

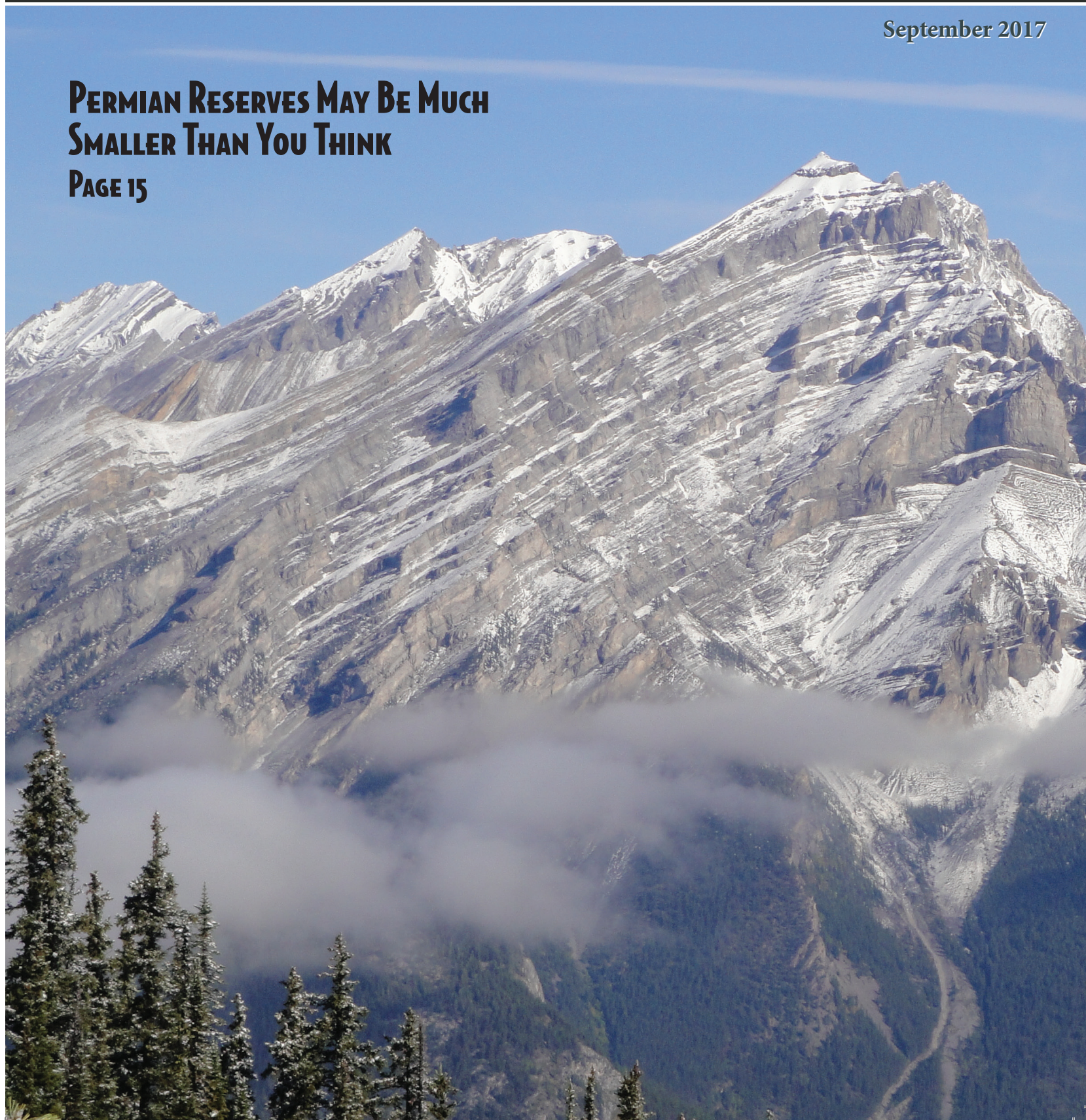
# HGS Bulletin

Volume 60, Number 1

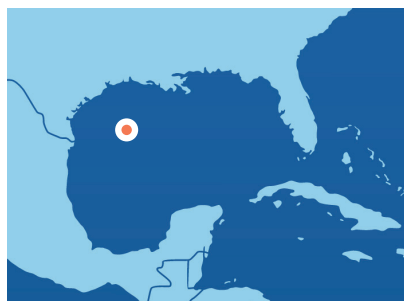
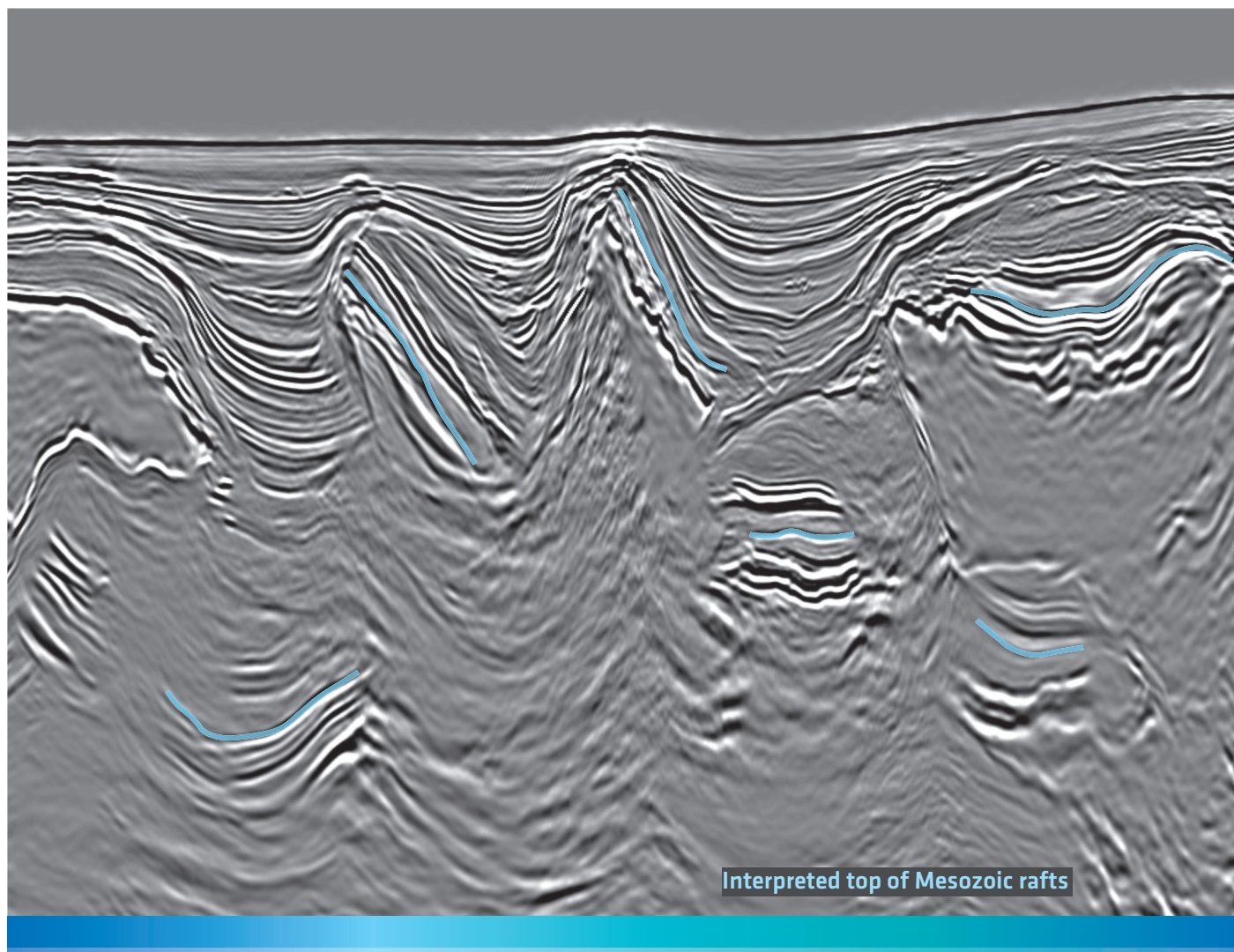
Houston Geological Society

September 2017

**PERMIAN RESERVES MAY BE MUCH  
SMALLER THAN YOU THINK**  
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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.

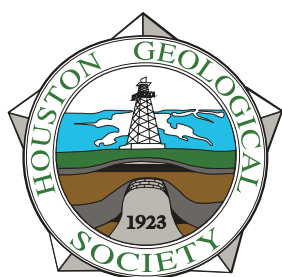
The rafted section drilled in suprasalt positions and between stacked salt sheets in Garden Banks wells within the Triton survey area contains a significant fraction of high-velocity Mesozoic carbonates. PGS included rafts as high-velocity geobodies in the Triton velocity model to optimize the imaging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

**Please contact: Tel: +1 (281) 509 8000 | Email: [gominfo@pgs.com](mailto:gominfo@pgs.com)**

**A Clearer Image** | [www.pgs.com/Triton](http://www.pgs.com/Triton)







# The Bulletin

## Houston Geological Society

Volume 60, Number 1

September 2017

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**Editorial correspondence** and material submitted for publication should be addressed to the Editor, Houston Geological Society Bulletin, 14811 St. Mary's Lane, Suite 250, Houston, Texas 77079-2916 or to Brian.Horn@iongeo.com.

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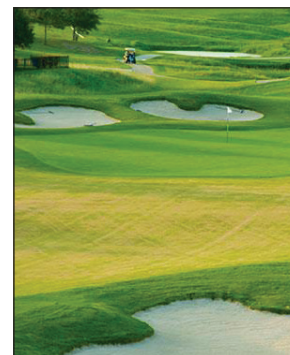
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### Technical Meetings

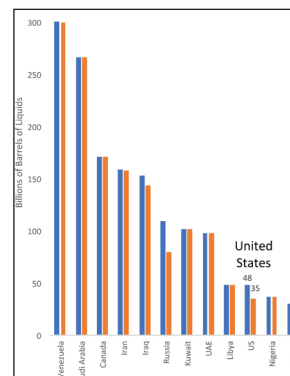
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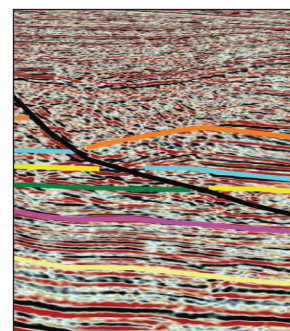
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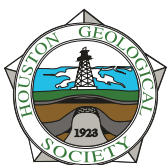


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## Introduction to Drones (UAVs) for Surveying in the Energy Business Workflows and Demonstration

### A Half-Day Short Course

by Mike Allison, Raptor Aerial Services LLC and

Kwasi Perry, UAV Survey Incorporated

Friday, September 15, 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

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, September 15, 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](http://www.hgs.org)

For more information about this event, contact HGS Office 713-463-9476 • [office@hgs.org](mailto:office@hgs.org)

### 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](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 on Sept 13 with additional details.



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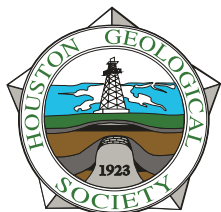
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# It's Time to Renew Your HGS Membership

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](http://www.hgs.org)**

Please complete and return this portion with your remittance.

**Include your CURRENT EMAIL and UPDATE ALL contact information.**

**Please email completed application to [office@hgs.org](mailto:office@hgs.org) and [smsartain1@comcast.net](mailto:smsartain1@comcast.net)**

Name: \_\_\_\_\_

Membership type: \_\_\_\_ Active \_\_\_\_ Emeritus \_\_\_\_ Associate \_\_\_\_ Student

Mailing / Billing Address: \_\_\_\_\_  
(required)

Email Address: \_\_\_\_\_  
(required)

Current Employer \_\_\_\_\_  
(required/if unemployed mark 'in transition')

Job Title \_\_\_\_\_

Graduating University \_\_\_\_\_  
(required)

☐ I do not wish to disclose

Year Graduated \_\_\_\_\_

Degree Name & (BS MS or PH.D) \_\_\_\_\_  
(required)

Work Phone: \_\_\_\_\_ Mobile Phone: \_\_\_\_\_

Would you like to volunteer? \_\_\_\_ (Y/N) Committees of Interest: \_\_\_\_\_

Annual dues \$30.00 Active or Associate: \_\_\_\_\_

Annual dues \$15.00 Emeritus: \_\_\_\_\_

\$0.00 Student: \_\_\_\_\_

\$0.00 Digital Bulletin: \_\_\_\_\_

\$150.00 Annual Hard Copy Bulletin Subscription: \_\_\_\_\_

**OPTIONAL DONATION:** Scholarship Contributions Calvert & HGS Foundation: \$5.00

Additional Donation: \_\_\_\_\_

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*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

## In the Beginning...

Welcome to the 95th edition of the Houston Geological Society! Our Society has been serving the needs of Houston area geoscientists since 1923 and hopefully will continue to do so for many years to come. The title of this article may seem strange. But in reality, each year represents a new beginning for the Society as new management (officers) take their positions with their own aspirations to help and improve the Society. The new HGS Board of Directors is no exception. We have a number of initiatives we hope to make progress with over the year including:

**Increase overall membership** – Over time, there has been a general decrease in HGS membership. Some of this is due to structural changes in the industry yet there are many geologists in Houston who are not members of HGS. What can we do to show these individuals the value provided by the HGS and bring them on board?

**Getting our HGS members (young and older) more engaged with the Society** – During my time in the HGS, I have seen many people who were very passionate about the mission of HGS. Age made little difference in their attitude. More often than not, there was some particular aspect of the HGS mission that they truly believed in. For me, it was trying to help out university students trying to get their degree in geoscience. I am convinced that many of our members would be more active within the HGS if they found their niche, so to speak. I particularly hope that we can convince HGS members retiring or near to retirement to “give back” to the science by remaining members of HGS and sharing their knowledge with younger members or even aspiring geologists.

**Making geoscience relevant (and fun!) to children in the greater Houston area** – I am always interested in hearing what got members interested in geology. For many of us, this occurred WAY before college or even high school! HGS is beginning to promote geoscience to kids in a variety of ways and it is my sincere hope that HGS might provide that “spark” to ignite a passion in geology for at least some of them.

**Improving the quality and content of the Society’s technical programs** – The Board and Committee chairmen recognize that having good quality, relevant talks are key reasons that members attend our meetings. We are working very hard to provide you top-notch technical programs over the course of the coming year.

**Reducing cost to members (and the Society) where we can** – The HGS operated at a loss last year and cannot continue to do so over the long term. To that end, the Board will work hard to reduce costs where possible. We have had some success already in

reducing costs through a variety of means. The net result is that we should be able to reduce costs to our members AND reduce the shortfall to the HGS budget.

**Successfully transitioning our *Bulletin* to a predominantly digital product** – The HGS Board last year decided to convert our *Bulletin* to a predominantly digital product, beginning with the September 2017 issue. There were a number of reasons for this but reducing cost and turnaround time were major factors. The goal of the Board is to see you continue to receive a high quality *Bulletin* with good technical content in a digital format.

**Putting some extra effort into promoting the advertising opportunities available from HGS through our *Bulletin*, the website, and meetings** – In recent years the Society has been somewhat reactive rather than proactive in promoting advertising opportunities through HGS. We are going to try and change this over the coming year by focusing some effort (and talent) into this area.

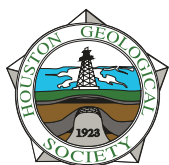
**Develop concrete plans for the HGS 100th anniversary in 2023** – Although it seems a long way off, plans are already underway to celebrate the HGS’ 100th anniversary in 2023. Current AAPG President Charles Sternbach and I both participated in building the program for the 75th HGS anniversary and realize the amount of time and effort it takes to build a successful program. A committee has been formed and will work on developing the long term plan for the 100th anniversary over the course of the coming year. If you have ideas we would welcome your input.

Over the course of the coming year we will dig into these subjects in a lot more detail and I will share the results of our efforts through my monthly *Bulletin* column.

Last, but certainly not least I would like to recognize individuals who have given “above and beyond” the normal call of duty with their HGS volunteer efforts in my monthly columns. The first individual is **Bryan Guzman**, a geologist with INGRAIN, Inc. based in Houston. Bryan is one of our young, active members within the Society. In his relatively short time within HGS Bryan has already been a member, co-chair, and then chairman of the Exhibits committee. He has also served on the HGS Board of Directors as Secretary, Treasurer-Elect, and Treasurer. Most recently Bryan agreed to chair the Advertising Committee to help the Society become more proactive in promoting advertising opportunities to area companies. If you see Bryan please give him a pat on the back for all of the good work he is doing for the Society! ■



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.**

**Wednesday, September 20, 2017 • 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

<b>Early Registration:</b> by 5 PM, Tuesday, September 4, 2017:	<b>Registration:</b> before 1 PM (afternoon), Friday, September 8, 2017:	<b>Late Registration:</b> closes 1 PM (afternoon), Monday, September 18, 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: \$80.00	
	(Student registration closes)	

*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](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:** Friday, October 14, 2016 • 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](http://www.hgs.org)**

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



**Brian W. Horn**  
Brian.Horn@iongeo.com

## Living in the *New Normal*

As I began thinking about how to introduce myself to the HGS membership and what the editor's letter should contain, my first thoughts were to thank Tami Shannon for doing such a great job over the past year and also the HGS membership and Board of Directors for allowing me the opportunity to serve as the 2017-18 term.

Like many of us living in Houston, I am from another part of the country. I had the great privilege to grow up in Colorado. Denver is home for me and where I began my career in the oil patch working the Williston Basin for Amerada Hess while attending school at the University of Colorado. My first assignment was to read every scout ticket and create a hand written notebook of all DST's, perforation and production intervals from the Red River Fm for the entire basin. It took a few months, but I learned how to read a scout ticket and the value of information an insightful explorationist will use to find oil on a 4x6 inch card. This was my first exposure the Bakken Fm and I was fortunate to learn from Fred Meissner about Mohr circles, fracture gradients and the relationship to the expulsion of hydrocarbons. He taught me that integration of multiple scientific disciplines is a critical skill petroleum geologists needed to master. Fred was decades ahead of his time in understanding what would become of one of the greatest oil plays in the history of North America and spawn multiple discoveries and new plays across the Lower Forty-Eight.

Having spent the first 15 years of my career working the Rocky Mountain Basins and having what some people in the industry refer to as the *Denver Problem* (unwilling to leave Colorado and holding on to any opportunity to stay) I decided to come to Houston in 1999. Since then my family and I have moved from

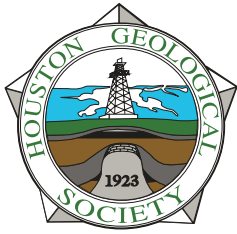
and back to Houston 3 times. Through all the family moves (I know many of us have similar experiences in this industry) I have learned that life is where we make it and how we choose to embrace change. I must admit that first summer in 1999 was a shocker, especially for our St. Bernard! But I realized I couldn't live in Houston wishing I was living in Denver. There is a line from the movie 'The Shawshank Redemption' where Red (played by Morgan Freeman) says to his friend Andy (Tim Robbins) – "Get busy living or get busy dying." In other words, embrace the present or change your future. My most recent return to Houston is going on year 7 and Houston is starting to feel like home. So much for the Denver problem!

*I have learned that  
life is where we make it  
and how we choose to  
embrace change.*

Recently WTI hit a nine month low and the industry *experts* predict continued over supply. For our industry I might call it the *unconventional (production) problem*.

This phenomenon is truly an example of ingenuity, technology and engineering innovation of the individuals and companies in our industry. The question most of us share is when and where will prices stabilize? Conventional wisdom is that \$40-50s is the new normal for the foreseeable future. Given the ever increasing rate of change in technology (AI, driverless cars etc.) our industry is poised to look very different in 10 years than it does today. New technologies (big data, cloud computing, AI) are going to revolutionize the way we explore for oil and gas. But as Wallace Pratt said, "where oil is found, in the final analysis, is in the minds of men (and women)." Critical thinking and asking the right questions are still the essential ingredients for future innovation. My hope and encouragement to the HGS members is let's embrace today for what it is; look to the future and remind all of us *get busy living* in the new normal. ■





# 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](http://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 [elliott.wall@corelab.com](mailto:elliott.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](http://www.hgs.org/golftournament)

**Email:** [office@hgs.org](mailto: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 \_\_\_\_\_

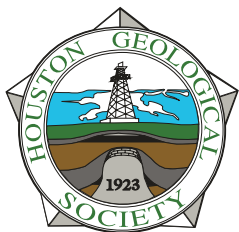
Billing Address \_\_\_\_\_

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](http://www.hgs.org/golftournament)

**Email:** [office@hgs.org](mailto: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 # \_\_\_\_\_

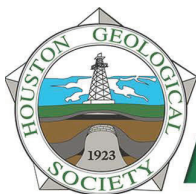
Exp. Date \_\_\_\_\_ Security Code# \_\_\_\_\_

**Please email your company logo to [office@hgs.org](mailto:office@hgs.org) and [elliott.wall@corelab.com](mailto:elliott.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.

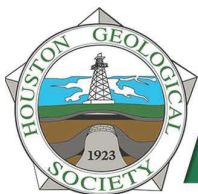
The program will highlight field examples of geomechanical workflows, with sessions focusing on Unconventional Geology & Geophysics, and Integrated Workflows & Engineering Design.

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				



For more information please visit: [www.hgs.org](http://www.hgs.org) or contact Andrea Peoples: [andrea@hgs.org](mailto: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](mailto: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 \_\_\_\_\_

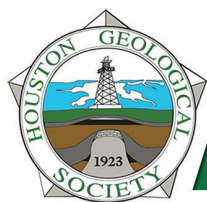
Special Billing Codes \_\_\_\_\_ Approved by \_\_\_\_\_ Date \_\_\_\_\_

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



For more information please visit: [www.hgs.org](http://www.hgs.org) or contact Andrea Peoples: [andrea@hgs.org](mailto:andrea@hgs.org)



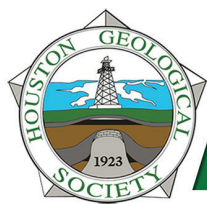


# Applied Geoscience Conference

November 8–9, 2017

## Oral Presentations – Wednesday, November 8, 2017

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



# Applied Geoscience Conference

November 8–9, 2017

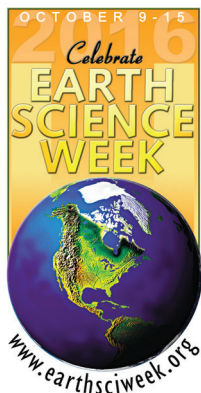
## Oral Presentations – Thursday, November 9, 2017

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

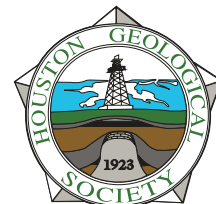




# Earth Science Activities for the Whole Family Coming in October!

## Earth Science Week, 2016

### 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.

<http://www.hgs.org/committee?cmtegrp=sci&committee=Earth%20Science%20Outreach%20Committee>



Panther Creek

Monday, September 11, 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.*

## HGS Joint Dinner Meeting

**Arthur E. Berman**

*Labyrinth Consulting Services, Inc.  
Sugar Land, TX*

HGS Joint Dinner Meeting

# Permian Reserves May Be Much Smaller Than You Think

We are entering a new age of American energy dominance according to Energy Secretary Rick Perry. President Trump reflected that view in comments he made last week that "...we've got underneath us more oil than anybody, and nobody knew it until five years ago."

Trump was referring to tight oil production and today, that means the Permian basin.

Pioneer Natural Resources CEO Scott Sheffield claims that Permian output may exceed 160 billion barrels of oil. Even credible sources like Wood Mackenzie believe that Wolfcamp growth alone will add 3 million barrels per day by 2024.

The EIA, however, estimated that 2015 Permian tight oil reserves were only 782 million barrels. That seems low and is considerably less than the 5 billion and 4.3 billion barrels attributed to the Bakken and Eagle Ford plays, respectively.

I estimate that there are approximately 3.7 billion barrels of proved Permian tight oil reserves using 2016 10-K SEC filings for leading operators in the plays.

All the companies on the table differentiated Permian reserves from other company reserves. Those companies accounted for 47% of all tight oil production in 2016. I used this as a scaling factor to estimate the contribution of companies such as Anadarko, Apache, EOG and OXY that did not separate Permian from other company reserves in their 10-K filings.

The estimate is grounded on a reliable base of 1.7 billion barrels from company filings. The assumption that unknown company reserves will follow 2016 production ratios is reasonable but uncertain.

	Permian 2016 Proved Oil Reserves (kbo)	2016 Tight Oil Production (kbo)	PCT OF Total 2016 Production
CONCHO	321,026	37,315	9.3%
PIONEER	283,647	45,538	11.3%
ENERGEN	199,575	10,468	2.6%
LAREDO	167,100	9,146	2.3%
RSP PERMIAN	164,700	11,040	2.7%
DIAMONDBACK	139,174	14,892	3.7%
PARSLEY	136,536	11,763	2.9%
EP	81,800	3,973	1.0%
DEVON	81,000	16,211	4.0%
CIMAREX	74,300	17,920	4.5%
CALLON	71,145	8,509	2.1%
SUBTOTAL	1,720,003	186,776	47%
TOTAL	3,696,999	401,459	100%

I imagine that an estimate of only 3.7 billion barrels may surprise many who buy into the vision of American energy dominance. Others may accept the estimate but argue that Permian plays have significant growth potential that the Bakken and Eagle Ford do not.

Concho and Pioneer included tables in their 2016 10-Ks that projected future production from proven undeveloped (PUD) reserves. That data indicates that the two leading producers in the Permian tight oil plays anticipate PUD production to peak in 2019.

Concho's and Pioneer's combined peak 2019 PUD production volumes are approximately 25% of their combined 2016 daily production from the Permian basin. That means that the addition of future PUD production may only offset legacy production decline rates.

Anticipated PUD volumes are already included as proved reserves so however we view this data, it does not affect the implied reserves for the Permian basin. 10-K reserve and PUD production forecasts are based on 2016 SEC oil and gas prices. Higher prices would mean higher reserves and PUD production although few now anticipate substantial price changes over the period covered by Concho's and Pioneer's estimates.

HGS Joint Dinner continued on page 17



# Upstream Oil & Gas Professionals Hiring Event

Monday, October 2, 2017 / 5

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



Permian tight oil reserves implied by this study are less than accepted estimates for the Bakken and Eagle Ford plays. Permian production, however, has already reached peak Eagle Ford levels and is still increasing.

To many, this implies that Permian production will continue to increase and will eventually eclipse output from the older tight oil plays. That may be true but, without additional reserves from new plays or deeper layers, it may only reflect rate acceleration followed by steep decline once peak production is reached. Concho's and Pioneer's future production forecast suggests that peak production may occur sooner than later.

This study represents one scenario that may provide context for the claims and expectations about future production potential for the Permian basin. Aside from weak growth in the offshore Gulf of Mexico or some return to growth in the Bakken and Eagle Ford plays, it is the only current basis for the crude oil portion of emerging American energy dominance.

For the U.S. to move into the top tier of oil producing countries, reserves must at least double from accepted estimates by BP, EIA and other credible organizations.

Even in upside scenarios where Permian reserves of 3.7 billion barrels are doubled or tripled, it is still not enough for the U.S. to become energy dominant in oil. Engineers commonly think of reserves as a tank—you can drain the tank with the best technology at very high rates and perhaps make some money along the way, the ultimate production is limited by the size of the tank.

I have presented an estimate of tank-size using data from the companies that know most about the plays. If it close to correct American energy dominance should be recognized as just another expression of alternative facts. ■

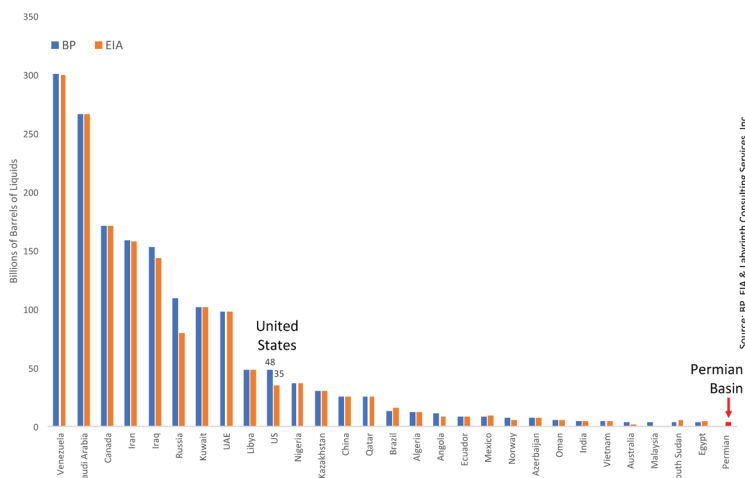
### Biographical Sketch

ARTHUR E. BERMAN is a petroleum geologist with 39 years of oil and gas industry experience. He is an expert on U.S. shale plays and is currently consulting for several E&P companies and capital groups in the energy sector.

He makes frequent keynote addresses for energy conferences, boards of directors

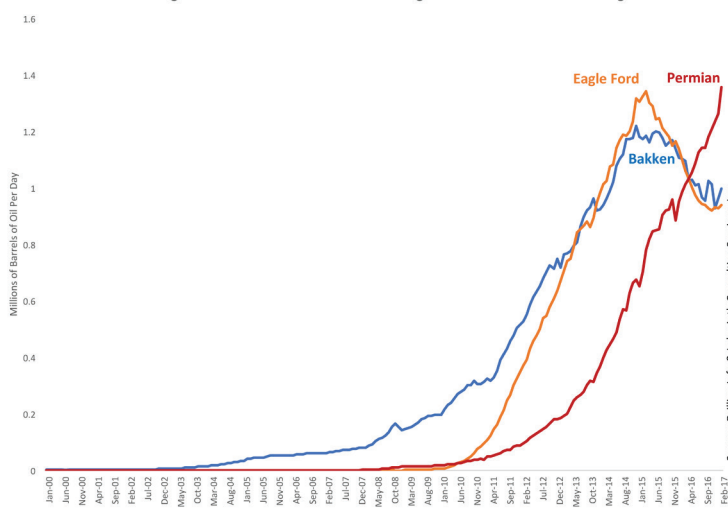


The U.S. Must Double Reserves To Become an Oil-Dominant Producer Even Doubling or Tripling Permian Reserves Not Nearly Enough



Source: BP, EIA & Labyrinth Consulting Services, Inc.

Permian Tight Oil Production Has Reached The Eagle Ford Peak & Is Still Increasing



Source: Drilling Info & Labyrinth Consulting Services, Inc.

and professional societies and has published dozens of articles on oil and gas plays and trends that may be found at artberman.com. He has been interviewed about oil and gas topics on CBS, CNBC, CNN, CBC, *Platt's Energy Week*, *BNN*, *Bloomberg*, *Platt's*, *The Financial Times*, *The Wall Street Journal*, *Rolling Stone* and *The New York Times*.

Berman is an associate editor of the American Association of Petroleum Geologists *Bulletin*, and was a managing editor and frequent contributor to *theoildrum.com*. He is a Director of the Association for the Study of Peak Oil, and has served on the boards of directors of The Houston Geological Society and The Society of Independent Professional Earth Scientists.

He worked 20 years for Amoco (now BP) and 19 years as consulting geologist. He has an MS (Geology) from the Colorado School of Mines and a BA (History) from Amherst College.

**Wednesday, September 13, 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.*

## HGS Environmental & Engineering Dinner Meeting

**Peter G. Pope, P.G. and Peter Fisher, P.G.**  
*Railroad Commission of Texas*

### ETHICS MOMENT

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

## Environmental Issues and the Railroad Commission of Texas

The stewardship of natural resources and the environment is an important part of the Railroad Commission of Texas' (RRC) mission statement. Mr. Pope and Mr. Fisher will discuss

environmental issues and regulation related to activities under the jurisdiction of the RRC, with a focus on regulation of Oil and Gas Exploration and Production activities. ■

### Biographical Sketches

**PETER POPE** attended Purdue University in the mid-1980s and then Rice University from 1987 to 1991 where he performed graduate-level research in Antarctic glacial marine sedimentation. He began his career in environmental consulting in 1991. After 10 years in the private sector, he took a position in the Site Remediation Section of the Railroad Commission of Texas using his knowledge and experience with contaminant fate and transport modeling and risk assessment to regulatory oversight of oil field cleanups. Mr. Pope currently manages the Site Remediation Section.



**PETER FISHER, P.G.**, works as the Houston District Director in the Field Operations Section of the Oil and Gas Division of the Railroad Commission of Texas. Mr. Fisher was promoted to Houston District Director on August 1, 2015, where he had been the Houston Assistant District Director since June 1, 2011. He is responsible for the overall operations of the Houston District

office ensuring that all Commission Rules, procedures, and policies are enforced in the District.

Before moving to Houston Peter worked for 11 years in the Site Remediation Section of the Oil and Gas Division of the Railroad Commission of Texas in Austin coordinating site assessments and cleanup of abandoned oil and gas surface sites using State funds. Prior to working in Site Remediation, he worked three years in Technical Permitting of the Environmental Permits and Support Section.



Prior to joining the Railroad Commission of Texas Mr. Fisher worked at Fluor Daniel GTI environmental engineering consulting firm where he managed several underground storage tank sites and helped assess and prepare surface mining studies and applications for lignite in east Texas. Mr. Fisher has a BS in geology from The University of Texas at Austin.

Thursday, September 14, 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

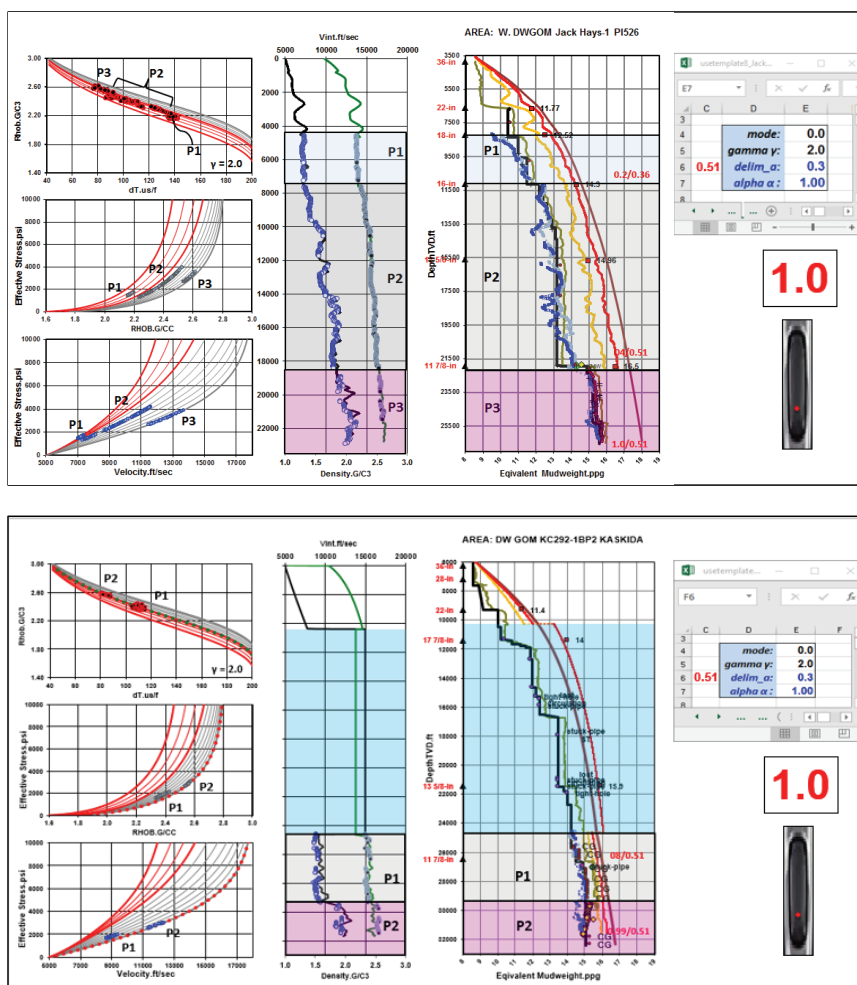
Matt Czerniak  
GCS Solutions, Inc

HGS Northsiders Luncheon Meeting

# RhoVe-T Method Empirical Density-Temperature-Effective Stress Transform

The rhob-velocity-effective stress (RhoV-e) method represents an empirical approach to pore pressure analysis and calibration utilizing a series of model-driven, stand-alone, “virtual” rock property relationships. The method is fundamentally a two-parameter approach ( $\gamma$  and  $\alpha$ ) that is used to construct a velocity-effective stress and a density-effective stress family of curves that can be applied to a well of interest, where convergence of the two transformed properties offers a robust solution. The RhoVe method reduces to a single parameter ( $\alpha$ ) in tethered mode, which includes the effects of compositional changes related to clay diagenesis.

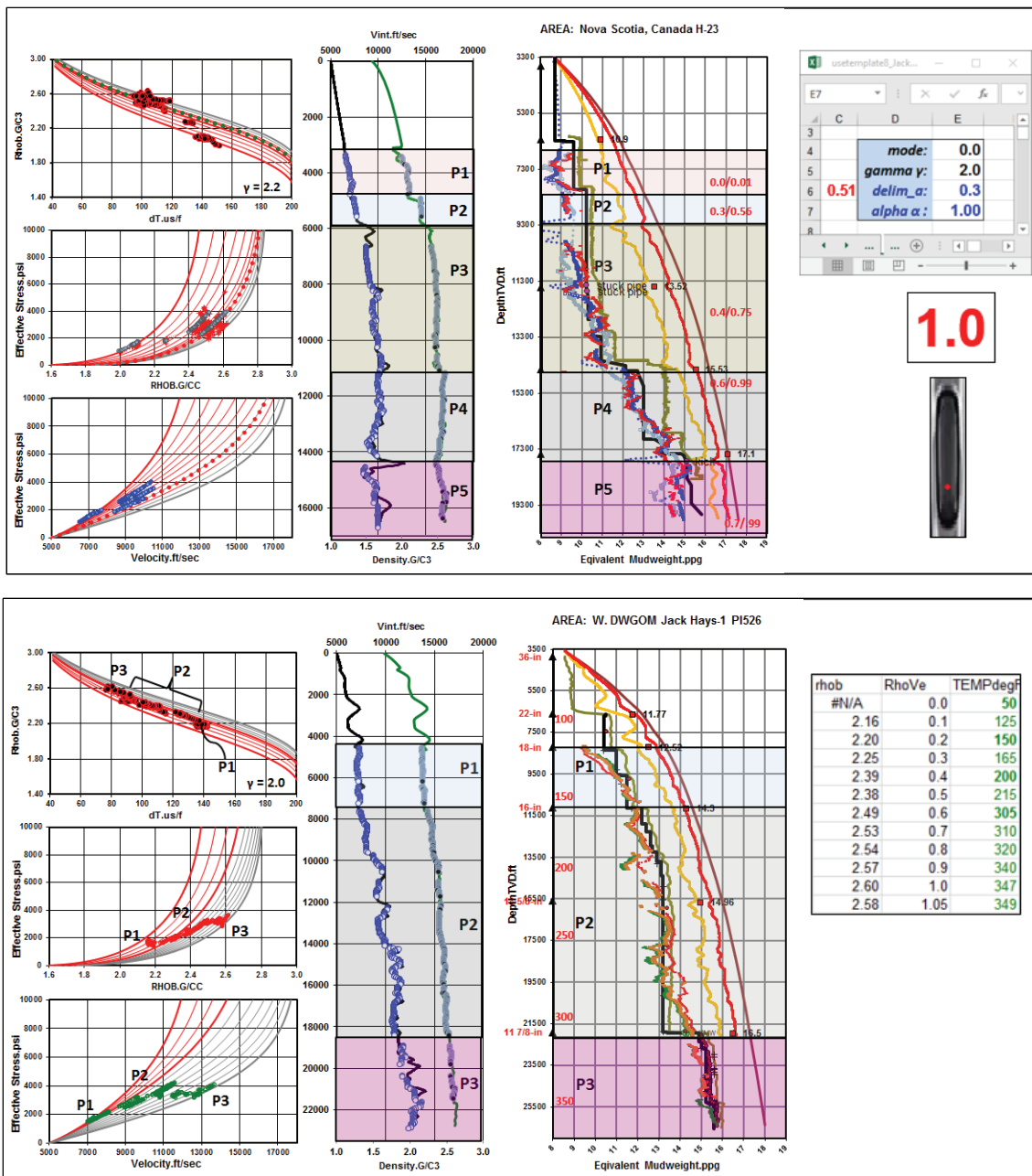
The transition from mechanical to chemical compaction is believed to take place between 70-90° C (158-194° F), and follows the onset of the smectite to illite reaction in mudstones, which commences at between 60-70° C (140-158° F). A sub-regional study of wells located in the south-central Deepwater Gulf of Mexico confirmed the presence of a plateau, or upper limit in  $\alpha$ - $\alpha$  relationships (in sonic versus density cross plot space), that approximately coincides with Bowers published Gulf of Mexico “slow” trend for shales, and is consistent with the effects of ongoing chemical compaction. Post-drill pore pressure analysis and calibration results for the Deepwater Gulf of Mexico sub-regional study area were re-evaluated, and the RhoVe method



**Figures 1a & b.** Pore Pressure calibrations for Hess Corp. Jack Hays (PI526-1) and BP Kaskida (KC292 1BP2) using RhoVe™ method. With a simple mouse-wheel rotation, gamma ray (shale) discriminated sonic and density data are transformed to common estimates of effective stress and pore pressure, where convergence of the two properties offers a robust solution. By including density data (an attribute that has been largely overlooked as a pore pressure indicator), the RhoVe™ method provides a rationale for subdivision of major flow units and boundaries, which can be utilized in basin modeling simulations and workflows.

HGS Northsiders Luncheon continued on page 20





**Figure 2a.** Pore Pressure calibrations for CVX offshore Nova Scotia H-23 (Newburn) using interactive RhoVe™ method solutions in background (blue and gray) and RhoVe™ Auto (red) - an executable, that can also account for progressive compositional changes in mudstones recognized in sonic-density cross plot space. Solutions using RhoVe™ Auto, or the interactive RhoVe™ method “untethered” mode are appropriate for temperatures less than about 100-120 degrees C, and are more applicable to younger offshore sediments.

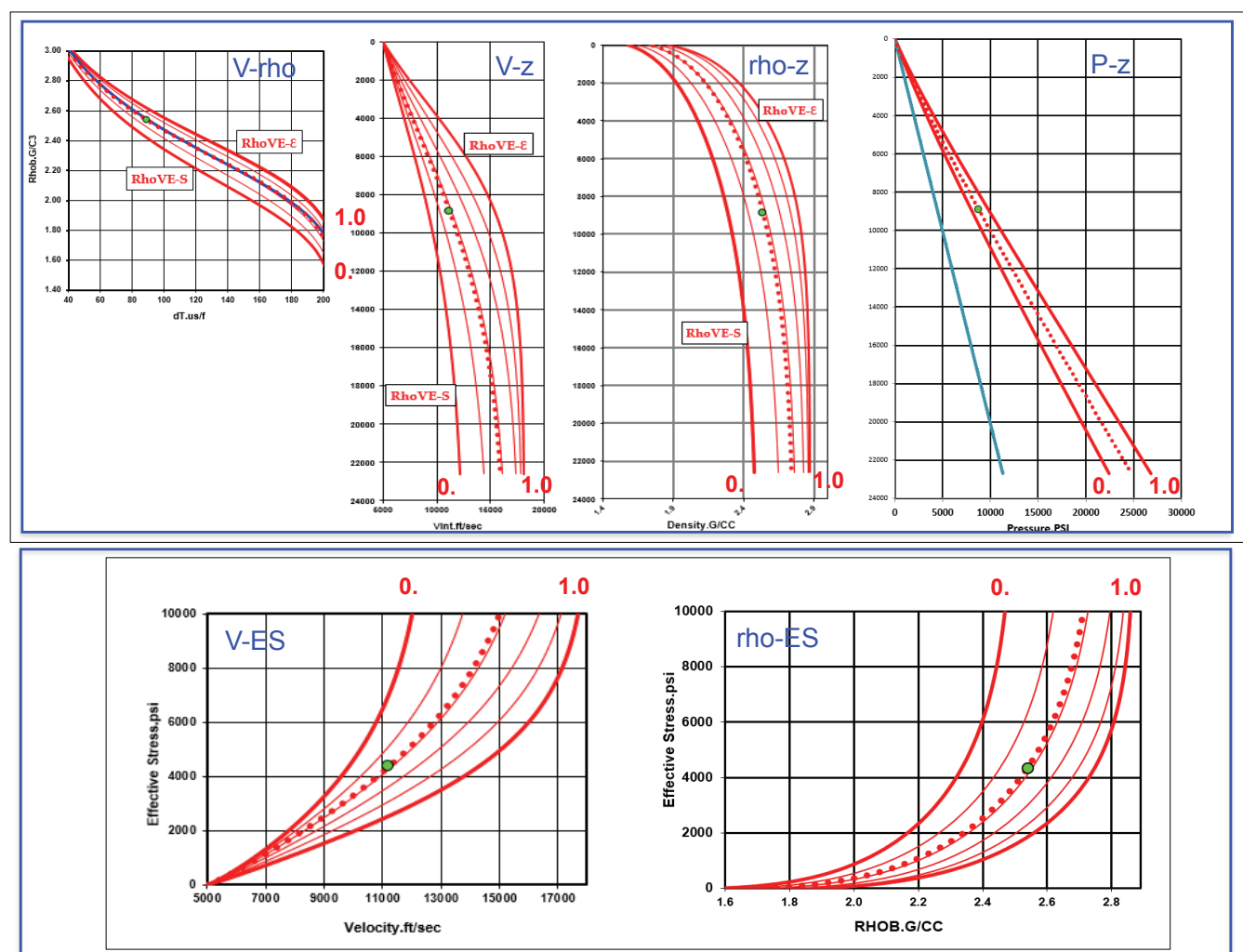
**Figure 2b.** Pore Pressure calibration for Hess Corp. Jack Hays (PI526-1) using RhoVe™ T. At greater depths, mudstone to shale transformation continues and is identified by changes in physical rock property relationships where ongoing chemical compaction and shale diagenesis are controlled principally by temperature. Thermodynamic solutions utilize RhoVe-T™ (executable) using density, sonic and acoustic impedance values as inputs versus temperature (transforms), and are directly applicable to geologically mature shale play reservoir sections and unconventional plays.

was extended to produce a family of density-effective stress relationships as a function of temperature (RhoVe-T) that can be applied predictively, and accounts for the effects of microquartz cementation and other diagenetic factors related to the effects of ongoing chemical compaction. Temperature relationships are easily extended to a well of interest using RhoVe-derived flow unit solutions that include density, velocity and acoustic impedance relationships to vertical effective stress.

Accounting for the effects of chemical compaction using alternate associations extends the predictability of high-velocity, low-effective stress rock types such as those found in the Deepwater Gulf of Mexico Wilcox-equivalent Paleogene mudstones and older onshore unconventional shale-play reservoir sections. ■

### Biographical Sketch

**MATT CZERNIAK** has over 28 years of experience in the oil & gas industry with major operators (BP, Mobil Exploration & Production, Chevron-Texaco, Hess Corp., BHP Billiton and ConocoPhillips) and is the founder of two geoscience companies. He received a BSc from Michigan State University and MSc from Louisiana State University in Baton Rouge, LA. Matt is committee member of the Operators Pore Pressure Forum since 2011, has patents pending on RhoVe method most recent publication is RhoVe Method – New Empirical Pore Pressure Transform, 2017, *Journal of Marine & Petroleum Geology*, v86 p. 1-24.



**Figure 3.** RhoVe™ method "virtual" model, which represents a fully-populated" shale-only petrophysical model that can be queried to perform advanced calculations (distinguishing it from other pore pressure methods).



# **HGS Presents:**

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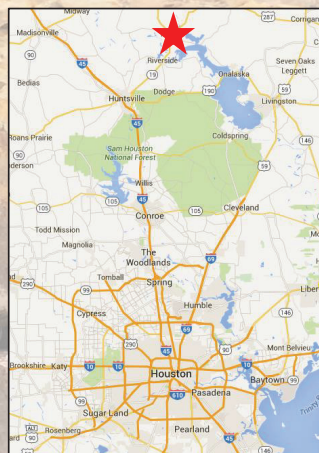
**Arts & crafts**

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Wednesday, September 27, 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**

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**Pre-registration without payment will not be accepted.**

**Walk-ups may pay at the door if extra seats are available.**

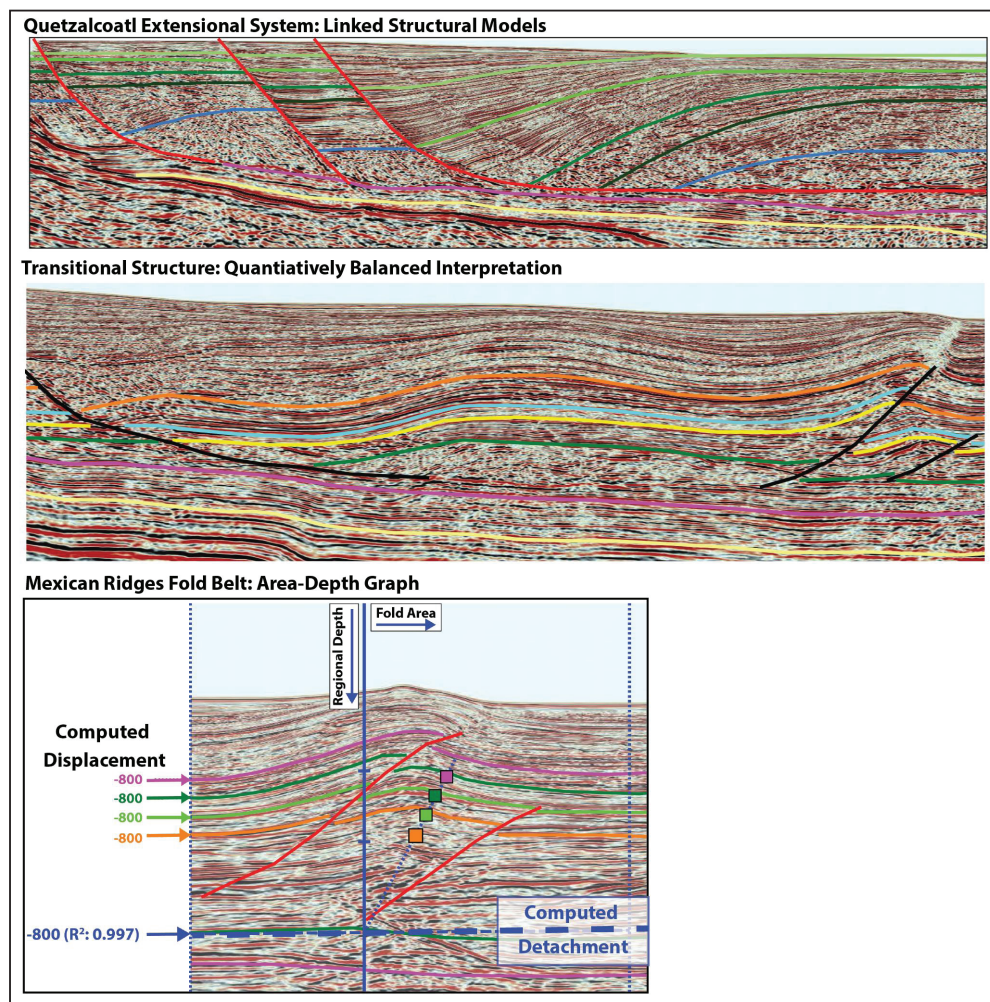
*If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.*

## HGS General Luncheon Meeting

**Nathan Eichelberger**  
*StructureSolver*

HGS General Luncheon Meeting

# Case Studies from the Gulf of Mexico and the Andes - Integrating Quantitative Structural Geology into the Interpretation Workflow



**Figure 1.** Top: Linked structural forward models of the growth faults within the Quetzalcoatl extensional system. The models are fit directly to the seismic data and reliably reproduce the pre-growth and growth strata geometry. Middle: Quantitatively balanced interpretation of the transition from the Quetzalcoatl Extensional System to the Mexican Ridges Fold Belt. The interpretation was developed using both forward modeling and area-depth-strain analysis. Bottom: Area-depth graph of one of the contractional Mexican Ridges Fold Belt structures. Area-depth-strain analysis computes the detachment depth and displacement (shown here) based on how fold area varies as a function of depth. The method also estimates horizon parallel strain. Data courtesy of TGS.

Continued improvement in seismic data acquisition and processing have provided geoscientists with increasingly detailed images of the folds and faults that define structural petroleum traps. However, understanding the geologic implications of the imaged structures is still a challenge for seismic interpreters regardless of technical background. This lack of understanding can result in errors that at best are time-consuming mistakes to fix and at worst end in dry wells. We present a series of quantitative structural geology techniques that can be implemented as part of the interpretation work flow to produce robust fault picks, define horizon correlations across faults, estimate strain and displacement, and reveal the geologic development of the structures under study. This approach is applied to three case studies:

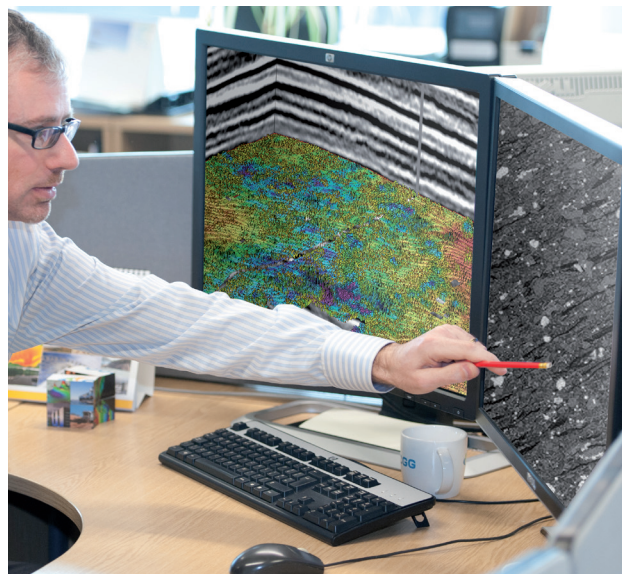
1. Gravitationally driven deformation in the Mexican Ridges Fold Belt.
2. Reactivated faults in the Peruvian sub-Andes.
3. Salt-related deformation in the Gulf of Mexico.

HGS General Luncheon continued on page 25





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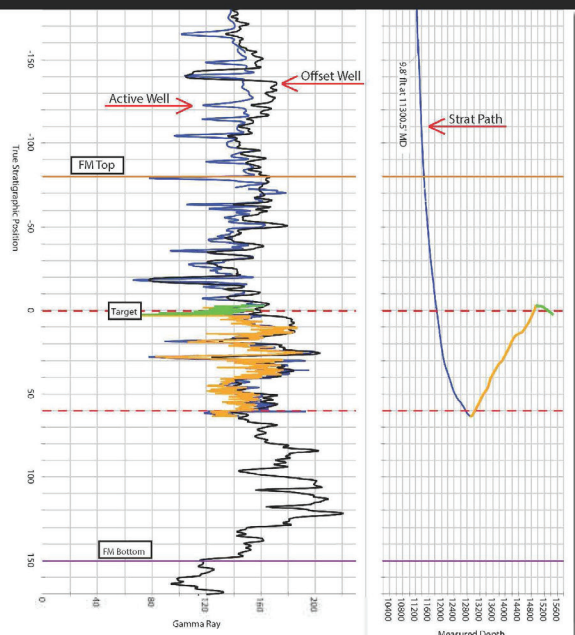
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Each study combines results from structural forward modeling, depth-to-fault calculations (the area-depth-strain method, or ADS), and structural restorations to develop a holistic understanding of structural trap development. A key to this approach is that the analysis methods are applied interactively to the seismic lines and the results are used to guide interpretation decisions.

The Mexican Ridges Fold Belt study details a situation where the seismic data quality is excellent but there is a high degree of natural structural complexity adding significant geologic uncertainty. The newly acquired data clearly resolves a gravitationally-driven system of extensional growth faults along the continental shelf edge (referred to as the Quetzalcoatl extensional system) is linked to the contractional Mexican Ridges fold and thrust belt by an over-pressured shale detachment. We develop a regional structural interpretation and define the sequence of structural development using structural forward models and ADS computations. The forward models refine fault geometry, correlate horizons across faults, and independently estimate displacement and strain (**Figure 1a, top**). The models are linked together and quantitatively animated to show the sequence of fault development. The ADS computations map out the regional detachment for the system and provides constraints on displacement, horizon strain, and relative timing of deformation (**Figure 1, bottom**). The integrated analysis leads to a balanced and fully quantified regional geologic framework extending from the shelf edge to the deep-water.

Understanding the timing of structural development is crucial to evaluating the prospectivity of structural traps. Using the example of a reactivated normal fault from the Peruvian Subandes, we examine how syn-kinematic growth strata can effectively constrain the timing of structural development. By interactively fitting fault-bend-fold and fault-propagation-fold forward models to the seismically imaged growth section, we interpret a complex structural history that reflects early extension, regional erosion during contraction, and structural quiescence before a final stage of contraction during Andean deformation.

Finally, we discuss a new approach to understanding salt-related deformation by sequentially restoring both the interpreted horizons as well as the seismic image on a component-by-component basis. Using 2-D restoration algorithms (e.g. flexural slip and inclined shear) we show that restoring seismic lines based on interpretations provides insight into the development of possible traps and assist interpreters in understanding reservoir strain distributions. ■

## Selected Publications

Eichelberger, N. W., Nunns, A. G., Groshong, R. H., Hughes, A. N., 2017. Direct Estimation of Fault Trajectory from Structural Relief. 2017. *AAPG Bulletin*, May 2017.

Eichelberger, N. W., Hughes, A. N., and Nunns, A. G., 2015. Combining multiple quantitative structural analysis techniques to create robust structural interpretations, *Interpretation*, vol. 3, no. 4, (November 2015)

Eichelberger, N., McQuarrie, N., Ryan, J., Karimi, B., Beck, S., and Zandt, G., 2016, Evolution of crustal thickening in the central Andes, Bolivia. *Earth and Planetary Science letters*, v. 426, p. 191 – 203.

Eichelberger and McQuarrie 2014, 3-D finite strain at the central Andean orocline and implications for grain-scale shortening in orogens, *GSA Bulletin*.

## Biographical Sketch

NATHAN W. EICHELBERGER is a structural geologist at StructureSolver, a geological software and consulting company. Nate holds a PhD in geosciences from Princeton University and a BS in geology from Bates College. His research focuses on defining the evolution of structural geologic systems at scales ranging from single faults to entire mountain belts.





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# September 2017



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	<b>Reservations:</b> The HGS prefers that you make your reservations on-line through the HGS website at <a href="http://www.hgs.org">www.hgs.org</a> . If you have no Internet access, you can e-mail <a href="mailto:office@hgs.org">office@hgs.org</a> , or call the office at 713-463-9476. <b>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.</b> 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 <a href="mailto:Webmaster@hgs.org">Webmaster@hgs.org</a> . Once the meals are ordered and name tags and lists are prepared, no more reservations can be added even if they are sent. <b>No-shows will be billed.</b>		
3	4	5  <b>HGS Board Meeting</b> <i>6 p.m.</i>	6
10	11  <b>HGS Joint Dinner Meeting</b> <i>"Permian Reserves May Be Much Smaller Than You Think," Arthur E. Berman Page 15</i>	12	13 <b>HGS Environmental &amp; Engineering Dinner Meeting</b> <i>"Environmental Issues and the Railroad Commission of Texas," Peter Pope and Peter Fisher Page 18</i>
17	18	19	20  <b>HGS Continuing Education</b> <i>"Interpretation and Analysis of Old Logs," Bill Price Page 6</i>
24	25	26	27  <b>HGS General Luncheon Meeting</b> <i>"Case Studies from the Gulf of Mexico and the Andes – Integrating Quantitative Structural Geology into the Interpretation Workflow," Nathan Eichelberger Page 23</i>

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# GEOEVENTS

Thursday

Friday

Saturday



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<b>7</b>	<b>8</b>	<b>9</b>
<b>14</b> <b>HGS Northsiders Luncheon Meeting</b> <i>"RhoVe-T Method: Empirical Density – Temperature-Effective Stress Transform," Matthew Czerniak Page 19</i>	<b>15</b> <b>HGS Continuing Education</b> <i>"Introduction to Drones (UAVs) for Surveying in the Energy Business," Mike Allison and Kwasi Perry Page 2</i>	<b>16</b>
<b>21</b>	<b>22</b>	<b>23</b>
<b>28</b>	<b>29</b>	<b>30</b>

**Aug 31- Sept 1, 2017**  
Africa Conference  
London

**October 16, 2017**  
HGS Golf Tournament  
Sterling Country Club and  
Houston National Golf Club  
(Page 8)

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

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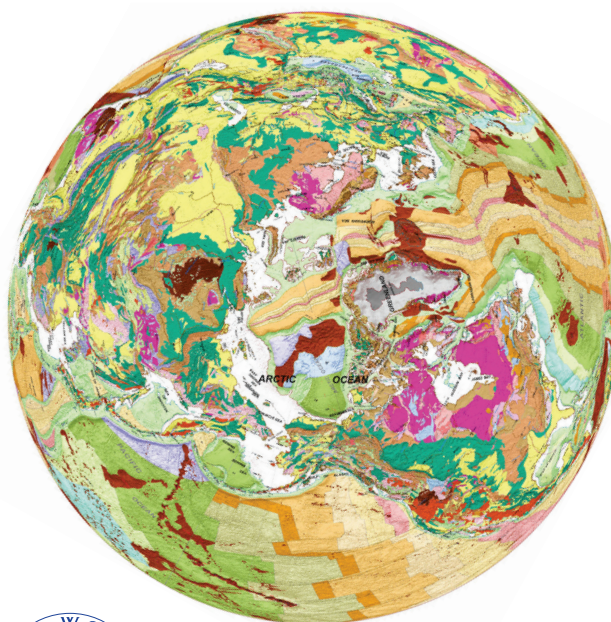
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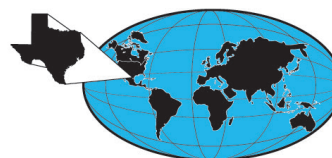
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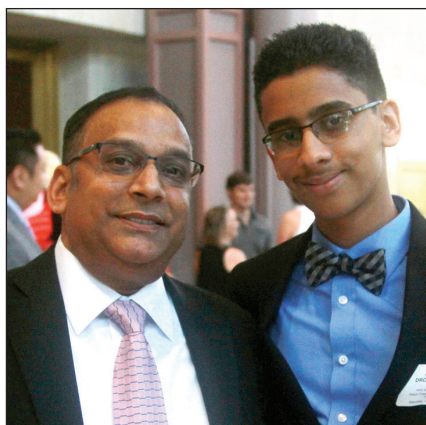


# Guest Night

by Pete Emmet

The HGS held its annual Guest Night at the Houston Museum of Natural Sciences on June 10, 2017. The evening began in the Burke Baker Planetarium with two showings followed by dinner on adjacent to the Cullen Hall of Gems and Minerals. The featured presentation was “Big Bones in Big Bend” by National Park Service Ranger and Paleontologist Don Corrick. Don brought the Cretaceous to life and showing a number of

interpretations of reconstructions of the flora and fauna of that time period that included large Pterodons (flying reptiles). Don discussed the rich Tertiary fossil assemblage and noted that the number, quality and diversity of fossils in Texas is as “Big as Dallas!” The talk was followed by a film (in 3D) featuring highlights from the National Parks of the United States. ■





# Houston Geological Society President's Night Award Dinner 2017

by Andrea Peoples, Office Director



The President's Night Award Dinner is held annually to distinguish the extraordinary efforts and contribution by our members, as well as recognize the generous support of our Corporate Sponsors. This year's event was held at Vic and Anthony's Steakhouse in downtown Houston. HGS President John Jordan (2016-2017) welcomed everyone and had the honor of delivering several awards.

## Corporate Star Award

Corporate Star Award honors companies who have made significant contributions to the Houston Geological Society. These contributions can be monetary (cash) or in kind (donation of venue, services, materials or an individual's time). Currently there are four levels of contribution. Platinum \$25K and over, Gold \$10K to 24,999, Silver \$2K to 9,999, Bronze \$500 to 1,999.

**Anadarko Petroleum Corporation** (Accepting Phil Towle, Distinguished Geophysical Advisor)– Platinum Sponsor  
Mudrocks Conference Venue 2 years running  
Student Initiative Sponsor (\$3,000 to pay for all HGS student memberships)

**Baker Hughes** (Accepting Mette Munkholm, VP of Wireline Services) – Gold Sponsor  
Applied Geoscience Mudrocks Conference  
Applied Geoscience Gemoechanics Conference

**Southwestern Energy** (Accepting Nicole Arres, Geologist) - Gold Sponsor "In-Kind"  
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**Marathon Oil Corporation** (Accepting John Breyer, Senior Technical Consultant) – Gold Sponsor  
Scholarship Night  
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**Thunder Exploration** (Walter Light, President / Exploration Geologist)– Silver Sponsor

Shrimp Peel & Crawfish Boil  
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Guest Night  
Mudrocks Conference

**Town In City Brewing Company** (Steve Macalello & Justin Engle) - "In-Kind" Sponsor  
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## Rising Star Award

The Rising Star Awards honor individuals who are relatively new to the HGS or have recently made a significant and promising contribution to the Society.

**Ryan Yarrington, MultiClient Geophysical** – Ryan is a dedicated volunteer with the HGS International Group, he can always be counted on to pick up and drop off meeting materials as well as work the registration table.

**Stephen Adeniran, Consulting Geoscientist** – Stephen has been a dedicated volunteer working with the Earth Science Week Committee as well as the HGS Exhibits committee. He can always be found manning the booth at NAPE and AAP or helping with the Shrimp Peel and many other local events.

**Nkechi Odumodu, Geologist** – Nkechi was a dedicated volunteer for the 2016 Africa Conference. She was instrumental in gathering the judging results of the presentations and delivering them on short notice at the end of the conference.





Ryan Yarrington and John Jordan



Nkechi Odumodu and John Jordan

**Brad Hammel** – Brad served on the 2016 Africa Conference committee as Chairman of the Judging Committee. He was in charge of gathering all final awards.

#### Chairman's Award

Justin Vanderbrink, outgoing Director, delivered the Chairman's Awards which honors members whose extraordinary efforts or unique contributions to their committee deserve special recognition.

**Cheryl Desforges**, *Consulting Senior Geologist* – Cheryl is an active member of the Continuing Education Committee, the

2017-2018 President-Elect and will be the HGS President for the 2018-2019 term. Cheryl's efforts with Continuing Education have aided the short courses and field trips provided by the HGS to continue our goal of providing quality technical training to the HGS members and greater geological community.

**Barbara Hill**, *Schlumberger Geologist* – Barbara has given exceptional and sincere efforts over the years through her speaker recommendations, participation and development of her company's sponsorship, attendance and speaker participation in support of the HGS Applied Geoscience Conference (Mudrocks).

**HGS President's Night Award Dinner 2017** continued on page 33



Cheryl Desforges and Justin Vanderbrink



Barbara Hill and Justin Vanderbrink



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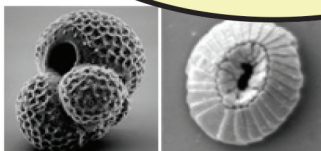
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*Bill Dickson and Justin Vanderbrink*

**Bill Dickson**, VP Explorations/Owner DIGs – Bill has been involved with almost every Houston based Africa Conference. He was a dedicated volunteer on the 2016 Africa Conference Technical Committee including attending regular organizing meetings, sharing ideas and plans and recruiting committee members and speakers.

**John Moran** – John was an active volunteer for the 2016 Africa Conference. He chaired the new vendor session titled “Interactive Seismic Showcase and Geology Workshop” for the first time at the Houston based Africa Conference.



*John Breyer and John Jordan*

## President's Award

The President's Award recognizes members who have demonstrated outstanding efforts or unprecedented contributions in a fiscal year or over a short period of time.

**Phil Towle**, *Anadarko*, was a dedicated HGS Volunteer on the 2016 Africa Conference Committee as the Technical Chair. Phil worked tirelessly on soliciting technical talks, laying out the abstract guidelines and writing visa letters and the technical organization the 2016 Africa Conference.

**HGS President's Night Award Dinner 2017** continued on page 35



*Tami Shannon and John Jordan*



*Weixin (Wayne) Xu and John Jordan*



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- **\$6,000,000** Future payout projected for settlement to widow with ORRI recovered under husband's consulting contract after company contended no payments due after death.
- **\$5,800,000** Combined cash settlement for UPRC East Texas and Central Louisiana royalty owner class action cases for underpaid royalties. Court approved fee of 1/3.
- **\$4,700,000** Jury verdict, oil company violates geologist non-compete contract. Settled later on confidential terms.
- **\$2,000,000** Settlement for downhole failure of casing results in loss of well bore, net to client \$1,372,411.79.
- **\$1,175,000** Settlement for geologist and family where oil company drilled too close to geologist property. Case filed 18 years after well drilled. Net to client \$664,822.51.
- **\$986,000** Cash settlement, net to clients \$657,207.60, plus future mineral interest valued at \$500,000.00. Dispute over mineral interest ownership from thirty year old contract.

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Charles Revilla and John Jordan



Frank Walles and John Jordan

**Tami Shannon**, *Oxy*, has a passion for communication and writing, these interests understandably guided her towards becoming the HGS *Bulletin* Editor. Tami actively participated as Editor-Elect in 2015-2016 and as Editor in the 2016-2017 year and has focused on trying to continue the *Bulletin's* historical status, while dually preparing for the transition to a digital *Bulletin*.

**L. Taras Bryndzia**, *Shell*, has given exceptional efforts over the years in support of the HGS Applied Geoscience Mudrocks Conference through speaker recommendations, participation, core program development with Shell cores and the development of his company's sponsorship, attendance and speaker participation.

**John Breyer**, *Marathon Oil*, has given remarkable efforts over the years in support of the HGS Applied Geoscience Mudrocks Conference through speaker recommendations, speaker participation and maintaining the continuation of his company's sponsorship, attendance and speaker participation.

#### Teacher of the Year Award

Vice President Thomas Hearon, delivered the Teacher of the Year Award that was established to honor educators who have made extraordinary efforts or unique contributions in earth science education. This year's award went to **Kathryn Barclay** teacher at Dulles Middle School of Fort Bend I.S.D..

John Jordan then proceeded to deliver other awards including Honorary Life Membership to **Martin Cassidy**, several Distinguished Service Awards including the very heartfelt "Posthumous" Distinguished Service Award in recognition of

**Marvin Smith's** dedicated commitment to the HGS; and the Gerald A. Cooley Award, HGS's highest award was presented to **Frank Walles**. He also recognized the departing of the 2016-2017 HGS Board and concluded his tenure by Passing the Rock Hammer" to 2017-2018 newly-elected President, **John Adamick**.

#### Distinguished Service Award

The HGS Distinguished Service Award honors members who have given long-term valuable service to the Society.

**Charles Revilla** – Charles has been an avid supporter and member of the HGS since moving to Houston with Amoco International in 1978. The HGS *Bulletin* has long been Charles's main area of society activities since 1995. Charles has been one of the longest standing editorial assistants, helping countless HGS Editors meet their deadlines.

**Neal Immega** – Neal is a long-time HGS member who not only volunteers at the Houston Museum of Natural Science, but is really an advocate for educating students on rock sciences. Neal is very active in the HGMS (Houston Gem & Mineral Show) which provides rock/materials/fossil kits to schools.

**Weixin (Wayne) Xu** – Wayne arrived in Houston when he joined Schlumberger in 1998. He has been a member of HGS since 2004. His interest in photography lead Wayne to volunteer as the photographer for the HGS and AAPG. Wayne has devotedly attended every important HGS function, photographing awardees, honorees and just about everything else the HGS asks him to take a picture of during our events. ■

# First Announcement and Call for Papers

## **BIG Continent - BIG Ideas - BIG Opportunity**

### **Strategies for Success**

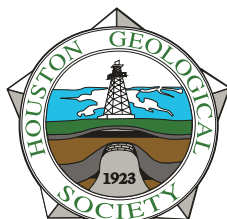
# The 17th HGS-PESGB Conference on African E&P

**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](mailto: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](mailto: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](mailto: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](http://www.hgs.org) and [www.pesgb.org.uk](http://www.pesgb.org.uk).





# 2017 HGS Skeet Shoot

*By Greedy Hunter, HGS Skeet Shoot Committee Chairman*

The 2017 Skeet Shoot was held on Saturday, June 10 at Greater Houston Gun Club in Missouri City. In spite of the heat, 54 shooters turned out to support HGS and the shoot. Here are the results:

HOA	Drake Davis
HOA RU	Mark Trammel
LADY CHAMP	Kari Anderson
LADY RU	Rachel Gray
AA	John Walker
AA RU	Gary Martens
A	Keith Peoples
A RU	Merrick Mainster
B	CW MacLeod
B RU	Ross Andress
C	Mason Howard
C RU	Bob Watts

**Winner of the Red Rider BB Gun - Chi Dong**

Depressed financial times in the industry made finding sponsorship a challenge this year, but we have some true-blue friends of HGS and the Skeet Shoot that made sure we had the support we needed for the success of the event: Fred Brown & Companies, Petrophysical Solutions, Inc., Merrick Mainster of Apache and Tim Garcia of Westbury Automotive, Peoples Choice Inspections and C&C Reservoirs. John Walker made a personal donation of gift cards for the door prize raffle. Merrick Mainster once again provided cold beer once the shooting was over to wash down the excellent barbecue lunch from Charlie's BBQ. Thanks to all of you for supporting the shoot!

The success of this event would not have been possible with the tireless efforts of Andrea Peoples and Jacky Jordan at HGS. Also the professionalism of Kevin Dougherty and his staff at Greater Houston Gun Club. ■



*Drake Davis, Highest Overall Average*



*HGS office director and HGS members who have attended the Skeet Shoot for 30+ years*



*Kari Anderson of PSI, Lady Champion*



*John Walker, Class AA Champion, Greedy Hunter Skeet Shoot Committee Chairman*



*Keith Peoples, Class A Champion, Greedy Hunter Skeet Shoot Committee Chairman*

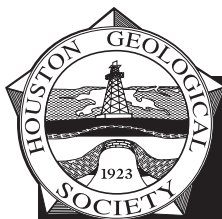


*Mike Scholars, Greg Nassar, Mike Kasecky, Tim McGinty*



*Patrick Burke, Clayton Tauber, Rachel Gray, Sara Whitmer, Philip Grove*





## HGS Welcomes New Members

### New Members Effective May 2017

#### ACTIVE MEMBERS

Richard Barren  
Travis Berry  
Matthew Bognar  
Benjamin Dellenbach  
Princess Helin  
Thomas Johnston

Jay King  
Bruce Laws  
Jack Looche  
Robert Morse  
Martin Quest  
Ron van Mourik  
Tomohiro Yamaashi

#### ASSOCIATE MEMBERS

Robert Chaffin  
Mark Mixon  
Frank Trice

#### STUDENT MEMBERS

EJonathan Garza  
Diane Harris-Cheung  
Kamil Madey  
Devin Pham

#### EMERITUS MEMBER

Bill Marshall

### New Members Effective June 2017

#### ACTIVE MEMBERS

Kathleen Bolger  
Elisabeth Boudreaux  
Tommy Chatfield  
Matthew Chumley  
Anne Gogola

Rachel Gray  
Greg Scott  
Herman Vacca

#### EMERITUS MEMBERS

Mike Effler

Nancy Engelhart-Moore

George Marion  
Ron Meers  
Ralph Stone  
Mark Sunwall

#### STUDENT MEMBERS

Matthew Danielson  
Anthony Der Tatevasion  
Jasmine Nelson  
Alishia Sam  
Samuel Shrull

### New Members Effective July 2017

#### ACTIVE MEMBERS

Bob Baker  
Karina Cheung  
Melanie Everett  
Robert Gibson  
Ashley Nguyen  
Briseida Palacios

Jennifer Perez  
John Suter

#### EMERITUS MEMBERS

James Bennett  
William Blount  
Jonathan Crocker

Andrew Hannan  
Charles Holman  
Norman Jenkins

Curtis Mayo  
Kenneth (Doug) Middleton  
Randy Schott  
Donald Singleton

Ralph Tibiletti

#### STUDENT MEMBERS

Waseem Khan  
Sheila Nguyen  
John Plail  
Euler Reyes

### New Members Effective August 2017

#### ACTIVE MEMBERS

Jonathan Allen  
Brendan Hargrove  
Jimmy Lawhon  
Jennifer Puryear  
David Riese

#### ASSOCIATE MEMBER

Andrew Miller

#### EMERITUS MEMBERS

Bill Brumbaugh  
Mike Cline

Don Heider

Stuart Hirsch  
William (Allen) Huckabay

Jim Lantz  
Victor Mistretta  
Clark Sutley

#### STUDENT MEMBER

Atif Hariz

*Welcome New Members*

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**WWW.HGS.ORG**



# 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.*

The Texas Legislature is now in session. To see which bills are of interest to Texas Geologists, go to the Wise Report: [https://www.hgs.org/multimedia\\_WiseReport](https://www.hgs.org/multimedia_WiseReport)

## **AGI Geoscience Policy Monthly Review (March 2017)** **House Passes Bill to Increase Regulatory Oversight**

The House passed the OIRA Insight, Reform, and Accountability Act (H.R.1009) on March 1, 2017. The Office of Information and Regulatory Affairs (OIRA) is part of the Executive Office of the President (EOP). It is the central authority for the review of Executive Branch regulations. OIRA also reviews government collections of information from the public, and oversees the implementation of government-wide policies regarding information policy, privacy, and statistical policy.

The bill would place independent regulatory agencies, such as the Environmental Protection Agency (EPA), under OIRA's jurisdiction.

In addition to expanding OIRA's authority to review the regulatory actions of these agencies, H.R.1009 requires the Administrator of OIRA to convene a working group that assists with the review of regulatory plans. The bill directs OIRA to publish a unified agenda of each regulation that is under review, identify any redundancies or conflicts with existing standards, and determine which standards are outdated and prime for elimination.

After its passage in the House, the bill was introduced in the Senate and referred to the Senate Committee on Homeland Security and Governmental Affairs on March 2, 2017.

## **House Passes Regulatory Integrity Act**

The House passed the Regulatory Integrity Act of 2017 (H.R.1004) on March 2, 2017.

The bill would require agencies to publicize any pending regulatory actions and related communications. The bill would also prohibit agencies from using such public communications to directly advocate or lobby in support of the pending action.

This legislation comes on the heels of a Government Accountability Office (GAO) finding in 2015 that the EPA violated anti-lobbying rules by promoting the Clean Water Rule on social media. Democrats failed in their attempts to amend

the rule and define "propaganda," "publicity," and "advocacy" as any information or claims that are unsupported by science or empirical data.

The Senate Committee on Homeland Security and Governmental Affairs is currently reviewing the bill.

## **Science Committee Hearings Delve into NSF Priorities**

The House Committee on Science, Space, and Technology, Subcommittee on Research and Technology held two oversight hearings on funding priorities for the National Science Foundation (NSF).

On March 9, 2017 NSF Director France Córdoba and NSF Inspector General Allison Lerner discussed the agency's goals, challenges, and overall economic impact. In her testimony, Ms. Lerner provided recommendations to increase accountability, addressing problems such as research fraud and the incurred cost of contract employees. Dr. Córdoba indicated that the rising frequency of research misconduct identified by the agency, such as plagiarism and data falsification, is likely due to improved detection, rather than increased occurrence.

Dr. Córdoba also highlighted the NSF INCLUDES (Inclusion across the Nation of Communities of Underrepresented Discoverers in Engineering and Science) program and its commitment to building diversity in all areas of science and engineering as well as promoting innovation. Congressman Lamar Smith (R-TX-21) said that the NSF needs more guidance to rebalance priorities, improve oversight, and ensure accountability and transparency.

During the second hearing on March 21, 2017 four expert witnesses testified on the future of the NSF. The hearing also examined some of the agency's challenges, such as setting priorities to meet societal needs, opportunities for data sharing, and developing a new generation of STEM workers. Some members of the committee expressed concerns that cuts to geoscience funding could hurt national security and public health. Dr. Maria T. Zuber, Chair of the National Science Board, explained that the United States is in an increasingly competitive global landscape, facing challenges that only the insights of science and technology can address. Dr. Zuber discussed how fundamental research into the geosciences supported by the NSF has provided the

**Government Update** continued on page 40

scientific framework for hydraulic fracturing, led to better storm and hazard prediction, and increased our understanding of large climatic trends. According to Dr. Jeffrey Spies, Co-Founder and Chief Technology Officer at the Center for Open Science and Assistant Professor at the University of Virginia, the results of NSF-funded initiatives are readily observed in our everyday lives, and the return on investment is immense

### **Nuclear Energy Bill Introduced in Senate**

A bipartisan group of senators introduced the Nuclear Energy Innovation and Modernization Act (S.512) on March 2, 2017. The bill aims to modernize nuclear energy regulations and promote innovation in the nuclear sector.

S.512 focuses on reforming the Nuclear Regulatory Commission's (NRC) budget and fee programs, streamlining the licensing process for advanced nuclear technology, and improving the efficiency of uranium recovery licensing and regulation. The bill establishes transparency and accountability measures related to the NRC's fee calculations, and limits the amount the NRC may charge in fees. Approximately 90 percent of the NRC's budget comes from these charges to its applicants and license holders.

The Senate Committee on Environment and Public Works reviewed S.512 and reported to the full Senate chamber for further consideration without amendment on March 22, 2017.

### **Bill to Stimulate Investment in Offshore Energy Development**

On March 15, 2017 Senator Bill Cassidy (R-LA) introduced a bill that would authorize more lease sales on the Outer Continental Shelf (OCS). S.665, the Unleashing American Energy Act of 2017, would enable the Department of the Interior (DOI) to add additional lease sales to an existing five-year program.

Under the Outer Continental Shelf Lands Act (OCSLA), the Secretary of the Interior is responsible for the approval of oil and gas exploration and development on the continental shelf of the United States. Currently, only six percent of the OCS is available for energy production. S.665 would amend the OCSLA to offer new lease sales in the Gulf of Mexico and additional lease areas off the coast of Alaska.

This bill was referred to the Senate Committee on Energy and Natural Resources

### **Senate and House Introduce Landslide Bills to Promote Research and Save Lives**

Senators Maria Cantwell (D-WA) and Lisa Murkowski (R-AK) introduced the bipartisan National Landslide Preparation Act (S.698) on March 22, 2017.

The bill directs the U.S. Geological Survey (USGS) to establish a National Landslide Hazards Reduction Program. This program would identify and characterize landslide risks, and work to improve emergency preparedness. USGS would also establish a Cooperative Landslide Hazard Mapping and Assessment Program to provide grants to state, local, and tribal governments to study landslide hazards. The bill re-authorizes the USGS 3D-elevation program (3DEP) to better characterize landslide-prone regions. The 3DEP initiative collects high-resolution topographic data covering the U.S. that would be used to create and inform city planning and hazard risk assessment activities.

S.698 is being reviewed by the Senate Committee on Commerce, Science, and Transportation. It is matched on the House side by H.R.1675, which was introduced by Representative Suzan DelBene (D-WA-1) on March 22, 2017. The House bill is being reviewed by the House Committee on Science, Space, and Technology.

### **Bill Introduced to Prepare Northwest for Next Earthquake**

The Pacific Northwest Earthquake Preparedness Act (H.R.654) moved a step closer to becoming law when the bill passed the House on March 27, 2017. Representative Pete DeFazio (D-OR-4) introduced H.R.654 on January 24, 2017.

The bill would establish an earthquake and tsunami inter-agency task force to create a strategy to approach earthquake and tsunami preparedness. The Federal Emergency Management Agency, under this bill, would develop an early warning system plan for potential earthquakes resulting from the future rupture of the Cascadia Subduction Zone.

The Senate received the bill and referred it to the Committee on Homeland Security and Governmental Affairs on March 28, 2017.

### **Soda Ash Producers May Receive Royalty Cut**

Soda ash, also known as sodium carbonate, which is used in products such as glass, detergent, and other industrial goods, may receive a royalty cut. Senator John Barrasso (R-WY) introduced the "American Soda Ash Competitiveness Act" (S.546) to temporarily reduce the government royalty rate for natural soda ash production on federal land by four percent, from six to two percent.

The bill was referred to the Senate Committee on Energy and Natural Resources.

Representative Paul Cook (R-CA-8) introduced a similar bill (H.R.1399) in the House, which was referred to the House Committee on Natural Resources, Subcommittee on Energy and Mineral Resources.



### **Bills Introduced to Permanently Authorize Land and Water Conservation Fund**

Two bills introduced in the Senate and House would permanently authorize the Land and Water Conservation Fund. The “Land and Water Conservation Authorization and Funding Act” (S.569) was introduced on March 8 to compliment the House bill “To permanently reauthorize the Land and Water Conservation Fund” (H.R. 502), which was introduced on January 12. In 2015, the LWCF was not re-authorized and the program expired on September 30, 2015.

The Land and Water Conservation Fund uses offshore oil and gas leasing revenues to support U.S. natural and cultural heritage and recreation activities. S.569 would authorize and permanently fund the LWCF at \$900 million and would not change appropriations due to fiscal year constrictions.

S.569 was referred to the Senate Committee on Energy and Natural Resources. H.R. 502 was referred to the House Committee on Natural Resources.

### **Domestic Supply of Critical Materials Would be Boosted by New Bill**

Representative Duncan Hunter (R-CA-50) introduced the “Materials Essential to American Leadership and Security (METALS) Act” (H.R.1407) to ensure the U.S. has access to a sustainable and secure supply of materials to safeguard our national security on March 7, 2017.

H.R.1407 would use one percent of Department of Defense internal program administrative costs of aircraft and missile weapon systems to create a Strategic Materials Investment Fund. This fund would provide loans to innovative companies that work to increase the U.S.’s supply of critical materials. Many of these materials are crucial for defense applications and technologies. The U.S. is primarily dependent upon foreign sources, especially China, for the majority of these critical materials, and this bill acts to increase the nation’s ability to produce them. The METALS ACT would also ban the sale of U.S. rare-earth mineral mines to foreign entities.

The bill was referred to the following House committees: Energy and Commerce, Foreign Affairs, Financial Services, and Armed Services.

### **Senate Hearing Examines U.S. Reliance on Foreign Sources of Minerals**

Industry and agency experts examined the United States’ increasing dependence on foreign sources of minerals on March 28, 2017. The Senate Committee on Energy and Natural Resources held a hearing to explore opportunities to rebuild and improve the supply of critical minerals in the United States.

Critical minerals are a group of elements that are essential to the economy and vulnerable to disruptions in supply. These include rare earth elements and other metals which are vital for the production of cars, cell phones, and medical imaging technology.

In her opening statement, Senator Lisa Murkowski (R-AK) emphasized the importance of developing mechanisms to track which minerals which are critical in use and susceptible to supply disruptions, fixing the permitting system to reduce delays for new mines, and promoting research into alternatives, efficiency, and recycling options.

According to Murray Hitzman, of the U.S. Geological Survey (USGS), in 2016 the United States was entirely reliant upon foreign sources for 20 mineral commodities, 8 of which were identified as critical. During the hearing, experts highlighted the potential threat of foreign mineral dependence to our nation’s growth, independence, and national security. They identified several areas for potential improvement, including permitting processes, extraction techniques, and domestic mapping and exploration.

Another issue highlighted during the hearing was a lack of qualified workforce in the mining sector. Over the next ten years, an estimated 70 percent of mining engineers will retire, causing a shortage of skilled workers in the industry. Dr. Rod Eggert from Colorado School of Mines suggested that increased funding for research grants would help inspire new engineers. Sen. Murkowski also indicated that developing environmentally responsible mining practices would be necessary in order to gain permission to extract minerals.

Testimony from this hearing will inform the content of the American Mineral Security Act, which is expected to be re-introduced later this year.

### **AGI Geoscience Policy Monthly Review (April 2017) House Committee Hearing Considers Nuclear Waste Legislation**

The House Energy and Commerce Subcommittee on Environment held a hearing on April 26, 2017 to examine a discussion draft of a bill that would amend certain provisions of the Nuclear Waste Policy Act of 1982 (NWPAct) to streamline management and licensing processes for nuclear waste disposal.

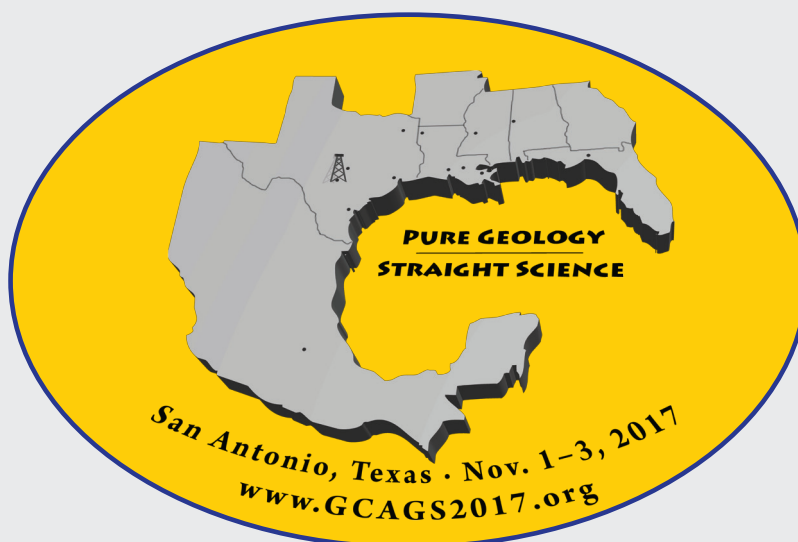
The Nuclear Waste Policy Amendments Act of 2017 proposes a number of changes to the NWPAct, including the addition of options to enter into cooperative agreements with respect to monitored retrievable storage facilities. It would revoke Public Land Order 6802, which directs the Department of Energy (DOE) to maintain the physical integrity of the subsurface environment at

**Government Update** continued on page 43

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Yucca Mountain, Nevada, to ensure that scientific studies for site characterization are not adversely impacted. It would withdraw approximately 147,000 acres of land at Yucca Mountain site from all forms of entry, appropriation, and disposal under the previous public land laws, and reserves the withdrawal area for activities associated with the disposal of high-level radioactive waste and spent nuclear fuel. The bill also would direct the Secretary of the Interior to submit a management plan for use of the withdrawal area, providing that the Secretary permit non-project related uses that the Secretary considers appropriate, including domestic livestock grazing and hunting.

#### **Hazards Caucus Briefing Conveys the Importance of Geologic Mapping and Monitoring**

The Hazards Caucus Alliance, a network that supports the Congressional Hazards Caucus, hosted a briefing on April 6, 2017 about how geologic and hazards mapping and monitoring are used to prepare and protect communities from natural hazards. The Hazards Caucus provides congressional staff with information and educational materials concerning preparation, mitigation, and response for natural disasters. The caucus is led by Senators Lisa Murkowski (R-AK) and Maria Cantwell (D-WA), and Representative Suzan DelBene (D-WA-1).

The briefing, "Watching the World: Saving Lives Through Hazards Mapping and Monitoring," emphasized the importance of federally funded programs that support geologic and topographic mapping projects and seismic monitoring efforts. The speakers discussed the functions of several federal programs, including the USGS 3D Elevation Program (3DEP), National Cooperative Geologic Mapping Program (NCGMP), and the NSF-funded EarthScope program.

Kevin Gallagher, Associate Director for the USGS Core Science Systems, explained how mapping can help save lives and protect infrastructure by underpinning hazards research and response. Mike West, State Seismologist for the Alaska Earthquake Center, focused on the critical value of seismic monitoring stations in Alaska and throughout the United States. Dr. West talked about the need for a reliable seismic network throughout the nation and expressed his support for reauthorization of the National Earthquake Hazards Reduction Program. Richard Ortt, Director

and State Geologist for the Maryland Geological Survey, highlighted the importance of NCGMP-funded geologic maps for use at the state level.

#### **Senate EPW committee hearing reviews Clean Water Act rule**

On April 26, 2017 the Senate Committee on Environment and Public Works (EPW) held an oversight hearing to review the Obama Administration's Waters of the United States (WOTUS) rule. The WOTUS rule, also known as the Clean Water Rule, was established to provide a more clear definition of the waters protected under the Clean Water Act (CWA).

The EPA developed a report on water connectivity to inform the WOTUS rulemaking process, which confirmed the basic hydrologic principle that all parts of a watershed are connected to some degree. According to Senator John Barrasso (R-WY), Chairman of the EPW Committee, the EPA's report fails to examine whether connections are significant, and it does not address the issue of federal jurisdiction, therefore it cannot be used to justify the WOTUS rule.

Witnesses provided testimony during the hearing to assess which streams and wetlands should be subject to federal regulation. Misha Tseytlin, Solicitor General for the State of Wisconsin, said that the WOTUS rule is "an overbroad assertion of federal authority over local waters, which are rightfully subject to state, not federal, regulation." According to President and Chief Executive Officer of the National Wildlife Foundation (NWF) Collin O'Mara, however, the WOTUS rule is an important part of collaborative federal and state conservation efforts. Mr. O'Mara explained that the rule is a product of years of transparent scientific and public deliberations, and it protects the drinking water for more than 117 million Americans.

The hearing follows an executive order signed by President Trump on February 28, 2017 directing the Environmental Protection Agency (EPA) and the Army Corps of Engineers (USACE) to review and then rescind or revise the WOTUS rule. The rule is currently stayed (postponed from further action) pending legal challenges, including a petition before the Supreme Court to decide whether or not circuit courts should have jurisdiction to hear challenges to the rule. ■

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# HGS Grand Canyon Field Trip



You are invited to join us as the HGS will once again be offering its Grand Canyon field trip in Summer 2018. This very special “Journey Through Time” will weave the impressive geologic story of the Canyon (with other natural sciences on display), the human history, plus the thrills of running many exciting rapids of the Colorado River.

We will float the River on motorized rafts, providing us the opportunity to see and discuss all the classic geology so beautifully portrayed – from some of the earliest Precambrian sediments found in the US, all the way up to modern processes which continue to shape the canyon. Geological concepts are introduced and magnificently illustrated in the Canyon in such a way that the geology comes alive for everyone. In addition to running rapids, we will take a number of short hikes in some of the many side creeks, eat like royalty, and sleep under the stars. Your river guides and gear are supplied by Hatch River Expeditions (Hatch), one of the most experienced outfitters serving the Grand Canyon. Past participants have stated this was the best geologic trip they ever took and many have brought one or more of their family along to share this incredible experience with them.

While this is not an overly strenuous trip, participants must be in good enough physical condition to climb in and out of the rafts. We will enjoy some hiking each day, the longest being six miles, and several hikes require some scrambling. While any of the hikes will be at your pleasure, I encourage you to take as many as you are comfortable doing to fully experience this extraordinary trip.

The trip begins in Las Vegas on June 3, 2018. We provide transportation from there to Marble Canyon by way of Zion National Park for an opportunity to view the geology. Also included are the first night in Cliff Dwellers Lodge, food and drink for our 8 days/7 nights on the river, a helicopter ride to Bar 10 Ranch the last day, and the flight from there back to Las Vegas. Costs not covered include round-trip airfare to Las Vegas, first night's dinner and breakfast in Marble Canyon, tips for our river guides, souvenirs purchased at Phantom Ranch or Bar 10 Ranch, and anything you might spend in Vegas should you decide to extend on either end. Optionally, you may join us in Marble Canyon and Hatch will arrange a return flight to there at the end.

***Dates: June 3 – 11, 2018***

***Cost: \$3600 / person***

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### 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.**

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No. of Issues	Random Eighth Page	Random Quarter Page	Random Half Page	Random Full Page	Inside Front Cover Full Page	Inside Back Cover Full Page	Page 2 Full Page	Outside Back Cover Half Page	Back of Calendar Full Page	Calendar Quarter Page
10	\$950	\$1,350	\$2,550	\$4,750	\$8,000	\$7,500	\$7,050	\$6,850	\$6,650	\$3,000
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						
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Professional Directory Section Business Card Ad: 10 Issues – \$160 (\$30 for each additional name on same card)

### Website Advertising Opportunities

There are currently 5 opportunities to help spread the word about your business or event and generate traffic to your website or campaign. Please submit all ad materials five (5) days prior to the go-live date for testing.

Placement	Rate	Specifications/Description
HGS Website Home Page Banner Ad	\$800 – Monthly	275 x 875 pixels; home page top banner ad. All Home Page Banner Ads rotate every 10 seconds.
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HGS Website Event Page Ad	\$600 – Monthly	200 x 400 pixels; calendar page left column ad. All Event Page Ads rotate every 10 seconds.
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Geo-Jobs	\$50 – 14 days	Posting of job opportunities on HGS website. Click the Geo-Jobs tab to get started. Must be filled out completely and the dates set appropriately.
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Vendor Corner	\$1200 – 12 Months	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.
	\$250	
	*4 Pack option with 1 FREE bonus event for \$1000.00 available. Send request to vendorcorner@hgs.org.	
Event/Short Course Calendar Ad	\$100 – Monthly	An event ad posted within the HGS website calendar under the Events tab.
Bundle & Save!	<ul style="list-style-type: none"> <li>• 30% off website ads when combined with print ads in all 10 HGS <i>Bulletin</i> issues.</li> <li>• 20% off website ads when combined with print ads in 5 HGS <i>Bulletin</i> issues.</li> <li>• 10% off website ads when combined with print ads in 3 <i>Bulletin</i> issues.</li> </ul>	





# 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.

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- 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.

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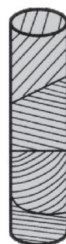
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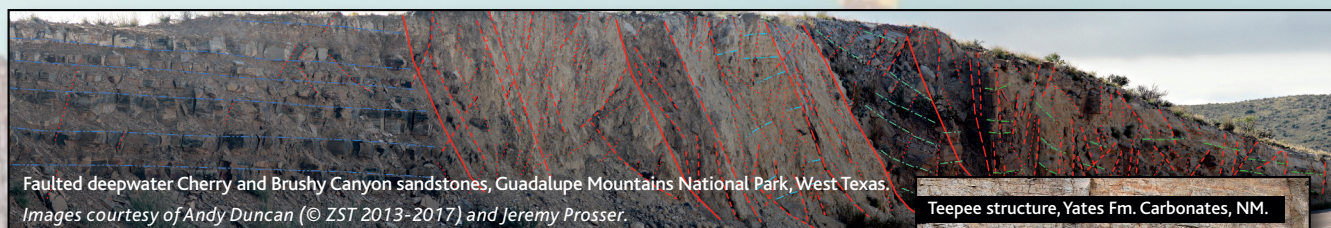
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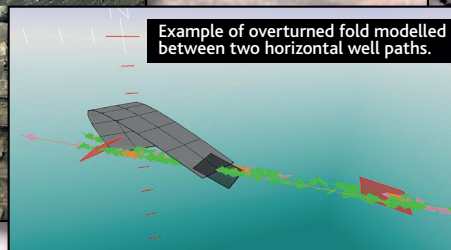
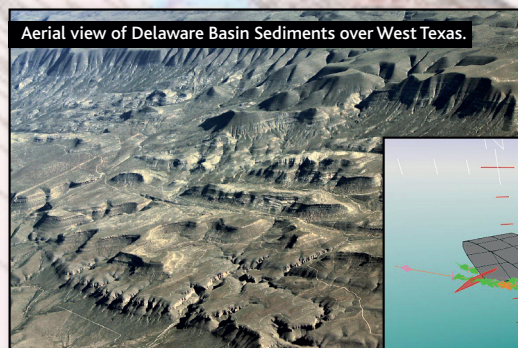
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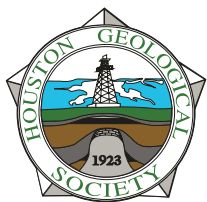
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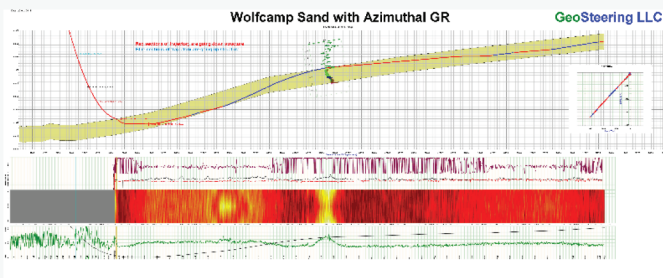
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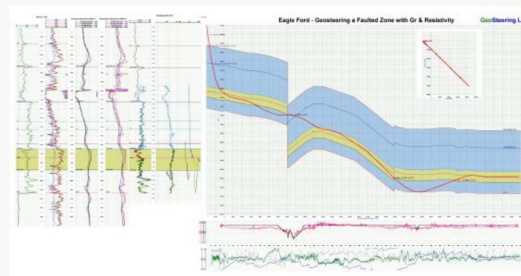
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