil and gas industry. We will conclude with a discussion on how the volumes and risk numbers are used in economic analysis.

Pricing

Emeritus/Life/Honorary or HGS Members unemployed: call for special pricing

Early Registration: by 5 AM, Tuesday, September 26, 2017		**Registration:** before 1 PM (afternoon), Friday, September 29, 2017		**Late Registration:** after 1 PM (afternoon), Friday, September 29, 2017
HGS Member:	$100.00	HGS Member:	$110.00	$120 HGS Members
Non-Member:	$140.00	Non-Member:	$150.00	$160 Non-members
HGS Student Member:	$80.00	HGS Student Member: (Student registration closes)	$80.00	

Non-members can save $10 and receive the Member registration price, if they apply for any category of HGS membership online (https://www.hgs.org/membership_overview), submit the application, including payment, then register for the course by calling the HGS Office (713-463-9476) before receiving formal acceptance.

Notebook, Certificate of Attendance, Networking Lunch, Continental Breakfast, Coffee and Break Refreshments are included in the Registration price.

Date: Friday, October 13, 2017 • 8:00 am – 5 pm (Doors open at 7:30 am)

Venue courtesy of Marathon Oil

Location: Marathon Oil – Parking Structure, 10th Floor Conference Center
5555 San Felipe St., Houston, TX 77056

Visitor parking is accessed from the driveway between the main Tower and Parking Structure.

Please make your reservations on-line through the Houston Geological Society website www.hgs.org

For more information about this event, contact HGS Office 713-463-9476 • office@hgs.org

Erik Scott is the Principal Geologist for E&P Geoscience, LLC and an Adjunct Professor at Rice University in Houston, Texas. He works on a wide variety of projects in both energy exploration and production. Over his career he has engaged in petroleum system studies in numerous areas that include the Gulf of Mexico, Alaska, North Sea, offshore West Africa, Southeast Asia, South America, onshore North America and the eastern Mediterranean. He received a PhD in geology from Louisiana State University, studying under Dr. Arnold H. Bouma, with whom he investigated the influence of tectonics and structure on deep water sedimentation based on the outcrops in the Karoo Basin of South Africa.

Brian W. Horn
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Preparing Ourselves for Storms

The current storm in our industry and the slower than expected rate of recovery is not unprecedented, but is certainly a significant historical event. After the drop in oil prices and the subsequent staff reductions that inevitably follow, the staff that remain are left to pick up the slack and continue to deliver on many of the projects that are in various stages of completion. For many HGS members the recent downturn is not been the first and will most likely not be the last. Since 1984 I have been through at least 10 staff reductions and watched many of my friends and colleagues consider the future in a different employment context. This is always a difficult experience.

What is different in the latest cycle is the continued extent of lower oil price. Previous cycles have been more V-shaped in the decline and recovery. The present trend seems to be more analogous to a *glacial valley*. It appears that prices have stabilized and in have climbed back into the high $40's to low $50's. The question is whether these fluctuations are more akin to *lateral moraines* or an actual than a climb out of the U-shaped cycle valley.

Given the current and future uncertainty I have had several career discussions with many colleagues and staff. A common theme is, *what is the future for my career?* and *will I be vulnerable if there is another downturn?* During these storms many of us find ourselves wondering if we will be the next person to be made redundant and wondering what I can do to increase my value in my current role.

I always remember the time when I was just starting out on my career path and asking myself similar questions. A senior colleague reminded me how fortunate I was saying, "Brian, you have a college degree and you live in the United States of America."

In these situations I try to assure my colleagues that everyone (including myself) has asked these questions at some point in their career. I also try to have a Socratic response asking, "What do *you* want to do? What is the role or position *you* would like to have in five or ten years?" I have discovered the importance in finding new ways to educate myself in new areas and technology during *down* time in the current job due to the decrease in activity.

Quite often people view their work career as a static or *closed system* with a perspective that the current job will last forever and there is a single or straight forward career path. What I have observed in the E&P industry is most roles or job postings last between two to three years. Employers want staff with a well-rounded perspective, multiple capabilities and people who are conversant in various disciplines of our industry. That is why many companies move staff into different roles on a regular basis.

What I find ironic is many people with decades of industry experience find themselves asking, *what do I want to be when I grow up?* This question never seems to go away and quite frankly I believe it should always be something you should continually ask yourself. Here's why. I have learned that one thing successful people have in common is they spend most of their day reading. Icons such as John D. Rockefeller, Warren Buffet and Bill Gates are known for spending the majority of their day reading. They educate themselves in many areas. I am certainly not an accomplished student or reader, but I do make an effort to try and learn something new every day. Life is a continuing education process. College should teach students how to educate themselves, not provide a four-year study program that is sufficient for a 40 year career. Sitting in a classroom digesting a didactic delivery of information is a small part of a life-long education plan.

Life is a continuing education process.

I believe that continuing education is one of the most important aspects for the HGS membership. Not only for receiving but also giving. Our membership has thousands of years of experience in the oil industry. I would encourage everyone to consider how we might be able to participate in sharing our collective knowledge and learning. The upcoming Continuing Education courses and monthly meetings are great opportunities to meet other HGS members and acquire new insight and skills.

The next time we speak with colleagues and friends about the future and all of its uncertainty try to focus on things that they have the power to influence; one, what do I want to accomplish today? Two, what are the skills and/knowledge that I want to acquire? Three, what are the skill sets that will make me more valuable in my current role? Four, what are the skill sets I need to acquire to progress my career along the five and ten year plan? If you focus on the present, don't dwell on the past or worry about the future you will be prepared to weather any storms that may lie ahead. ■

HGS Golf Tournament

Monday – October 16, 2017
Sterling Country Club and
Houston National Golf Club
4-man Scramble

Come join us for golf, food, friends and fun at the annual HGS Golf Tournament at our new location, **Sterling Country Club** and **Houston National Golf Club** (www.sccathn.com). There will be prizes awarded for closest to the pin and long drive as well as many great door prizes for participants.

Entry Fee: $175.00/Golfer or $700.00/Team.
Early Bird Special: Sign up before September 25th to receive a discount of $25.00/Golfer or $100/Team.
Entry Deadline: October 9th.

Individual entries will be grouped with other individual golfers to make a foursome. Entries are limited to and will be accepted on a first-in basis.

Companies or individuals interested in sponsoring the event should contact Elliot Wall at 713-328-2674 or elliot.wall@corelab.com. *Sponsorship deadline is September 30th.*

SCHEDULE OF EVENTS

8:00 – 9:45 a.m.	Registration and free use of driving range (Breakfast will be provided by **Core Lab** and**Petro Log International, Inc.**)
10:00 a.m.	Shotgun start
3:00 p.m.	Cash bar, open buffet
3:30 p.m.	Door prizes and awards presentation

REGISTRATION OPTIONS

Online: www.hgs.org/golftournament
Email: office@hgs.org
Fax: 281-679-5504
Mail: Houston Geological Society, 14811 St. Mary's Lane, Suite 250, Houston, TX 77079
If paying by check, please make check payable to HGS Entertainment Fund.

Team Captain _____ Phone _____ Amount Enclosed _____

Company _____ Email _____

Billing Address _____

Credit card # _____ Exp. Date _____ Code# _____

Please Provide Email Addresses For All Team Members. All Communications Will Be Done Via Email.

Foursome Members *(Please Print)*	**Company**	**Phone Number/Email**	**Hdcp/ Avg. Score**
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____

*Please provide email addresses for **all team members**. All communications will be done via email.*

HGS Golf Tournament

Monday – October 16, 2017
Sterling Country Club and
Houston National Golf Club

Sponsorship Application

Trevino Sponsorship $250.00

- **Sponsor Logo** signs on courses.
- **Company name** displayed on sponsor recognition board at registration and awards banquet.

Hogan Sponsorship $500.00

- **Sponsor logo** signs on courses.
- **Company logo** displayed on sponsor recognition board at registration and awards banquet.

Nicklaus Sponsorship $1,000.00

- **Sponsor logo** signs on courses.
- **Company logo prominently** displayed on sponsor recognition board at registration and awards banquet.
- **Company logo** displayed on driving range and practice putting green.

Title Sponsorship $2,000.00

- **Sponsor logo** signs on courses.
- **Company logo prominently** displayed on sponsor recognition board at registration and awards banquet.
- **Company logo** displayed on driving range and practice putting green.
- **Company logo** displayed on beverage carts.
- **Sponsorship includes tournament entry for one team (4 people).**

SPONSORSHIP REGISTRATION OPTIONS – Deadline September 30

Online: www.hgs.org/golftournament
Email: office@hgs.org
Fax: 281-679-5504
Mail: Houston Geological Society, 14811 St. Mary's Lane, Suite 250, Houston, TX 77079
If paying by check, please make check payable to HGS Entertainment Fund.

Name _____ Phone _____ Amount Enclosed _____

Company _____ Email _____

Billing Address _____

Credit card # _____

Exp. Date _____ Security Code# _____

Please email your company logo to office@hgs.org and elliot.wall@corelab.com.
Note: Company logos (high resolution file) must be received no later than September 30th.
If there are any questions, please contact Elliot Wall at 713-328-2674.

Applied Geoscience Conference

SOUTHWESTERN ENERGY • 10000 ENERGY DRIVE • SPRING, TX 77389

November 8-9, 2017

Geomechanics in Unconventionals

Please join us for the Houston Geological Society's premier two day technical conference, focusing on geomechanical integration and advancement in the assessment of unconventional reservoirs.

The program will highlight field examples of geomechanical workflows, with sessions focusing on Unconventional Geology & Geophysics, and Integrated Workflows & Engineering Design.

Wednesday AM	Session 1	- Geomechanical Characterization
Wednesday PM	Session 2	- Engineering Applications
Thursday AM	Session 3	- Surveillance and Diagnostics
Thursday PM	Session 4	- Case Studies

Sponsorship Opportunities	Platinum Sponsor $10,000	Gold Sponsors $5,000	Silver Sponsors $2,500	Bronze Sponsor $1,000
Advertisement in Program Book	Full Page	1/2 Page	1/4 Page	1/8 Page
Complimentary Full Registrations	4	2	1	
Complimentary Vendor Booth	✓	✓	✓	
Recognition in Program Book, onsite signage, HGS Bulletin	✓	✓	✓	✓
Recognition in conference announcements and website with logo hyperlink	✓	✓	✓	✓
*Booths/Posters	Assigned on first come, first serve basis with confirmation of payment			

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For more information please visit: www.hgs.org or contact Andrea Peoples: andrea@hgs.org

Applied Geoscience Conference

SOUTHWESTERN ENERGY • 10000 ENERGY DRIVE • SPRING, TX 77389

November 8-9, 2017

To sponsor, please indicate your sponsorship level_____with payment (payable to HGS) to: **HGS, 14811 St. Mary's Lane, Ste. #250 - Houston, Texas 77079 - Attn: Andrea Peoples**, or you can email your sponsorship form to andrea@hgs.org.

Name_____Phone_____Amt. Enclosed_____

Company_____Email_____

Billing Address_____

Credit Card #_____Exp. Date_____Sec. Code#_____

Approved by_____Date_____

If you would like HGS to invoice your sponsorship please complete the section below:

Invoicing Address_____

Accounting Contact Name_____Contact Email Address_____

Special Billing Codes_____Approved by_____Date_____

Please email your company logo to andrea@hgs.org. Note: Please send only company logos at 300+dpi

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For more information please visit: www.hgs.org or contact Andrea Peoples: andrea@hgs.org

Applied Geoscience Conference

November 8–9, 2017

Oral Presentations – Wednesday, November 8, 2017

7:00	**Registration and Coffee**	
8:00 - 8:10	**Welcome and Opening Remarks:** Robert Hurt, *Pioneer Natural Resources;* Umesh Prasad, *Baker Hughes, a GE company*; John Adamick, *TGS, HGS President 2017-2018;* Ron Hayden, *SWN Vice President of Technology*	
	Session 1: Geomechanical Characterization **Chairs:** Shihong Chi, *ION E&P Advisors* ; Farid Reza Mohamed, *Schlumberger*	
8:10 - 8:45	A Novel Geomechanical Characterization Methodology for Quantifying Fine Scale Heterogeneity	**Jesse Hampton**, *New England Research*
8:45 - 9:20	Brittleness and Fracability in Stimulating Shale Reservoirs	**Mao Bai**, *Independent Geomechanics Consultant*
9:20 - 9:40	**Coffee, Posters, Exhibits**	
9:40 - 10:15	The Relationship between Natural Fracture Distribution and Elastic Mechanical Properties in the Subsurface: Measurement and Calibration	**Ron Nelson**, *Broken N Consulting, Inc.*
10:15 - 10:50	A Novel Way to Characterize Biot's Coefficient in Unconventionals	**Munir Aldin**, *MetaRock Laboratories*
10:55 - 11:55	**Open Floor Discussion & Posters**	
11:55 - 1:00	**Lunch, Posters, Exhibits**	
12:15 - 1:00	**Keynote:** What Maintains High Pore Pressure in Gas Shale During Exhumation, Long After Thermal Maturation Ceases?	**Terry Engelder**, *The Pennsylvania State University*
	Session 2: Engineering Applications **Chairs:** See Hong Ong, *Baker Hughes, a GE company*; Cem Ozan, *BHP Petroleum*	
1:05 - 1:40	Complex Fracture Network Creation in Stimulation of Uncoventional Reservoirs	**Ahmad Ghassemi**, *The University of Oklahoma*
1:40 - 2:15	Hydraulic Stimulation in the Presence of Fractures	**Tobias Hoeink**, *Baker Hughes, a GE company*
2:15 - 2:35	**Coffee, Posters, Exhibits**	
2:35 - 3:10	Holistic Approach to Geologic and Geomechanical Modeling in Unconventional Reservoirs PART 1	**Ewerton Araujo, Sebastian Bayer, Marcus Wunderle,** *BHP Petroleum*
3:10 - 3:45	A Holistic Approach to Geologic and Geomechanical Modeling in Unconventional Reservoirs PART 2	**Ewerton Araujo, Sebastian Bayer, Marcus Wunderle,** *BHP Petroleum*
3:45 - 4:45	**Open Floor Discussion & Posters**	
5:00 - 8:00	**Social Hour**	

Applied Geoscience Conference

November 8–9, 2017

Oral Presentations – Thursday, November 9, 2017

7:00	**Registration and Coffee**	
8:00 - 8:10	**Welcome and Opening Remarks:** Robert Hurt, *Pioneer Natural Resources;* Umesh Prasad, *Baker Hughes, a GE company*; John Adamick, *TGS, HGS President 2017-2018*	
	Session 3: Surveillance and Diagnostics **Chairs:** Robert Hurt, *Pioneer Natural Resources;* Kim Hlava, *Statoil*	
8:10 - 8:45	Validating Completion Design Using Monitoring of Offset Wells	**Erica Coenen,** *Reveal Technologies*
8:45 - 9:20	DAS Microseismic Monitoring and Integration with Strain Measurements in Hydraulic Fracture Profiling	**Dan Kahn,** *Devon Energy*
9:20 - 9:40	**Coffee, Posters, Exhibits**	
9:40 - 10:15	Focal Mechanism Solutions of Microseismic Events from Hydraulic Fracture Monitoring: A Case Study of the Eagle Ford Shale	**Rongmao Zhou**, *BHP Petroleum*
10:15 - 10:50	Integration of DAS Fiber-Based Strain and Microseismic Data for Monitoring Horizontal Hydraulic Stimulations – Midland Basin Texas Examples	**Rob Hull**, *Pioneer Natural Resources*
10:55 - 11:55	**Open Floor Discussion & Posters**	
11:55 - 1:00	**Lunch, Posters, Exhibits**	
12:15 - 1:00	**Keynote:** Optimized Recovery from Unconventional Reservoirs: How Nanophysics, the Micro-Crack Debate, and Complex Fracture Geometry Impact Operations	**Lans Taylor**, *Energy and Geoscience Institute (EGI) at the University of Utah*
	Session 4: Case Studies **Chairs:** Joel Walls, *Ingrain, a Halliburton service;* BJ Davis, *Baker Hughes a GE company*	
1:05 - 1:40	Quantifying the Impact of Induced Asymmetric Fracturing from Horizontal Development Wellbores; a Geostatistical Perspective	**Doug Walser**, *Halliburton*
1:40 - 2:15	Efficient Well Delivery in Shale Plays – Examples from the Marcellus and Permian	**Julie Kowan,** *J. Kowan Consulting, LLC*
2:15 - 2:35	**Coffee, Posters, Exhibits**	
2:35 - 3:10	Optimized Hydraulic Fracturing Treatments Using Neural Network Modeling and Advanced Data Analytics	**Amir Nejad PhD,** *StrataGen Engineering*
3:10 - 3:45	Lateral Characterization and Fracture Optimization Solution with Case Studies	**Sergey Kotov,** *Baker Hughes, a GE company*
3:45 - 4:45	**Open Floor Discussion & Posters**	
	Closing Comments and Invitation to Posters	

Poster Session

Invited Presentations from Graduate Students • Open during Coffee and Lunch Breaks

Applied Geoscience Conference

November 8–9, 2017

Posters – November 8-9, 2017

Poster Session Chair: Mike Effler

University	Student Name	Poster Topic
Georgia Institute of Technology	**Ming Lui** and Haiying Huang	A Poroelastic Solution of Rigid Sphere Indentation into a Compressible Half-Space
Texas A&M University	**Anusarn Sangnimnuan** and Jiawei Li, Kan Wu	Development of an Efficient Coupled Fluid Flow and Geomechanics Model to Predict Stress Evolution in Unconventional Reservoirs with Complex Fracture Geometry
Texas A&M University	**Arash Shadravan** and Behrouz Haghgouyan	Geomechancal Cement Sheath Finite Element Modeling to Achieve Enhanced Zonal Isolation
Texas A&M University	**Edith Sotelo Gamboa** and Richard L. Gibson	Fracture Compliance: Relationship with Fracture Conductivity and effect on Wave Propagation
Texas A&M University	**Guangjian Xu**, Judith Chester and Fred Chester	Developing a Mechanical Stratigraphic Model of the Eagle Ford Formation
The University of Oklahoma	**Ishank Gupta**, Carl Sondergeld and Chandra Rai	Water Weakening: Case Study from Marcellus, Woodford and Eagle Ford
The University of Oklahoma	**Alex Vachaparampil** and Ahmad Ghassemi	Failure Characteristics of Three Shales under True-Triaxial Compression
The University of Oklahoma	**Zhi Ye** and Ahmad Ghassemi	Mechanical Properties and Permeability Evolution of Shale Fractures under Triaxial Loading
The University of Texas	**Matthew Ramos**, D.N. Espinoza, C.I. Torres-Verdín, K.T. Spikes and S.E. Laubach	Stress-Dependent Dynamic-Static Transforms of Anisotropic Mancos Shale
University of Calgary	**Bram Komaromi**, Dr. Per Kent Pedersen and Dr. Paul MacKay	Facies-Controlled Fracture Stratigraphy in Organic-Rich Petroleum Systems, Turonian Second White Specks Formation, Southwestern Alberta
University of Houston	**Ismot Jahan**, John Castagna, and Michael Murphy	Characterization of Faults Using Seismic Attributes From 3D Seismic Data in the Bakken Formation
University of Houston	**Ali Rezaei**	Effect of Pore Pressure Depletion on Horizontal Stresses and Propagation of New Fractures during Refracturing Process

Participating Schools

Georgia Institute of Technology • Texas A&M University

The University of Oklahoma • The University of Texas

University of Calgary • University of Houston

Open During Coffee and Lunch Breaks

Monday, October 2, 2017

New Location

Live Oak Room • Norris Conference Center • 816 Town and Country Blvd #210
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

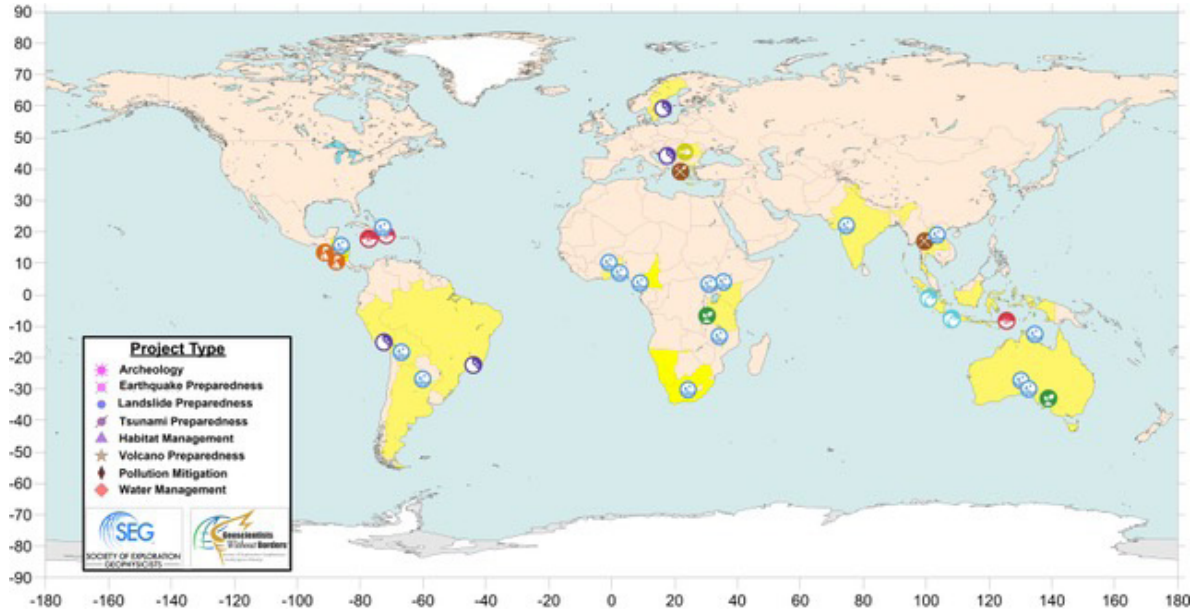
Cost: $40 Preregistered members; $45 non-members/walk-ups

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

If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

Robert K. Merrill
Catheart Energy, Inc.
Sugar Land, TX

Geoscientists *Without* Borders® Adventures in Geoscience for Global Sustainability and Building Community Resiliance



Geoscientists *Without* Borders (GWB) is a program of the Society of Exploration Geophysicists (SEG). Following the 2004 Tsunami in Southeast Asia, members of the SEG recognized that geophysics and geology could make significant contributions to worldwide humanitarian efforts. GWB was initiated in 2008 by Craig Beasley and Schlumberger as the Founding Sponsor. A variety of sponsors and partners including the AAPG Foundation as well as individuals and corporations from the oil and gas industry support of up to eight GWB humanitarian projects around the world each year.

The mission is to support humanitarian applications of geoscience globally funding projects that benefit communities in need facing environmental hardship,natural hazards due to resource shortages and natural and human-induced disasters. In order to accomplish this mission there are four important characteristics that we look for in each project.

1. **Strengthen** global geoscience and engineering application through multidisciplinary projects with humanitarian impacts and provide training to the next generation of geoscientists.
2. Make a significant **difference** to the lives of those in need with special attention to community improvements.
3. Have a plan to **collaborate** project activities with local community and state governments and other humanitarian organizations.
4. **Empower** participating community residents, students, and scientists to work together and share knowledge.

GWB has funded approximately 33 projects in over 27 countries since 2008. These projects cover a broad range of topics including:

- Geological and geophysical studies to build tsunami preparedness programs in Indonesia.

HGS General Dinner *continued on page 17*

Upstream Oil & Gas Professionals Hiring Event

October 3, 2017
10am to 3pm
Trini Mendenhall Community Center
1414 Wirt Rd., Houston, TX 77055

The Members-in-Transition committee invites you to participate in the second edition of the Upstream Oil and Gas Professionals Hiring Event. Following the success of the March 2017 inaugural event we continue to provide a platform for connecting experienced job seekers with oil and gas companies with open positions.

Please visit https://spegcs-mit-hiringevent.org/

Job seekers: Up to 40 oil and gas employers are expected to participate! For an updated list of participating companies, sponsors, and collaborating professional organizations please visit https://spegcs-mit-hiringevent.org/employers-sponsors/. Job seekers' registration will begin in early September so please visit regularly https://spegcs-mit-hiringevent.org/job-seekers/ for important updates.

Employers & Recruiters: Registration is now open at https://spegcs-mit-hiringevent.org/employers/. A booth at the Hiring Event is an excellent opportunity to screen and meet hundreds of highly qualified industry professionals. Employer registration fees, scaled to the company size, vary from $100 for less than 50 employees up to $1000 for more than 1000 employees. Additional information in our Q&A section at https://spegcs-mit-hiringevent.org/faqs/.

Event Website: https://spegcs-mit-hiringevent.org/
Event Contact Names: Tarek Ghazi/James Rodgerson/Daniel Mendez

HGS General Dinner continued from page 15

- Geophysical surveys to enhance agricultural productivity and livelihoods of smallholder farmers through improved groundwater management in Laos and Ghana.
- Seismic imaging to help understand and manage water quality in Benin, West Africa.
- Geophysical studies to better understand active faults and earthquakes in Haiti, Jamaica, and Timor Leste for earthquake preparedness.
- Hydrological and geophysical studies to utilize and manage groundwater resources in Australia and Eastern and Southern Africa.
- Geophysical and geological work to define landslide hazards in eastern Europe and Brazil.
- Geophysical studies to build volcano preparedness in Central America.
- Pollution mitigation efforts in Eastern Europe.

Geosciences *Without* Borders projects are designed to benefit communities in need. Applying geoscience and engineering technology is critical to improving conditions of povertyor where dangerous conditions and hazards can be mitigated or removed using applied geoscience technology. It is anticipated that every project should have a lasting impact on the community and engage students and introduce them to the broad range of geosciences careers and strengthen university programs in geophysics and geology by building bridges between the academic geoscience community and the geoscience and engineering industry. ■

Biographical Sketch

Dr. Robert Merrill has over thirty years of industry experience. He has worked for American Stratigraphic Company, Cities Service Company, Occidental, Unocal and Samson in various domestic and international exploration and staff positions. He formed Catheart Energy Inc. in 2005 as an independent exploration and consulting company to actively pursue oil and gas opportunities and is currently active in several conventional and unconventional oil and gas plays. Dr Merrill also maintains a consulting practice focused on evaluating exploration portfolios. Additionally, he currently teaches a course entitled "Visual Rock Characterization." He has served on the Society of Exploration Geophysicists Geoscientists Without Borders Committee since 2015.

He is past president of the American Institute of Professional Geologists, active in the American Association of Petroleum Geologists, a Fellow of the Geological Society of America, a Chartered Geologist with the Geological Society and has served on committees for the American Geological Institute. Dr. Merrill has his PhD and MS from Arizona State University and his BA in Geology from Colby College.

From the President continued from page 5

Committee has provided support over the last five years to these schools including holding multiple Geology Labs, Rock Labs, and Career days. Members of the committee have led field trips for the students to various sites such at the Texas Hill Country, Whiskey Bridge, High Island, and organized tours of the Paleontology Hall, the Gem and Minerals Hall, and the Energy Hall at the Houston Museum of Natural Science. To learn more about the Educational Outreach Committee and its many programs, contact **Letha Slagle** at lslagle@comcast.net.

All of these committees do a great job of spreading the word about geology to students in our community. To often these opportunities are limited by the small number of volunteers on their committees. Would you like to give back to your profession by helping kids develop the *spark* for geology? If so, please contact one of the chairwomen above or Andrea Peoples at the HGS office at andrea@hgs.org.

I'd also like to remind all of you that the GCAGS convention will be occurring in San Antonio from November 1–3. The organizers of this event have put together a great program with technical sessions on Deep Water, the Austin Chalk and Eagle Ford Formations, Gulf Coast Fields, Water Resources, Reservoirs and Field Analogs, and Conventional and Unconventional Workflows. Short courses and field trips are also planned. Attend the convention if you can and support GCAGS.

Last, but not least, I would like to recognize HGS volunteer **Shannon Lemke** for going "above and beyond" the normal call of duty with HGS. Shannon is currently Vice President of Exploration and Technical Team lead for NewVista Energy Partners here in Houston. She has been an HGS member since 2000 and has served on the Undergraduate Scholarship Foundation since 2009 where she is currently Foundation Secretary. Shannon received a Rising Star award in 2010-2011 and served on the HGS Board of Directors as Secretary in 2012-2013. She has been chairwoman for the Outcrop Family Campout Committee since its inception in 2016 and is working hard to make this new idea a long-term success for HGS. Thank you for your continued efforts on behalf of HGS! ■

Earth Science Activities for the Whole Family Coming in October!

Earth Science Week, 2017

October 14 – 22

HGS in partnership with the American Geosciences Institute (AGI) is pleased to announce the theme of Earth Science Week 2017

Earth and Human Activity

This year's event explores human interaction with the planet's natural systems: geosphere, hydrosphere, atmosphere and biosphere.

In celebration of Earth Science Week Houston, HGS will be hosting the following exciting events:

Saturday, October 14 (11:00am – 3:00pm)

Earth Science Celebration at the Houston Museum of Natural Science
Our popular passport program guides students through hands-on activities and interactive science demonstrations.

Special pricing for the event: **$3.50 K – 12 students**
$3.50 College Students/Teachers/Professors with valid school/college ID

Teachers: 2017 ESW Toolkits free with valid school ID

Sunday, October 22 (Arrive between 11:00 am – 3:00 pm)

A free family-friendly outdoor geology fieldtrip to Panther Creek, Montgomery County Preserve, south of The Woodlands. Come explore meandering stream processes with us! Learn about meander bends, point bars, delta bar deposits, cut banks and the local flora.

For more information, see the HGS Earth Science Week webpage.
https://www.hgs.org/committee?cmtegrp=sci&committee=Earth%20Science%20Outreach%20Committee


Panther Creek

Wednesday, October 11, 2017

Black Lab Pub, Churchill Room • 4100 Montrose Blvd.
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $30 Preregistered members; $35 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.
Walk-ups may pay at the door if extra seats are available.

If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

Troy W. Meinen
ERM

ETHICS MOMENT

We will dedicate 15 minutes at the beginning of each meeting to ethics to apply towards 0.25 hours of ethics credit.

Sustainable Water for Developing Countries

In many developing countries of the world access to clean water is a continual crisis. Many organizations are working to mitigate this crisis with rain water collection systems, water purification systems and installation of wells. In spring of 2017, Troy Meinen joined a team organized by Living Water International on a trip drill and install a drinking water well and teach general hygiene basics at a school in the community in a suburb of Cap Haitian, Haiti. Cap Haitian is a community of 275,000 people located on the north coast of Haiti. The region consists of very rich soil derived from Quaternary sands, and gravels, deposited across the coastal plain by numerous area rivers.

In the Northern part of Haiti the drilling equipment utilized by Living Water International includes a trailer mounted wet rotary rig capable of drilling more than 300 feet. PVC wells are generally installed to depths around 100 feet to provide clean water and

HGS Environmental & Engineering Dinner *continued on page 21*

All work and no play would make a terrible trip!

Team of Living Water Haitian staff and American volunteers drilling the new well.

HGS Presents:

Take a kid to the outcrop family campout!

November 10-12, 2017
Camp Cullen YMCA in Trinity, TX

Come join fellow HGS members and their families for a weekend of fun! Activities include:

Interpreted quarry with hunts for fossils and petrified wood
Newly renovated geology lab with samples and flume
Gold panning
Zip line
Archery
Riflery
Arts & crafts
Marathon pipeline slide
Basketball
Gaga ball
Campfires

All of this and more, all only 1.5 hours north of Houston!

Check in Friday evening and check out Sunday morning. Cost is $110/person for up to 4 people. For families of 5+, call for a discounted rate. The fee includes overnight stay Friday and Saturday nights, 4 meals and all activities. Each family will have a private bunkhouse for up to 8 and private family bathroom in newly renovated cabins. For more information on the facilities, please visit the Camp Cullen website at https://www.ymcacampcullen.org/

Reserve your spot today! Reservations accepted through October 31.

Call Andrea at the HGS office at 713-463-9476

HGS Environmental & Engineering Dinner

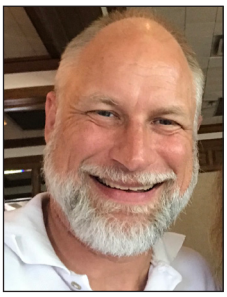
continued from page 19

replace hand dug wells that are commonly contaminated, or shorten the distance water must be carried by several miles. Sustainable and right-sized drilling techniques utilized in water well construction techniques and pump installation are demonstrated.

A review of the format and style of the hygiene lessons conducted to help school leaders and children learn to care for the well and better understand the methods of spread for the numerous waterborne diseases common in this area. The goal of this presentation is to provide a glimpse into one organization's processes for addressing the critical water issues present in our world today and, hopefully, encourage HGS members to utilize their professional expertise and time to make a difference. ■

Katie Meinen testing the newly installed pump

Biographical Sketch



Troy W. Meinen is a Texas Professional Geoscientist and Global Health and Safety Advisor with ERM in Houston. Over his 20-year career, he has worked on a wide variety of industrial facilities and upstream oil and gas projects to address contaminated ground water, soil and sediment issues. His background includes managing investigation and remediation of upstream oil and gas sites and assisting with due diligence for large oil and gas acreage position transactions for major oil and gas clients, which includes assessment of water use and protection, property transaction support, environmental impact assessment, environmental permitting and management, and Stakeholder concerns. He currently utilizes his field experience to support teams globally in improving health and safety performance in key ERM accounts. Over the past 15 years, Troy has participated in trips to Guatemala, Nicaragua, and Haiti organized by Living Water International to install drinking water wells and teach better hygiene techniques.

Monday, October 16, 2017

New Location

Live Oak Room • Norris Conference Center • 816 Town and Country Blvd #210
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $40 Preregistered members; $45 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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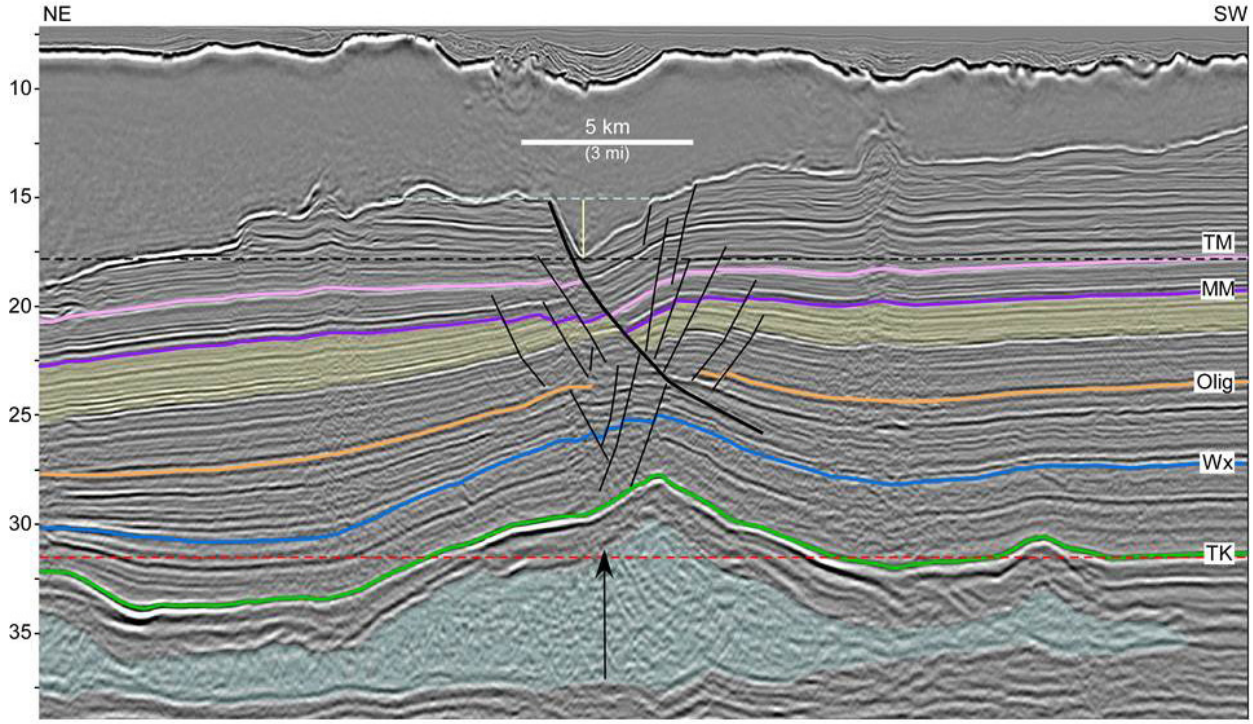
Carl Fiduk, Vivian Robertson, Marianne Clippard, George Jamieson, and Sarah Power
Sugar Land, TX

Distribution and Detachment Level of Salt Keels in the Deep Water Northern Gulf of Mexico: Insights into Canopy Advancement, Salt Sediment Interplay, and Evidence for Unrecognized Mass Sediment Displacement



Seismic line showing example of simple group 1 O-E detached keel. The red dashed line shows the top Cretaceous regional level. The light blue dashed line shows the canopy emplacement level at keel. The black dashed line marks the regional level of the top Miocene horizon which is below regional in the keel hanging wall. The yellow vertical line shows the keel displacement below canopy. The black arrow points to a graben formed by late salt movement related to keel displacement. The yellow shaded interval shows thinning of middle Miocene over deep salt structure. Horizon abbreviations: Basement – BSMT (red), near top Lower Cretaceous – LK (magenta), top Cretaceous – TK (green), top Wilcox Formation – Wx (blue), top Oligocene – Olig (orange), lower Miocene – LM (light green), middle Miocene – MM (violet), top Miocene - TM (pink). Depth scale in 1000s of feet. Vertical exaggeration ~2:1. Seismic data provided courtesy of Schlumberger Multiclient. Reference: Fiduk.et.al_2016.GCAGS.Journal.v5.03.p47-63.

Extension-related salt keels observed in the deep water northern Gulf of Mexico can be organized into three categories based on the stratigraphic level at which associated extensional movement occurs. The first category of keels have faults which detach within Oligocene-to-Eocene strata. The second category of keels have faults which detach into deep salt. The third category appears to be directly associated with

HGS North American Dinner *continued on page 25*

HGS North American Dinner continued from page 23

basement level deformation. Oligocene-to-Eocene (O-E) detached keels are the most important economically and the main focus of examination.

The distribution of O-E detached keels can be subdivided into two groups. Group 1 keels are well delineated by mapping of the base of salt on the canopy. These keels form a trend parallel to the Sigsbee Escarpment but offset shelfward (updip). The trend extends over 200 kilometers across the Keathley Canyon OCS area and into the Alaminos Canyon OCS area. The canopy over these keels was emplaced in the late Miocene to early Pliocene. Group 2 are previously unrecognized keels that lie updip of the Sigsbee Escarpment but basinward of the ascension zones where salt rises from the primary autochthonous salt basin(s). This group of O-E keels is not easily delineated by mapping of the base salt canopy. The canopy in this area was emplaced in the early to middle Miocene.

The distance between the Group 1 O-E keel trend and the Sigsbee Escarpment varies from 10-30 km. The trend as mapped is not a single discrete continuous structure but a series of linked shorter keel segments with a few gaps. Linkage style between keel segments appears similar to that seen for growth faults (i.e. relays). In eastern Keathley Canyon the location for detachment initiation is often found in close relationship with deeper salt structures. Some of these deeper salt structures appear to have moved/adjusted at about the time of O-E keel faulting. In western Keathley Canyon deep salt is absent below the O-E keels. Available well data and mapping constrain the timing for displacement, which must occur after emplacement of the shallow canopy, to late Miocene-early Pliocene but initial movement could be younger. The current interpretation suggests that the canopy needs to reach a thickness of ~1-1.5 km before the underlying weak O-E detachment layers near the Sigsbee Escarpment fail. Failure at shallower levels may occur early as frontal thrusts under minimal cover near the sea floor.

Salt loading (gravity) on a weak detachment is the main driver of extension forming O-E keels. Another component believed critical is the absence of deep structures basinward of the detachment. Non-critical but contributing components include the ability to detach towards basement and/or bathymetric lows, the ability to detach onto basinward flanks of deeper structure, and drive from updip sediment loading. One result of strata displacement by keels may be the creation of over pressured or gumbo zones below the canopy. ■

Biographical Sketch

Dr. Carl Fiduk is currently an independent research scientist and consultant. He has held industry or academic positions at Freeport-McMoRan Oil and Gas, Schlumberger, CGG, CGG Veritas, the University of Colorado, the Texas Bureau of Economic Geology, Discovery Logging, and Gulf Oil. He earned his BAand MS in geology from the University of Florida, an MBA from The University of Texas Permian Basin, and a PhD in geology and geophysics from The University of Texas at Austin. His research interests include salt tectonics, basin analysis, marine depositional processes, petroleum systems analysis, fluvial and deltaic deposition, and restoration of complex structural settings. Carl has published more than 90 peer reviewed abstracts and papers and is a past AAPG Distinguished Lecturer.

Wednesday, October 25, 2017

Petroleum Club of Houston • 1201 Louisiana (Total Building)
Social Hour 11:15 a.m.
Luncheon 11:45 a.m.

Cost: $35 Preregistered members; $40 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.
Walk-ups may pay at the door if extra seats are available.

If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

Robert G. Bertangne
Rusk, Bertagne & Associates

Petroleum Systems and Prospects in the Deepwater Mozambique Channel

The Mozambique Channel can be divided into three geologic provinces:

The western sedimentary province has a thick Mesozoic / Tertiary sequence representing the late Zambezi flood plain and consisting of eastern dipping clastics alternating with turbidite channels oriented in a north-south along the western flank of the Davie Fracture Zone. The petroleum systems are analogus to the Rovuma basin with proximal or in situ hydrocarbon generation of migrating into overlying clastics (Mandawa-7 well). A younger petroleum system consisting of Tertiary gas has migrated into turbidites with high porosity and permeability has been proven in near-shore Mozambique in areas 1 and 4 (Golfinho/Atun and Coral fields 46TCF) (**Figure 1**).

The Davie Fracture Zone (DFZ) is a major tectonic element that extends for 2100 miles (3400 km) offshore along the margin from Somalia to southern Madagascar. In the Mozambique Channel reworked Jurassic sediments are overlain by mid-to-late Cretaceous clastics that were exposed to massive erosion by the waters of the Zambezi River. Crystalline material was deposited during the Tertiary as the Zambezi was rejuvenated. The primary petroleum system in the DFZ is Jurassic age. The source interval is present in onshore western Madagascar as a) migrating into the Cretaceous sands sourced from western Madagascar and sealed by Turonian volcanics (**Figures 2** and **3**). The trap is the classical anticlinal type formed by the uplift of the DFZ. Accretionary wedges on the west flank of the DFZ may also be considered as gas prone prospects

The Malagasy micro plate located east of the DFZ is a relatively quiet province from a structural and stratigraphic standpoint. Continuous sedimentation from Permian through Tertiary and the formation of drag folds expanding into flower structures caused by the reactivation of older Karoo sinistral transforms typical of the African craton as a consequence of the mid-Cretaceous and Tertiary rejuvenation of the DFZ.

HGS General Luncheon *continued on page 28*

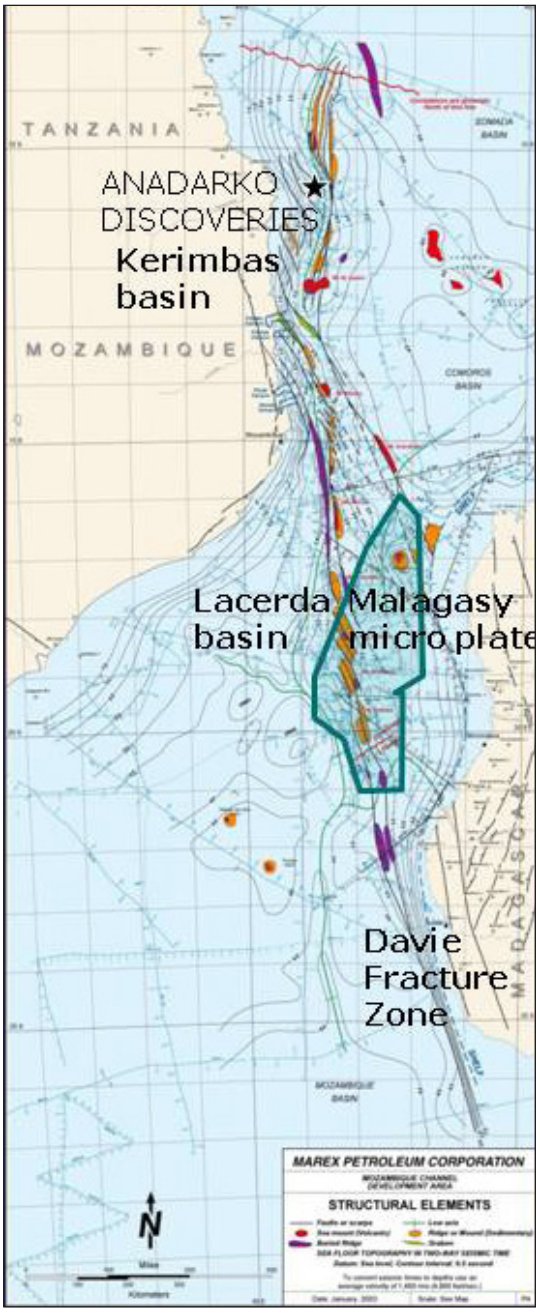


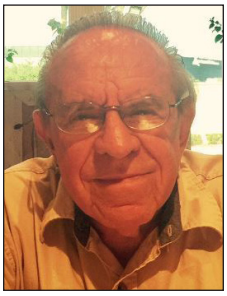
Figure 1. *Mozambique Channel geological zones: The Davie fracture zone (DFZ) is a major dividing element between the present day Meso-Cenozoic basins on the west and the Malagasy micor-plate to the east. However the DFZ formed an integrant element of the Zambezi flood plain in post Turonian time.*

HGS General Luncheon continued from page 27

Six distinct petroleum systems can be found on the Macua uplift ranging from upper and middle Cretaceous deep basin fans, middle and lower Jurassic four way closures and the Permo-Triassic system of the Bemolanga tar sands observed in Triassic flower structures (**Figure 4**).

In 2012 the USGS estimated that 22.4 billion barrels of oil, 349 TCF gas, and 10.7 million barrels of natural gas liquids remained to be discovered in the Mozambique Channel between Mozambique and Madagascar. Based on recently discovered reserves and newly obtained geological/geophysical data and studies it is expected that these figures can be doubled. ■

Biographical Sketch



Robert (Bo) Bertagne has over fifty years experience in petroleum exploration with majors, independents, the World Bank as well as managing his own company. He has worked on seventy-seven sedimentary basins in forty-four countries. He has participated in most of the international plays since the sixties including Libya, the North Sea, Southeast Asia, Latin America, and more recently East Africa offshore.

He studied math and physics at Aix-Marseille University and structural geology at the University of Tulsa. He has also participated in various scientific studies on plate tectonics under Professor Harry Hess of Princeton and with French scientific institutions on the Davie Fracture Zone in the Mozambique Channel.

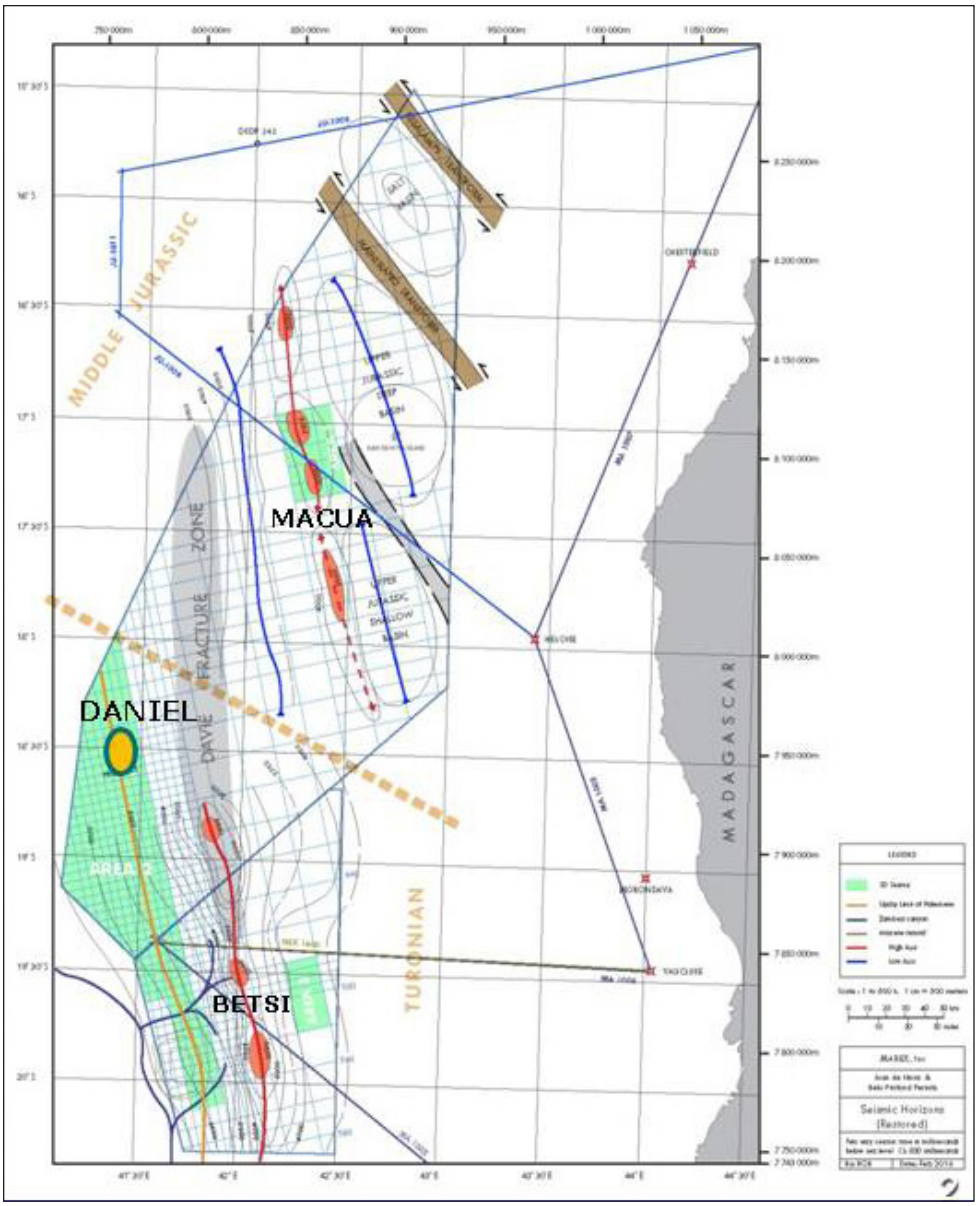


Figure 2. *Generalized structure map of the Turonian and the middle Jurassic. This map shows the general structural grain, at different geological levels, and the mega prospects locations. Note on the left sided the updip limit of the Coniacian (?) wedge (yellow line) with its apex on the JDN Permit (Daniel Prospect)*

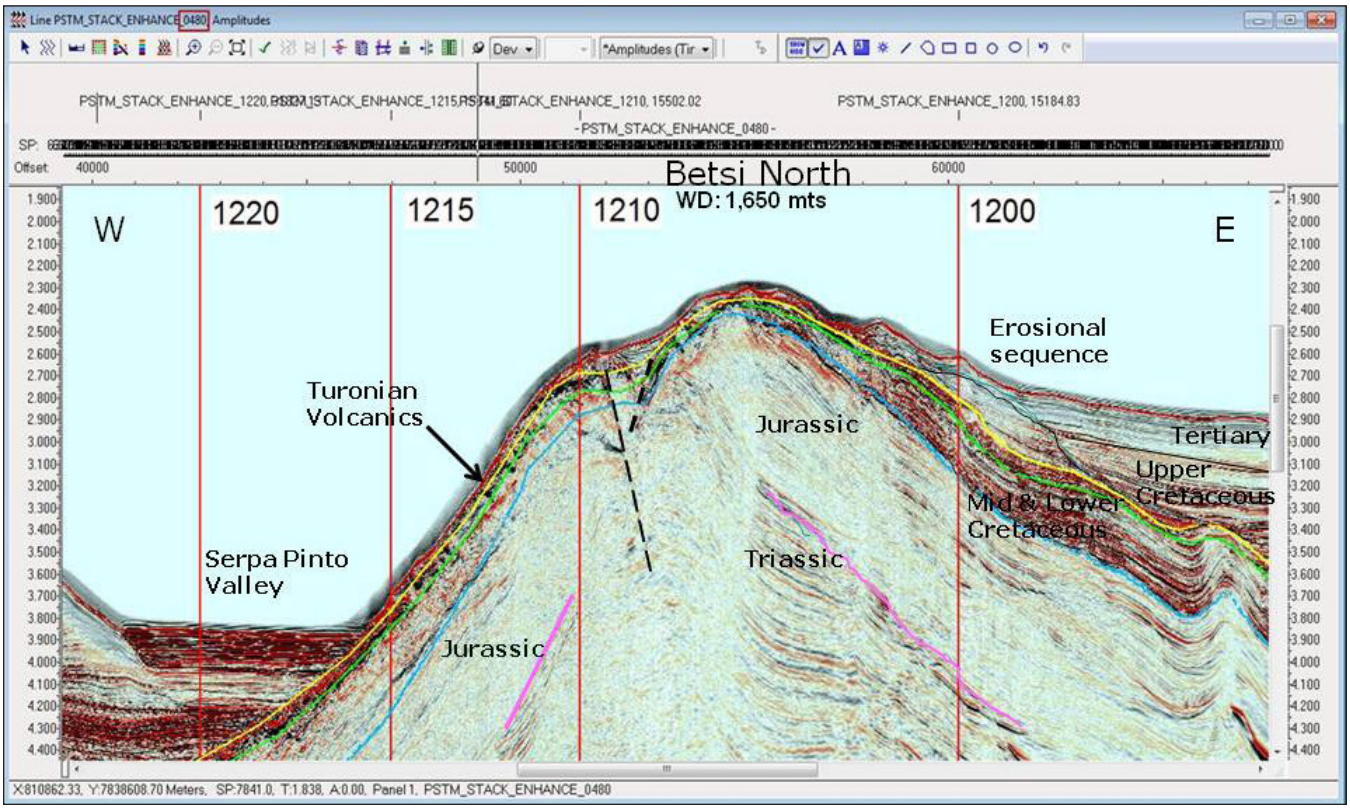


Figure 3. *2D seismic cross line 480 over Betsi North, vertical to horizontal scale approximately 5X*

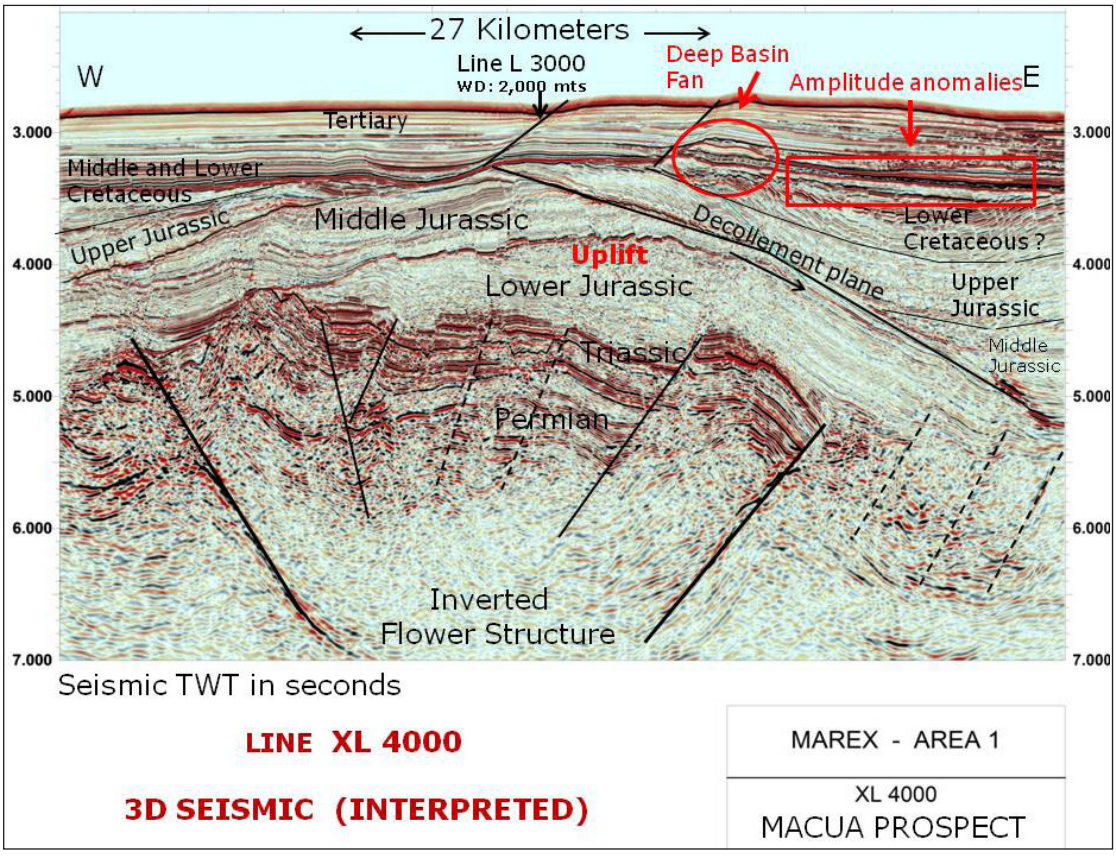


Figure 4.

Thursday, October 26, 2017

Southwestern Energy Conference Center, 10000 Energy Drive, Spring, TX 77389
Social 11:15 a.m., Luncheon 11:30 a.m.

Cost: $35 Preregistered members; $40 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.
Walk-ups may pay at the door if extra seats are available.

If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

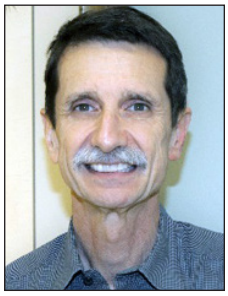
HGS Northsiders Luncheon Meeting

Dr. Dan Georgi

Aramco Research in Support of Unconventionals

Unconventional Resources are seen as a key contributor to Saudi Arabia's domestic energy source for electricity generation and water desalination. The investment by Saudi Aramco in unconventional light hydrocarbon resources will reduce the Kingdom's reliance on liquid fuels for utilities and will provide petroleum feedstock for a growing petrochemical industry. Certainly the unconventional work being done in the Kingdom is already benefiting from the experience gained by operators in North America; however, given the fact that there are many fewer well penetrations in Saudi Arabia than in North America, locating and optimizing production with the drill bit is not a viable option for development of unconventional source rock reservoirs. Considering these obstacles and considerable future opportunities, technology development and research support is being provided from both Saudi Aramco's domestic research organization and the Aramco Research Center in Houston. This work involves a multi-disciplinary team consisting of reservoir engineers, geologists, geochemists, chemists and physicists. Evaluation techniques include a combination of high resolution imaging, NMR, vapor adsorption, geochemical analysis and core analysis to identify potential productive source rock reservoirs to quantify hydrocarbons in place, estimate flow rates using reservoir simulation and predict EUR. ■

Biographical Sketch



Dr. Dan Georgi is recently retired from Houston Aramco Research Center where he was the Reservoir Technology Team Lead for team of multi-disciplinary scientist and engineers focused on hydrocarbon production from tight source-rock reservoirs. Dan worked for Baker Hughes for more 22 years in many positions and was the first Baker Hughes Technology Fellow. He served as the Vice President of Baker Hughes' Regional Technology Centers and started the Dhahran Research and Rio de Janeiro Technology Centers. Prior to Baker Hughes he was the Director of Research at Core Laboratories, then part of Western Atlas International. Dan also worked for 10 years at Exxon Production Research Company and Esso Resources Canada Limited in various positions in research and formation evaluation.

Applied Geoscience Conference

March 6-8, 2018

Integrated Approaches of Unconventional Reservoir Assessment and Optimization

Please join us for the Houston Geological Society's premier technical conference, offering the latest breakthroughs, technical perspectives and integrated approaches to unconventional reservoir assessment.

DAY 1

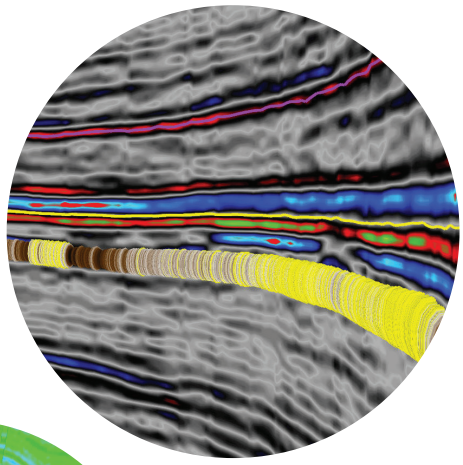
- **Session 1:** Diagenetic Components of Mudrocks and Their Impact on Production
- **Session 2:** Nanoscale Porosity and Hydrocarbon Phase Producibility / Wettability
- **Session 3:** Predicting petrophysical flow properties using digital rock physics
- **Session 4:** Geophysical Methods for Producibility, Fracability and GeoHazards

DAY 2

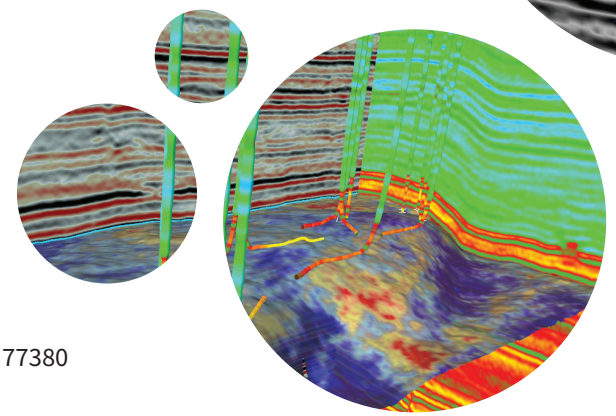
- **Session 5:** Analytical Applications for Improved Hydrocarbon Recovery
- **Session 6:** Hybrid Tight / Complex Opportunities
- **Session 7:** Technology Applications for Stimulated Rock Volumes Versus Drained Rock Volume
- **Session 8:** Operator Cases of Integrated Applied Geoscience for Fun and Profit

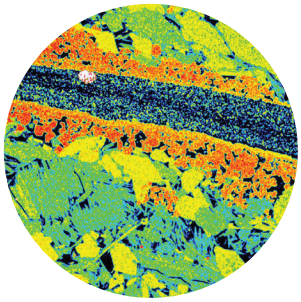
DAY 3

- **Workshop (separate registration):** Applied Methods of Core Descriptions to Maximize Value to an Operator (geared for the novice to the expert)



The full integrated industry member developed program includes the latest University Research (Poster Program Event), supporting Cores (Multi-Core event) and a Luncheon Keynote SME Speaker, as well as an first evening industry social.





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1201 Lake Robbins Drive, The Woodlands, TX 77380

Registration Open!
For more information please visit: www.hgs.org

Applied Geoscience Conference

March 6-8, 2018

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To sponsor, please indicate your sponsorship level _____ with payment (payable to HGS) to: **HGS, 14811 St. Mary's Lane, Ste. #250, Houston, Texas 77079, Attn: Andrea Peoples**. You may also email your completed sponsorship form to andrea@hgs.org.

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If you would like HGS to invoice your sponsorship, please complete the section below:

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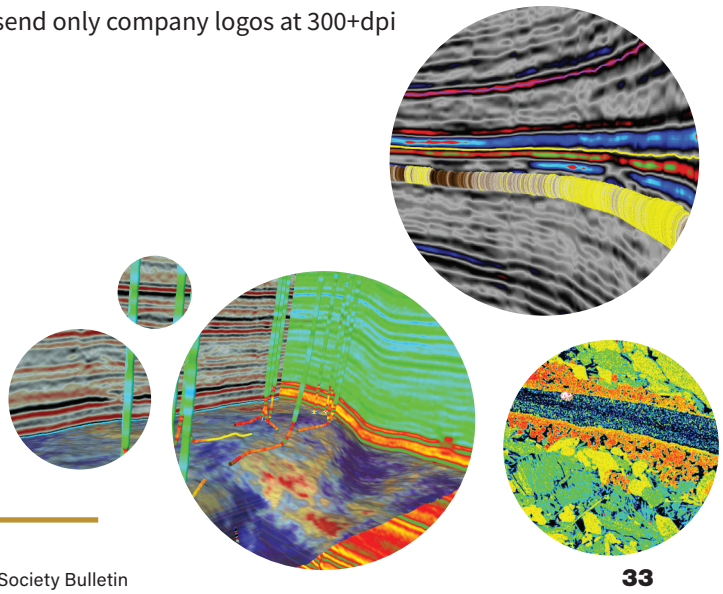
Please email your company logo to andrea@hgs.org. Note: Please send only company logos at 300+dpi



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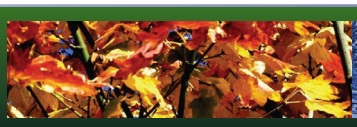
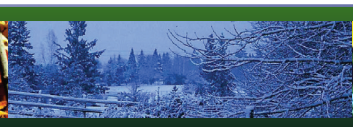
1201 Lake Robbins Drive, The Woodlands, TX 77380

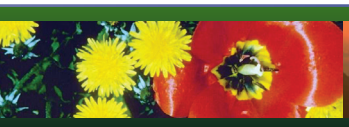
For more information please visit: www.hgs.org

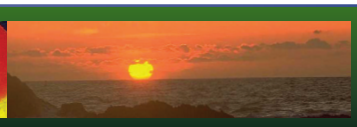
October 2017





Sunday	Monday	Tuesday	Wednesday
1	2 **HGS General Dinner Meeting** *"Geoscientists Without Borders®: Adventures in Geoscience for Global Sustainability and Building Community Resiliance,"* *Robert K. Merrill* *Page 15*	3	4
8	9	10 **HGS Board Meeting** *6 p.m.*	11 **HGS Environmental & Engineering Dinner Meeting** *"Sustainable Water for Developing Countries,"* *Troy Meinen* *Page 19*
15 **Earth Science Week**	16 **HGS Golf Tournament** *Sterling Counrty Club and Houston National Counrty Club* *Page 8* **HGS North American Dinner Meeting** *"Distribution and Detachment Level of Salt Keels in the Deep Water Northern Gulf of Mexico," Carl Fiduk, Page 23*	17	18
22 **Earth Science Week Family-Friendly Outdoor Geology Fieldtrip** *Panther Creek* *Montgomery County Preserve* *11:00 am – 3:00 pm* *Page 18*	23	24	25 **HGS General Luncheon Meeting** *"Petroleum Systems and Prospects in the Deepwater Mozambique Channel,"* *Robert Bretange* *Page 27*
29	30	31	





GeoEvents

Thursday Friday Saturday

5 **Don't wait, make your reservations online at hgs.org**	**6** **HGS Continuing Education** *"Introduction to Drones (UAVs) for Surveying in the Energy Business," Mike Allison and Kwasi Perry, Page 2* **GHS/HGS Saltwater Fishing Tournament** *TopWater Grill Marina, San Leon, Page 26*	**7**
12	**13** **HGS Continuing Education** *"A Practical Guide to Hydrocarbon Volumetric Calculations and Risking," Erik Scott, PhD* *Page 6*	**14** **Earth Science Week Earth Science Celebration** *Houston Museum of Natural Science* *11:00 am – 3:00 pm* *Page 18*
19	**20**	**21**
26 **HGS Northsiders Luncheon Meeting** *"Aramco Research in Support of Unconventionals," Dan Georgi* *Page 31*	**27**	**28**

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 office@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.**

Members Pre-registered Prices:

Dinner Meetings members	$40
Emeritus/Honorary members	$40
Student members	$10
Nonmembers & walk-ups	$45
Except - Env. & Eng.	$30
Nonmembers & walk-ups	$35
Emeritus/Honorary members	$15

October 16-19, 2017
AAPG ICE
London, UK

November 8-9, 2017
HGS Applied Geoscience Conference
Geomechanics in Unconventionals
Houston, TX (Page 10)

November 28, 2017
Continuing Education
Interpretation of Old Logs
Houston, TX (Page 36)

March 6-8, 2018
HGS Applied Geoscience Conference
Integrated Approaches of Unconventional Reservoir Assessment and Optimization
The Woodlands, TX (Page 32)

The Houston Geological Society Continuing Education Committee Presents

Interpretation and Analysis of Old Logs

Encore Presentation – Back by Popular Request!

A One-Day Short Course
by Bill Price, Petrophysical Solutions, Inc.
Tuesday, November 28 • 8:30 am – 5:00 pm

Well over 1 million wells were drilled in the US and the rest of the world before 1960. Many of these wells still form our understanding of the subsurface in most large fields and in smaller ones, too. What makes these wells particularly difficult to understand and interpret?

A review of the early history of logging and the myriad of logging tools will be given with hands-on learning examples. After class, students will be able to identify the types of electrical tools and the appropriate methods to properly interpret them.

Pricing
NO WALK-UPS ACCEPTED

Emeritus/Life/Honorary or HGS Members unemployed: call for special pricing

Early Registration: by 5 PM, Friday, October 27, 2017:		**Registration:** before 1 PM (afternoon), Monday, November 20, 2017:		**Late Registration:** closes 1 PM (afternoon), Monday, November 27, 2017:
HGS Member:	$100.00	HGS Member:	$110.00	$120 HGS Members
Non-Member:	$140.00	Non-Member:	$150.00	$160 Non-members
HGS Student Member:	$80.00	HGS Student Member: (Student registration closes)	$80.00	

Non-members can save $10 and receive the Member registration price, if they apply for any category of HGS membership online (https://www.hgs.org/membership_overview), submit the application, including payment, then register for the course by calling the HGS Office (713-463-9476) before receiving formal acceptance.

Online Registration closes when Full. There may be no walk-ups

Notebook, Certificate of Attendance, Networking Lunch, Continental Breakfast, Coffee and Break Refreshments are included in the Registration price.

Date: Tuesday, November 28 • 8:30 am – 5 pm (Doors open at 7:30 am)

Venue courtesy of Noble Energy Corp.

Location: Bldg. NEC-1 Conference Center, 1001 Noble Energy Way, Houston, TX 77070 – Off Hwy 249 (Tomball Pkwy.) at Louetta

Please make your reservations on-line through the Houston Geological Society website www.hgs.org

For more information about this event, contact HGS Office 713-463-9476 • office@hgs.org

Mr. Price is a Petrophysicist with over 35 years of comprehensive and diverse petrophysical and geological experience, he has worked extensively with all aspects of log interpretation, the integration of log data with geological and engineering data, operations, and wellsite geology. Mr. Price also has significant experience with integrated field studies involving multi-disciplinary teams. His other skills include advanced expertise with old electric logs, including Russian logs, and he is recognized as an authority on and instructor of petrophysical methodologies and database applications. Mr. Price, a registered geologist in Texas, is active in professional associations developing best-practice standards for petrophysics. His previous experience includes consulting, software development, operations and exploration and development. His professional affiliations include AAPG, SPE, SEG, HGS, and SPWLA.

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.*

AGI Geoscience Policy Monthly Review (July 2017)

House And Senate Committees Approve Five Appropriations Bills for DOE, CJS, and Interior and Environment

The House of Representatives has been moving Fiscal Year (FY) 2018 budget bills out of committee more quickly than the Senate. The full House has passed one bill, for the Department of Defense; no appropriations bills have reached the Senate floor yet. Congress and the President must agree a budget or a Continuing Resolution by September 30, 2017 to avoid a government shutdown.

The House Appropriations Committee approved FY 2018 funding for the Department of Energy (DOE), providing the DOE with $29.8 billion, which is $898 million below the FY 2017 enacted level and $1.8 billion above the President's budget request. The House allocated $634.6 million to Fossil Energy Research and Development, a $33.4 million decrease below the FY 2017 level and $354.6 million above the President's request. The bill provides flat funding for the Office of Science at $5.3 billion, although it eliminates funding for Advanced Research Projects Agency-Energy (ARPA-E).

The House Appropriations Committee approved $54 billion in discretionary funding to Commerce, Justice, and Science agencies for FY 2018. The total discretionary funding is $2.6 billion below the FY 2017 level but $4 billion above the President's budget request. The bill funds the National Science Foundation (NSF) at $7.4 billion, a decrease of $72 million from the 2017 enacted level but a $748 million increase above the President's request. The bill does not reduce Research and Related Activities at NSF, funding it slightly above the FY 2017 enacted level. The bill also provides the requested $175.8 million for continued development of NASA's Landsat-9 mission, which is due to launch in 2020.

The House Appropriations Committee approved a $31.4 billion FY 2018 Interior and Environment Appropriations Bill, which is $824 million below the 2017 enacted level and $4.3 billion above the President's request. The bill provides $10.2 million for the USGS Earthquake Early Warning System, a project that the President's budget proposal would have eliminated entirely. The FY 2018 appropriations bill also provides $24.4 million to USGS for the National Cooperative Geologic Mapping Program (NCGMP) and $22.5 million for 3DEP (3D Elevation Program) National Enhancement.

The Senate Appropriations Committee approved $31.4 billion in FY 2018 funding to the Department of Energy (DOE), a $718 million increase from the FY 2017 enacted level and a $4.1 billion increase above the President's budget request. The bill funds the Office of Science at $5.5 billion, $138 million above the FY 2017 enacted level and $1 billion more than the President's request. Within the Office of Science, the Advanced Research Projects Agency-Energy (ARPA-E)—which funds research and development of high-impact energy technologies—is funded at $330 million, a $24 million increase above the FY 2017 level. In contrast, the House appropriations bill eliminated all ARPA-E funding for FY 2018.

The Senate Appropriations Committee approved a Commerce, Justice, and Science FY2018 Appropriations Bill for $53.4 billion, which is $3.2 billion below the FY 2017 enacted level and $4.4 billion above the President's FY 2018 budget request. The bill provides $19.5 billion for the National Aeronautics and Space Administration (NASA), including $100 million for education programs that were otherwise slated for elimination in the President's budget request. The National Oceanic and Atmospheric Administration (NOAA) is funded at $5.6 billion, a $85 million decrease from the FY 2017 enacted amount. NOAA's Operations, Research, and Facilities are funded at $3.4 billion, which is $452 million above the President's budget request.

Secretary Zinke Signs Order to Streamline Permitting for Onshore Resources Development

Interior Secretary Ryan Zinke signed Secretarial Order 3354 on July 6, 2017 to promote energy exploration and development through better management of leasing programs for onshore oil and gas resources and solid mineral resources on federal lands. The Order directs the Bureau of Land Management (BLM) to hold quarterly lease sales, as outlined in the Mineral Leasing Act of 1920, and to identify additional options to enhance the leasing programs. The Order also intends to streamline the permitting process overall.

The Mineral Leasing Act requires oil and gas lease sales, where eligible, to be available at least quarterly or more frequently if determined necessary by the Secretary of the Interior. According to Secretary Zinke, multiple quarterly federal lease sales have been postponed or cancelled since 2009.

Government Update *continued on page 39*

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Discover San Antonio's Vibrant Downtown

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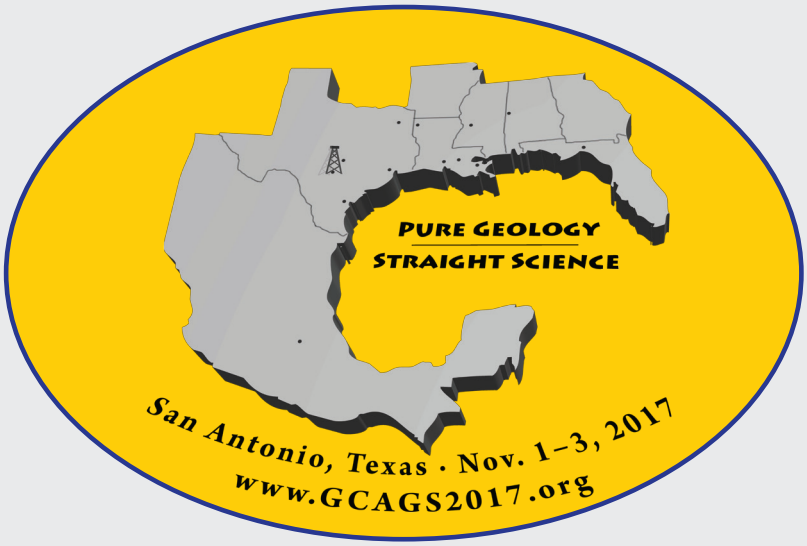
CONVENTION



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Government Update continued from page 37

The Order aligns with the Trump administration's goal to make America energy dominant, as announced by Energy Secretary Rick Perry in the White House Daily Briefing on June 27. Over the past decade, the total amount of onshore and offshore oil production on federal lands has fallen by 10%, while oil production on private and state lands in the same time frame has more than doubled. Secretary Perry expressed his belief during the briefing that unleashing the energy potential in this country with a diverse energy portfolio will lead to job growth and economic expansion in every sector.

Atlantic Offshore Oil and Gas Development Discussed in House

The House Natural Resources Subcommittee on Energy and Mineral Resources held an oversight hearing on July 12, 2017-08-26to evaluate the potential development of offshore drilling on the Outer Continental Shelf (OCS).

Earlier in the year, President Donald Trump issued an executive order "Implementing an America-First Offshore Energy Strategy," which authorizes the Department of the Interior (DOI) to begin oil and gas leasing on the OCS. Following the Executive Order, Interior Secretary Ryan Zinke issued Secretarial Order 3350 to implement the president's order and establish regulations for the leasing process.

While offshore drilling has long been a part of American energy production, it is currently limited to the Gulf, North Atlantic, and West coasts. One provision of the secretarial order is to expedite the consideration of seismic permitting applications in the Atlantic. A witness at the hearing, Dr. James Knapp, pointed out in his testimony that the Mid- and South Atlantic regions have never been adequately explored for oil with commercial seismic surveys.

Several representatives from coastal states, however, were hesitant at the prospect of leasing on the Mid- and South-Atlantic OCS. Representatives Niki Tsongas (D-MA-3) and Anthony Brown (D-MD-4) voiced their concerns about the impact OCS energy production would have on the tourism, recreation, and fishing industries for their respective states.

DOI Announces Craters of the Moon, Hanford Reach, and Canyons of the Ancients No Longer under Review

On July 13, 2017 Interior Secretary Ryan Zinke announced that Craters of the Moon National Monument in Idaho and Hanford Reach National Monument in Washington are no longer under review by the Department of the Interior (DOI). The announcement of another unaltered monument, the Canyons of the Ancients in Colorado, came days later.

The DOI announced on May 11, 2017 it would be conducting a review of 27 National Monuments created since 1996 that are larger than 100,000 acres or the Secretary deems were made without sufficient public input, pursuant to an executive order issued by President Trump in April of this year. AGI submitted written comments to the Secretary detailing the geologic significance of several National Monuments under review, including Craters of the Moon and Hanford Reach National Monuments.

Craters of the Moon boasts a high density of diverse and well-preserved volcanic features, the youngest of which formed just 2,100 years ago. Also at Craters of the Moon, the Great Rift has exposed fissures, lava fields, lava tubes, craters, and cinder cones of immense scientific interest. The White Bluffs at Hanford Reach contain a sedimentary sequence of Ice Age floods, which may be the largest known floods to have every occurred on the Earth, as well as late Miocene fossils of the Ringold Formation.

On July 21, 2017 Secretary Zinke announced that he would not recommend any alterations to Canyons of the Ancients National Monument in Colorado. Canyons of the Ancients is home to the densest concentration of archaeological sites in the United States, as well as the McElmo Dome, which contains one of the largest geological carbon dioxide reservoirs in the United States.

Secretary Zinke released an interim report on June 12, 2017 providing his preliminary recommendations for the Bears Ears National Monument in Utah, in which he suggested reducing the monument by an unspecified amount. As of the end of July, Zinke has not announced his recommendations for any of the other monuments on the list.

House Holds Oversight Hearing on Hardrock Mining

On July 20, 2017 the House Natural Resources Subcommittee on Energy and Mineral Resources held an oversight hearing to discuss the future of hardrock mining in the United States. Streamlining the permitting process, royalties reform, and reclamation concerns were among the topics discussed at the hearing.

In his opening statement, Subcommittee Chairman Paul Gosar (R-AZ-4) expressed his support for domestic mineral exploration and reforms to the permitting and reclamation processes. Ranking Member Alan Lowenthal (D-CA-47) also highlighted the need for changes to hardrock mining reclamation programs, and advocated for a federal hardrock mining royalty program similar to those implemented for oil, gas, and coal.

The permitting process for hardrock mines can take anywhere from one month to 11 years, but averages around two years

Government Update continued on page 41

First Announcement and Call for Papers

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The 17th HGS-PESGB Conference on African E&P

September 11-12, 2018 • Houston Texas

The HGS/PSEGB Africa Conference is the primary technical E&P conference on Africa. Attendance regularly exceeds 300: with industry operators, consultants, governments and academia, engaged in a two-day program of talks, technical posters and vendors exhibits in Houston on September 11-12, 2018.

The annual conference series, alternating locations between London and Houston, organized by the Houston Geological Society (HGS) and Petroleum Exploration Society of Great Britain (PESGB) 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 (up to two pages) should be submitted now and no later than March 15, 2018, to the technical committee, Africa2018@hgs.org. The program will be finalized at the close of April 2018.

Currently, volunteers are being sought to be proactive Session Chairs and anyone interested should contact Brian W. Horn, Conference Chair, as soon as possible. (brian.horn@iongeo.com)

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

Early bird registration will be available in April 2018. Further details will be appear in the HGS and PESGB bulletins and websites; www.hgs.org and www.pesgb.org.uk.

HGS Welcomes New Members

New Members Effective September 2017

ACTIVE MEMBERS	ASSOCIATE MEMBER	EMERITUS MEMBERS	STUDENT MEMBER
Jose Cortina	Lymari Nguyen	Jon Huggins	Diego Gonzalez
Eric Levitt		John Newcomb	
Evan Sitler		Carl Norman	
Walter Sklenar			
Maria (Maggy) Squier			

Welcome New Members

Government Update continued from page 39

according to a U.S. Government Accountability Office (GAO) report from 2016. However, the process can take even longer; Mitchell Krebbs, President and Chief Executive Officer of Coeur Mining, testified during the hearing that it took over 19 years to obtain proper permits at the federal, state, and local levels for the Kensington Gold Mine in Alaska.

While many states have royalty programs to mitigate the local impacts of mining, there is no federal royalty fee for hardrock mining on production from federal lands. Unlike coal mining and Abandoned Mine Lands (AML) reclamation, hardrock mining operations do not require a reclamation fee, and mining companies face significant liability when undertaking reclamation projects.

Representative Doug Lamborn (R-CO-5) intends to introduce a bill which will include Good Samaritan legislation for hardrock mine cleanup.

President Trump Reestablishes National Space Council

On July 7, 2017 the Executive Office of the President published Executive Order 13803, which was signed by President Trump on June 30, 2017 reestablishing the National Space Council. The National Space Council was created in 1989 under the H.W. Bush administration. Although the Council was never formally disbanded, it was last chaired in 1993 by Vice President Quayle.

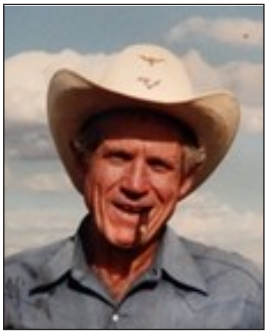
During the past three administrations, the Office of Science and Technology Policy (OSTP) and the National Security Council (NSC) have jointly developed the President's space policy. The OSTP is currently working with one-third of the staff it had under the Obama administration and President Trump has yet to nominate a science advisor, therefore an independent council focused on space policy may be an alternative way to make timely policy decisions.

The Council intends to bridge the gap between the Executive Office, NASA, and commercial space activities to present a unified national space agenda. The Council is responsible for making recommendations to the President on space policy and strategy, as well as monitoring the implementation of the President's policy. It will also advise the President on how the U.S. participates in international space activities.

Vice President Pence will become chair of this iteration of the Council, coordinating with Acting NASA Administrator Robert Lightfoot, Executive Director Scott Pace, and other Cabinet Members and staff. ■

Remembrance

Charles E. Cusack, Jr.
1925-2017



Charles "Charley" Edmund Cusack, Jr., of Houston, Texas, passed away peacefully on Thursday, September 7, 2017 at his home in Houston at the age of 92. Born in Chicago, Illinois on July 29, 1925 to Charles E. Cusack Sr. and Ann Hamilton Cusack, he grew up in Beverly Hills, California and in Cuero, Texas and lived most of his adult life in Houston, Texas. He is preceded in death by his parents and his brothers Mickey and Billy. He leaves behind his four children and seven grandchildren. His son, Charles Cusack III, is a TAMU Geology alumni and President and CEO at Recoil Resources in Houston.

Charles was a multi-sport athlete in high school earning several scholarships. He enrolled at Texas A&M at the age of 16, but then enlisted in the US Army Air Forces at the age of 17 (by forging his mother's signature). He then became the first commissioned combination Navigator/ Flight Engineer in the USAAF where he flew B-29's. After WWII, he attended A&M and then finished his degree in Geology (minor in Engineering) from the University of Houston. He started work for Gulf Oil in 1950 until J. Paul Getty's American Independent hired him at the age of 27 to move to Kuwait to be their only field geologist running operations for two drilling rigs and two seismic crews. His adventures also included a two year stint of prospecting for uranium in Yellowknife, Canada. He then continued his oil and gas career as an independent geologist in the wildcatter days drilling wells mostly in South Louisiana, but also in South America, the North Sea, and South Texas.

Charley was passionate about life, friends and family, and loved to tell countless stories about his life experiences. He enjoyed time in Cascade, Colorado where his extended family spent many vacations together. He was a humble and proud member of the Tejas Vaqueros for 44 Years. He was named "Outstanding Trail Rider" in 1986 and loved his Vaquero brothers and riding horses. His other passions included dove hunting with his compadres in South Texas, annually celebrating St. Patrick's Day, traveling the world, hosting the annual ranch 4th of July party (where he won the very competitive horseshoe tournament again at the age of 74), and mostly spending time with his loved ones. He always made the extra effort to be there. His favorite place on earth was his ranch near Cuero, where he spent thousands of weekends with friends and family, riding horses, hunting, working on the ranch and just sitting around telling "true stories".

This Obituary was summarizes from his official obituary published in the *Houston Chronicle* from Sept. 16 to Sept. 17, 2017.

HGS *Bulletin* Instructions to Authors

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 hard copy printout to the Editor.

Figures, maps, diagrams, etc., should be digital files using Adobe Illustrator or Adobe Photoshop. Files should be saved and submitted in .ai, .eps, .tif or .jpg format. Send them as separate attachments via email or CD if they are larger than 5 MEGs 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 5 MB) or on CD or DVD.

HGS *Bulletin* 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 ads@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.**

Random Inside Ad Placement Black & White Prices Shown – Color add 30% to prices below					**Specific Page Color Ad Placement**					
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9	$800	$1,300	$2,500	$4,700						
8	$750	$1,250	$2,250	$4,300						
7	$600	$1,100	$2,200	$3,850						
6	$550	$950	$1,800	$3,500						$2,000
5	$500	$800	$1,600	$3,000	$4,700	$4,500	$4,350	$4,000		
4	$450	$650	$1,300	$2,500						
3	$300	$550	$950	$2,000						$1,000
2	$250	$400	$700	$1,500						
1	$150	$250	$450	$1,000	$1,500	$1,400	$1,250	$1,000	$1,250	$850

Professional Directory Section Business Card Ad: 10 Issues – $160 ($30 for each additional name on same card)

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HGS Website Home Page Banner Ad	$800 – Monthly $1800 – 3 Months $2800 – 6 Months $3600 – 12 Months	275 x 875 pixels; home page top banner ad. All Home Page Banner Ads rotate every 10 seconds.
HGS Website Home Page Column Ad	$700 – Monthly $1500 – 3 Months $2400 – 6 Months $3600 – 12 Months	200 x 400 pixels; home page right column ad
HGS Website Event Page Ad	$600 – Monthly $1200 – 3 Months $1600 – 6 Months $2600 – 12 Months	200 x 400 pixels; calendar page left column ad. All Event Page Ads rotate every 10 seconds.
Geo-Jobs	$50 – 14 days $100 – 30 days $300 – 3 Months $600 – 6 Months $1200 – 12 Months	Posting of job opportunities on HGS website. Click the Geo-Jobs tab to get started. Must be filled out completed and the dates set appropriately.
Vendor Corner	$250 *4 Pack option with 1 FREE bonus event for $1000.00 available. Send request to vendorcorner@hgs.org.	Company logo, company website, and company description will be highlighted on HGS Calendar website event. This is an opportunity to display company wares, gain personnel exposure and hand out product information at HGS dinner meetings.
Event/Short Course Calendar Ad	$100 – Monthly	An event ad posted within the HGS website calendar under the Events tab.
Bundle & Save!	• 30% off website ads when combined with print ads in all 10 HGS *Bulletin* issues. • 20% off website ads when combined with print ads in 5 HGS *Bulletin* issues. • 10% off website ads when combined with print ads in 3 *Bulletin* issues.	

Application to Become a Member of the Houston Geological Society

Qualifications for Active Membership

1) Have a degree in geology or an allied geoscience from an accredited college or university; or
2) Have a degree in science or engineering from an accredited college or university and have been engaged in the professional study or practice of earth science for at least five (5) years.

Qualifications for Associate Membership (including students)

1) Be involved in the application of the earth or allied sciences.
2) Be a full-time student enrolled in geology or in the related sciences.

Apply online at www.hgs.org and click on Join HGS

Annual Dues Expire Each June 30. (Late renewals – $5 re-instatement fee)

Annual dues are $30.00; emeritus members pay $15.00; students are free.

Mail this application and payment to:

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To the Executive Board: I hereby apply for ❑ Active or ❑ Associate membership in the Houston Geological Society and pledge to abide by its Constitution and Bylaws. ❑ Check here if a full-time student.

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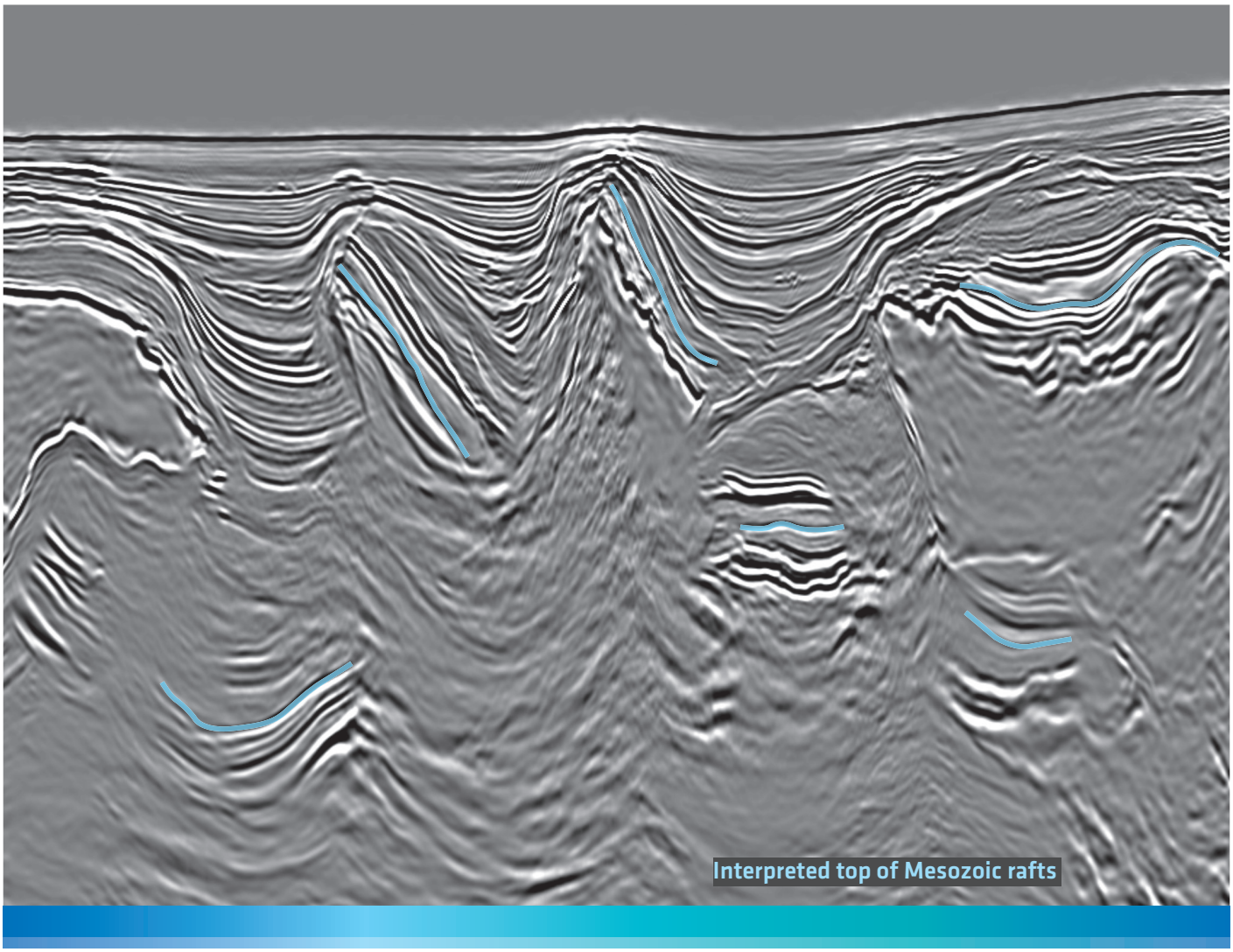

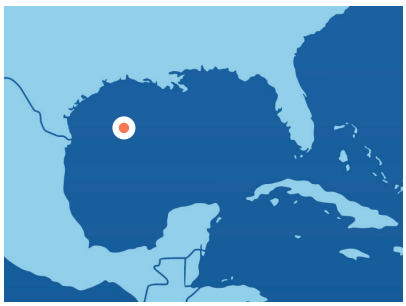

Triton FAZ Depth Imaging

Rafting in Garden Banks and Keathley Canyon

PGS recognizes that accurate migration velocity models are critical for successful depth imaging of the complex geology of the deepwater Gulf of Mexico. In building the velocity model for the full-azimuth (FAZ) ultra-long-offset Triton survey in Garden Banks and Keathley Canyon, PGS identified and incorporated rafted Mesozoic strata as essential elements of the model.

The rafted section drilled in suprasalt positions and between stacked salt sheets in Garden Banks wells within the Triton survey area contains a significant fraction of high-velocity Mesozoic carbonates. PGS included rafts as high-velocity geobodies in the Triton velocity model to optimize the imaging of prospective subsalt Wilcox targets.

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