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The Bulletin **Houston Geological Society**

January 2017

Volume 59, Number 5

In Ev	very Issue	Tech	nical Meetings	
5	From the President by John Jordan	• 17 •	HGS General Dinner Meeting The Appalachian Basin, Shale Capital of the World	
7	From the Editor by Tami B. Shannon	21	HGS Environmental and Engineering Dinner Meeting Field Safety at Environmental Assessment and Remediation Sites: The Use of Situational Awareness	
34	GeoEvents Calendar	•	and Operational Discipline in Combating the Normalization of Deviance	
42	New Members	23	HGS International Dinner Meeting	
47	Author Instructions	• 20	Expulsion and Migration Associated with	page 17
48	HGS Membership Application	27	HGS Northsiders Luncheon Meeting	
49	Professional Directory	•	Case Study: Application of Multicomponent Induction Tool Inversion to Natural Fracture Characterization in a Resource Play	
Houston G	eological Society	28	HGS North American Dinner Meeting Practical Seismic Petrophysics: The Effective Use of Log Data for Seismic Analysis	
John Adami Thomas E. H Rachel Todk Bryan Guzm Mike Allison	ck President elearon IV Vice President kill Secretary an Treasurer Treasurer-elect	31	HGS General Luncheon Meeting The Role of the Western Interior Seaway as a Paleoceanographic Corridor in the Deposition of the Organic-rich Eagle Ford Shale in South Texas	taan 20
Tami B. Sha	nnon Editor Editor elect	Othe	r Features	puge 28
DIRECTORS Mike Erpent Dave Miller Justin Vande	beck enbrink	10	HGS Applied Geoscience Mudrocks Conference Provides a Low-Cost, High-Quality, Training and Networking Opportunity Mike Effler and Frank Walles	
HGS OFFICE S	staff ples Office Director	37	Earth Science Celebration at HMNS Sharon Choens and Inda Immega	
John Tubb, J EDITORIAL BO Tami B. Sha Brian Horn B	Jr. Office Management DARD Innon Editor Editor-elect	38	The HGS K-12 Booth at the Houston Gem and Mineral Society Show Janet Combes	11 - 1.
Jon Blickwe Dave Miller Ed Marks Ad	de Advisory Editor Advisory Editor dvisory Editor	40	2016 Outcrop Family Campout Shannon Lemke	
Lisa Kruege The Houston Geo	er Design Editor blogical Society Bulletin (ISSN-018-6686) is	• 42 •	About the Cover Matt Smith	Proto-Gulf of Mexico (GoM)
Geological Soci Houston, Texas 281-679-5504	iety, 14811 St. Mary's Lane, Suite 250, 77079-2916. Phone: 713-463-9476; fax:	43	Government Update Henry M. Wise and Arlin Howle	μ ² ²
Editorial corresponsibility of the second se	ondence and material submitted for publication seed to the Editor, Houston Geological Society St. Mary's Lane, Suite 250, Houston, Texas o tami.hg@gmail.com. Subscription to this publication is included in subscription to this publication is included in	46	Three Students Recognized for Outstanding Research Posters at Annual Sheriff Lecture	EXAMPLE

Sub the membership dues (\$28.00 annually). Subscription price for nonmembers within the contiguous U.S. is \$50.00 per year. For About the Cover: "Duality", by Matt Smith, matt@bigtexstudios.com. Photo was taken those outside the contiguous U.S. the subscription price is 160.00per year. Single-copy price is \$8.00. Periodicals postage paid in Houston, Texas,

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POSTMASTER: Send address changes to Houston Geological Society Bulletin, 14811 St. Mary's Lane, Suite 250, Houston, Texas 77079-2916

on October 28, 2016, from near the summit of Enchanted Rock, Fredericksburg, Texas, using a Canon 6D with Rokinon $14 mm\,f/2.8$ lens. The base layer of the foreground was a 4-minute shot ISO 800 @ f/4. The rocks were illuminated by 2 shots of 12- and 13-seconds ISO 800 @ f/4 and the sky was a 20-second shot ISO 6400 @ f/2.8. The base layer and the rock layers were blended together to light up the rocks and merged with the sky and the final image is the result of layering of the 4 separate frames. Copyright © 2016

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page 38



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HOUSTON GEOLOGICAL SOCIETY Scholarship Night & Dinner Meeting

HGS Foundation Scholarship Calvert Memorial Fund Scholarship

Monday, February 13, 2017 5:30pm – 9:00pm

Speakers

Paul Britt - AAPG President Amy Atwater – Big Bend Paleontology Fellowship Awardee Eileah Sims – Big Bend Paleontology Fellowship Awardee

Hilton Westchase 9999 Westheimer Rd Houston, TX 77024

Cash bar starts at 5:30pm

Please join us on this evening to recognize HGS Scholarship Winners over the current fiscal year. We will also recognize Amy Atwater and Eileah Sims who recently completed Paleontology Fellowships at Big Bend National Park that were sponsored by HGS. Both will present summaries of their work. In addition, AAPG President Paul Britt will give a presentation on AAPG student programs. We hope you can join us.

John Adamick - HGS Foundation Chairman Carl Norman - Calvert Memorial Scholarship Chairman

This HGS special event has limited seating. Registration is now open. Please make your reservations online at <u>www.hgs.org</u>. Tickets are \$50 per person.

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Please contact the HGS office, 713-463-9476, or email Office@hgs.org for information on sponsorship opportunities.

All event profits benefit the HGS Foundation and Calvert Memorial Scholarship Funds.

From the **President**

A New Year; a New Beginning

The year 2017 has arrived and a new president will be L sworn into office in January; whether or not the new administration and legislature will act favorably towards our industry's issues remains to be seen. As a career explorationist, I will remain optimistic until evidence indicates otherwise. Any new production agreement from OPEC and Russia (if they can abide by the assigned production cuts) will also shape the oil and gas economic environment. I am uncertain that this will help oil prices for long, given that the United States Geological Survey (USGS) proclaims that the shale play in the Permian Basin is proving to be the largest potential oil deposit in the USA. The Houston Chronicle reported that the USGS estimates 20 billion barrels of oil, 16 trillion cubic feet of associated natural gas, and 1.6 billion barrels of natural gas liquids in the region. The most hopeful thing I have read recently is the International Energy Agency (IEA) does not see any sustained reduction in oil demand before 2040, so I am sure we will work our way through the excess capacity we are currently experiencing.

John Jordan john.jordan@hgs.org

Given all the turmoil in the political and economic arenas, it is good that some things remain the same. For example, every year in November the HGS sponsors the Robert Sheriff Lecture. The University of Houston (UH) Department of Earth and Atmospheric Sciences (The Department) organizes the Sheriff Lecture, and it is underwritten by BP. I would like to thank Julia Wellner and Hanna Walker from UH for all of their work to coordinate this event; as well as Rosemarie Geetan, the BP representative that helps keep the Sheriff Lecture funded.

The meeting structure is quite different from a traditional HGS dinner meeting as the university has a poster contest pre-lecture for the students currently enrolled in the Earth and Atmospheric Sciences department. Did you know they have over 650 students in their undergraduate, Masters of Science, and Doctoral programs? This is a great opportunity to see university students' research projects, and the department also awards the winners of the poster contest during the dinner lecture. See page 46 for a list of award winners.

The 2016 meeting kicked off with a few words from the department chair, Dr. Zhou, about the department, and he granted the Outstanding Alumni award to Rosemarie Geetan.

The Distinguished Guest Lecture is given by one of the department faculty and the goal of the lecture is to present a global view of some aspect of geology. This year's speaker was Dr. John Suppe, world famous structural and plate tectonics geologist, discussing the work he and his students are doing on plate tectonics. Despite being familiar with global plate reconstruction from my international work, I had never thought about the large missing plates and pieces of plates that must have existed to correctly reconstruct the terrain around the Tethys Sea and the Panthalassa Ocean. Dr. Suppe provided remnant evidence of these missing plates floating as semi-melted high velocity anomalies in the upper mantle of the Earth. They used earthquake tomographic seismology to find semi-tabular 3D velocity anomalies in the upper mantle of the Earth that align with plate subduction zones. They have unfolded these 3D velocity anomalies and showed that they fit into the missing holes in our plate tectonic reconstruction models. This is a major development for the science of plate tectonics. Consider attending the Sheriff Lecture in 2017 if you have never been to one as they can be eye opening.

The 2017 new year brings many challenges to the HGS. Our goal is to provide high quality training, lectures, conferences and events at the lowest cost we can. Last year, we focused on reducing our operating expenses while maintaining the quality of our events and products including moving to a digital HGS *Bulletin* during the 2017-2018 calendar year. We have evaluated each venue that we use for our events and have looked for lower cost alternatives. Possible cost-reduction strategies include considering monthly meeting locations that are more centralized as well as less expensive. We are moving the 2018 Africa Conference to a more cost-effective venue and changing the meeting structure. The annual Spring Shrimp and Crawfish boil, run by HGS volunteers, will be held at Bear Creek Park with live music and hopefully, a lower ticket price. Look for more details on this event in upcoming *Bulletins*.

I hope the New Year brings all of us exciting challenges and economic success.

Special Presidential Recognition and Thanks

"I would like to thank **Mark Dennis** for a great job on the HGS golf tournament. Mark revived the golf tournament and turned a profit after we had to cancel it last year." *John Jordan, HGS President*

HGS Scholarship Night & Dinner

HGS Foundation Scholarship & Calvert Memorial Fund

February 13, 2017 Speaker: Paul Britt - AAPG President Amy Atwater - Big Bend Paleontology Fellowship Awardee Eileah Sims - Big Bend Paelontology Fellowship Awardee

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Tami B. Shannon tami.hgs@gmail.com

Something Enchanted

When I first moved to Texas, I spent two years of my life engrossed in boring computer science graduate school (in Corpus Christi), and had only enjoyed the flat coastal beaches of North Padre Island. When I become a geologic teaching assistant for Geology 101 and Mineralogy classes, the professor invited me to fill a chaperone spot on a field trip to Llano, Texas. Even though I had no idea where Llano was located, nor any knowledge of the Llano Uplift or Enchanted Rock and its formation, I eagerly accepted.

The Llano Uplift refers to the enormous granitic batholith that essentially forms the "Hill Country" of Texas. Enchanted Rock is an exfoliation dome of pink granite that, from a distance, peeks out from the earth and looks a bit out of place with the rest of the limestone and lush green landscape. Enchanted Rock is 425 feet above base elevation, and its high point is 1,825 feet above sea level. It is said that climbing the rock is like climbing a 40-story building. Can you imagine the molten magma pools blanketing an area that size during its formation?

My very first visit to Enchanted Rock State Natural Area (ERSNA or "Enchanted Rock") was from afar; because we were focused so much on the geology of Llano, we visited many areas surrounding it, but never got to see the awesome dome up close. The few things I remember about that field trip: 1) my navigation skills were awful (GPS was not readily available back then); 2) llanite is a rhyolite, with blue quartz phenocrysts and is only found in Llano, Texas; hence the name; 3) llanite dike crops out in several places along State Highway 16, northeast of town; and 4) it was my first realization that Texas actually has some spectacular geology!

I finally experienced Enchanted Rock in the heat of an August afternoon in 2007 during my honeymoon, and we were lucky enough to make it to the top of the Summit Trail. The barrenness of the area took my breath away; strong winds blowing suddenly – and then stopping just as quickly. My impression during the hike up the dome was that was that the slope was gradual, perhaps that it was curved like the surface of a basketball. However, upon reaching the summit, I was so mesmerized by the beauty of the surrounding hills that upon looking down, I was shocked to discover that the ascent was quite steep. From this perspective, it appeared the "dome" to be shaped more like the end of a finger or hot dog.

Trepidation overwhelmed me at the summit; I would quickly lose balance while exploring near the "edge" when the wind decided to blow strongly or stop suddenly. It felt like the wind was toying with me a bit – or was it the Rock itself trying to get rid of me? There was something hypnotic about the wind, too. When it blew, it was powerful and loud, yet refreshed me from the heat of the day so I was eager to have it continue. When it stopped blowing, there was simply a void; a peaceful quiet, with a hint of loneliness. I felt entranced, and that I had found something magical...something enchanting.

The cover photo this month is "Duality", by Matt Smith. In my opinion, this image fully captured the enchantment of the Rock. There are so many reasons to visit this place: it has natural wonders, including vernal pools (water that collects in the low spots for several weeks) and unique plants and wildlife. Rock climbing and bouldering are favorite activities, and there are some great sustainable projects underway in the area. However, the stargazing is what makes it so spellbinding.

My current research led me to find out that Enchanted Rock's rural dark sky makes it one of the best public places for viewing stars in Central Texas, and that in 2014, it earned a Gold-Tier International Dark Sky Park designation – essentially reducing the "light pollution" to allow for better stargazing. I guess you know what I'll be doing in 2017! Happy New Year!!

Additional References: TPWD links:

Agency site: http://tpwd.texas.gov/

Dark Skies Program, http://tpwd.texas.gov/spdest/programs/dark_ skies/

Enchanted Rock, http://tpwd.texas.gov/state-parks/enchanted-rock

Enchanted Rock Stargazing page, http://tpwd.texas.gov/state-parks/enchanted-rock/more-info/dark-skies

TPWD News, 2014. Two Texas Parks and Wildlife Properties Achieve International "Dark Sky" Status. August 6, 2014. http:// tpwd.texas.gov/newsmedia/releases/?req=20140806a.

Other links:

International Dark-Sky Association, 2016. http://www.darksky.org.

Llano Uplift Mineral-Fossil Locations and Road Logs Field Geology, http://geology.uprm.edu/Morelock/thcgeol.htm.

Texas Academy of Science, 2016. Field Trip Guidebook: Geology of the Northern Llano Uplift, Junction to Llano, Texas. March 6, 2016. http://www.geology.sfasu.edu/TAS2016-0301 LlanoGuidebookFinal.pdf.





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HGS Applied Geoscience Mudrocks Conference Provides a Low-Cost, High-Quality Training and Networking Opportunity

by Mike Effler and Frank Walles

Please consider attending the upcoming Houston Geological Society 2017 Applied Geoscience Conference titled: "Integrated Approaches to Unconventional Reservoir Assessment and Optimization" scheduled to be held on March 7th and 8th, 2017 at the Anadarko Petroleum Conference Center in The Woodlands, Texas. As a service to advance your personal knowledge in this very important field, this two-day local event will feature the latest on reservoir characterization and optimization of recovery for unconventional reservoirs. A special addition will be a featured speaker, Jeremy Boak, Director of the Oklahoma Geological Survey, who will give a keynote luncheon presentation regarding the Quake Hazards in Oklahoma and their origin. An evening social event will provide opportunities for networking as well as provide time for follow-up discussions with speakers and fellow participants.

Speakers are recognized experts from industry, government, and university who have been specifically selected by our HGS conference organizing committee. The committee-organized technical program will include 20 expert, oral presenters organized within 8 sessions, 15 university research poster presentations, and cores on display from the Wolfcamp and Utica formations (both with presenters).

This is an annual HGS event that was first developed in 2006, at the advent of the combined industry, government, and university early mudrock reservoir characterization research. This conference has established itself as the premier Houston Mudrocks Technical Reservoir Characterization Conference that includes research and applied geology spectrum from the outcrop to the nanoscale. Invited presenters have included the top researchers and experts from the early applied research in the 50s through the present.

This year's technical oral program event includes 16 session Co-Chairs that have developed invited presenter sessions on:

- Diagenetic Components of Mudrocks and Their Impact on Production
- Nanoscale Intra-Kerogen Porosity and Hydrocarbon Phase Producibility/Wettability
- Predicting Petrophysical Flow Properties Using Digital Rock Physics
- Geophysical Methods for Producibility, Fracability and GeoHazards
- Hybrid Unconventional Opportunities
- Tight/Complex Reservoirs Opportunities

- Geo-engineered Completions/Geomechanics
- Operator Cases of Integrated Applied Geoscience for Fun and Profit

As a local Houston Geological Society event, it has proven to be highly cost-effective training for both geoscientists and engineers. The multi-member HGS organizing committee has contributed to making this conference happen for the past eleven years, in part because it would be cost and competitor prohibitive for one single company to organize such a diverse event.

Conference attendees will receive the committee and authordeveloped expanded abstract/paper technical brochure of the oral and poster presentations to assist in the communication and sharing of the learnings. The HGS provides this industry event to share knowledge of advancing applied geoscience technologies within mudrock reservoir characterization.

This annual Applied Geoscience Conference (AGC) event is a combined education and scientific advancement service for the HGS member community and continues to be generously supported by many industry sponsors. The event location (within conference facilities of Anadarko Petroleum) is a very special tribute from our sponsors and we are especially grateful



for the generosity of Anadarko to host this event. Houston Geological Society AGC technical program committee member, Wayne Camp, was especially important in arranging this venue opportunity.

This AGC on mudrock reservoir characterization and optimization has been highly popular since inception with demand frequently exceeding venue capacity. Attendee disciplines include the full range of management through geological, geophysical, petrophysical, production, reservoir and completion engineering. This year, in response to the continued industry downturn, and with the help of our venue sponsor, HGS is again offering this conference at a substantially reduced cost to make it as affordable as possible. If you are interested in attending, but are encountering financial hardships such as unemployment, please contact the HGS office for further reduced pricing consideration. See www.hgs.org or contact Andrea Peoples at (713) 463-9476.



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- Geophysical Methods for Producibility, Fracability and GeoHazards

Day 2

- Hybrid Unconventional Opportunities
- Tight / Complex Reservoirs Opportunities
- Geo-engineered Completions
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We will also feature posters highlighting university research, a multi core program supporting the oral technical program and a luncheon keynote address.







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Technical Agenda - Tuesday, March 7th

MORNING SESSIONS

7:00 - 8:00 8:00 - 8:10	Registration and Coffee Welcome and Opening Remarks	
SESSION 1:	Diagenetic Components of Mudrocks and Their Impact on Production Chairs: Tina Calvin & Neil Fishman	
8:10 - 8:45	Role of Diagenesis in Mudrock Evolution Neil Fishman, Hess	
8:45 - 9:20	Significance of Volcanic Ash in Mudrock Evolution Christina Calvin, Consultant	
9:20 - 9:55	Revealing the Reservoir with DNA Diagnostics Ajay Kshatriya, Biota	
9:55 - 10:20	Coffee Break	
SESSION 2:	Nanoscale Intra-Kerogen Porosity and Hydrocarbon Phase Producibility / Wettability Chairs: Avrami Grader & James Macquaker	
SESSION 2: 10:20 - 10:55	Nanoscale Intra-Kerogen Porosity and Hydrocarbon Phase Producibility / Wettability <i>Chairs: Avrami Grader & James Macquaker</i> What Are We Doing About EOR in Shale and Tight Formations? <i>Dr. James Sheng, Texas Tech PE Lead of</i> <i>DOE Consortium - Unconventionals</i>	
SESSION 2: 10:20 - 10:55 10:55 - 11:30	Nanoscale Intra-Kerogen Porosity and Hydrocarbon Phase Producibility / Wettability Chairs: Avrami Grader & James Macquaker What Are We Doing About EOR in Shale and Tight Formations? Dr. James Sheng, Texas Tech PE Lead of DOE Consortium - Unconventionals Quantifying Organic Porosity and Predicting Estimated Ultimate Recovery (EUR) TBD	
SESSION 2: 10:20 - 10:55 10:55 - 11:30 11:30 - 12:35	Nanoscale Intra-Kerogen Porosity and Hydrocarbon Phase Producibility / Wettability Chairs: Avrami Grader & James Macquaker What Are We Doing About EOR in Shale and Tight Formations? Dr. James Sheng, Texas Tech PE Lead of DOE Consortium - Unconventionals Quantifying Organic Porosity and Predicting Estimated Ultimate Recovery (EUR) TBD Lunch Break	

AFTERNOON SESSIONS

SESSION 3:	Predicting Petrophysical Flow Properties Using Digital Rock Physics Chairs: Taras Bryndzia & Timothy Diggs
12:35 - 1:10	Insights Into Segmentation and Related Problems of Predicting 3D Properties from 2D Images <i>Nishank Saxena, Shell</i>
1:10 - 1:45	Upscaling in Numerical Simulation of Shale Transport Properties by Coupling Molecular Dynamics Simulation with Lattice Bolzmann Method Yang Ning, University of Houston Chemical and Biochemical Engineering Dept, PhD Candidate
1:45 - 2:20	TBD
2:20 - 2:45	Coffee Break
SESSION 4:	Geophysical Methods for Producibility, Fracability and GeoHazards Chairs: Thomas Reed & Lisa Neelen
2:45 - 3:20 3:20 - 3:55	TBD Woodford and Barnett Curvature Approaches



Technical Agenda - Wednesday, March 8th

MORNING SESSIONS

7:00 - 8:00 8:00 - 8:10	Registration and Coffee Welcome and Opening Remarks			
SESSION 5:	Hybrid Unconventional Opportunities Chairs: Obie Djordjevic & Barbara Hill			
8:10 - 8:45	Developing a High-Resolution Understanding of Variations in Sedimentological and Petrophysical Property Space in a Thinly-Bedded Reservoir: Improving Predictions Through Cross-Disciplinary Collaboration and Data Integration <i>Steph Perry and Dawn Hayes, Anadarko</i>			
8:45 - 9:20	Enhancing Performance of a Wolfberrry Play via Comprehensive Integrated Petrophysical Analysis <i>Tim McGinley, Laredo Petroleum</i>			
9:20 - 9:55	Dynamic Flow Behavior Using Shale Rock Model for Recovery Analysis <i>Richard MacDonald (EP Energy), Steve Geetan</i> <i>(EP), and Denis Klemin (SLB)</i>			
9:55 - 10:25	Coffee Break			
SESSION 6:	Tight / Complex Reservoir Opportunities Chairs: Mark Andreason & Matt Williams			
10:25 - 11:00	Tight Oil Reservoirs of the Bone Spring Sands - An Example of Low Resistivity Low Contrast Pay <i>Randy Miller, Core Lab</i>			
11:00 - 11:35	Sweet Spot Identification in the Western Anadarko Basin Jacob Shumway and Brenden Curran, FourPoint Energy			
11:35 - 1:00	Lunch Break			

AFTERNOON SESSIONS

SESSION 7:	Geo-Engineered Completions Chairs: Randy Lafollette & Luis Baez
1:00 - 1:35	TBD Cretis Jenkins, Rose & Associates
1:35 - 2:10	TBD George King & Co-Author, Apache
2:10 - 2:45	Completion Optimization Using Both Vertical and Horizontal Measurements, an Eagle Ford Shale Case Study <i>William (Bill) Kreimeier, Lonestar Resources</i>
2:45 - 3:15	Coffee Break
SESSION 8:	Geoscience for Fun and Profit <i>Chairs: John Breyer & Raj Malpani</i>
SESSION 8: 3:15 - 3:50	Operator Cases of Integrated Applied Geoscience for Fun and Profit Chairs: John Breyer & Raj MalpaniAdvanced Core Analysis Methodologies Quantify and Characterize Prolific Liquid Hydrocarbon Quantities in the Vaca Muerta Shale R. D. Williams*, D. M. Willberg, D. Handwerger and D. Ekart, Schlumberger; J. Petriello; R. Suarez-Rivera, Von Gonten Labs



University Poster Presentations

UNIVERSITY	NAME	POSTER TOPIC
University of Louisiana at Lafayette	Logan Adams	New Plays in an Old Field: Depositional History and Source Rock Characterization at Teapot Dome, Wyoming
University of Houston	Anna Krylova	Dispersive Properties of a Fractured Fluid-Saturated Layer
Colorado State University	Marisa Boraas-Connors	Identifying Causes of Disturbances to the Re-Os Geochronometer in Black Shales: An Example from the Late Jurassic Agardhfjellet Formation, Svalbard
Oklahoma State University	Ibukun Bode	NMR Characterization and Pore-scale Imaging in Mississippian-aged Carbonate Mudrocks of the Southern Midcontinent
Oklahoma State University	Justin Steinmann	Assessing Sulfur Isotopes as a Potential Correlation Tool in Carbonate Mudrocks of the Mississippian Limestone
Texas Tech	Eric Friedman	Preliminary Results: Comparing Siliciclastic Content of Ramp to Rimmed Carbonate Slope Deposits During Relative Sea Level Highstands
Southern Illinois University	John Ejembi	Utilizing Multi-geochemical Proxies in Paleosols to Investigate the Shift in Middle Jurassic Depositional Environment in Western Colorado
University of Houston	Zohreh Souri	TOC Estimation of the Marcellus Shale, Bradford County, Pennsylvania
University of Houston	Ane Slabic	Uranium, Thorium, and Lead Isotope Geochemistry of Petroleum Source Rocks: An Example from the Eagle Ford Group, Texas
Texas A & M Univerisity	Han Li	Hydraulic Fracture Height Predictions in Laminated Shale Formations Using Finite- Discrete Element Method
Cornell University	Jonathan (Casey) Root	Diagenetic Evolution of the Cherry Valley Member of the Oatka Creek Formation, Marcellus Subgroup, New York
University of Oklahoma	Alex M Vachaparampil	The Influence of the Intermediate Principal Stress on the Strength of the Mancos Shale
New Mexico Tech	Natasha Trujillo	Influence of Lithology and Diagenesis on Mechanical and Sealing Properties of the Thirteen Finger Limestone and Upper Morrow Shale, Farnsworth Unit, Texas
University of British Columbia	Pablo Lacerda Silva	Contrasting Reservoir Facies of the Doig Formation, Western Canada Sedimentary Basin: Insights from Pore-size Distribution, Mineralogy and Organic Geochemistry
University of Texas of Permian Basin	Troy Tittlemier	The Impact of Post Oil Emplacement Tectonics of the Delaware Mountain Group, with an Emphasis on Residual Oil Zone Potential

Posters will be on display throughout the conference.

Monday, January 9, 2017

Westchase Hilton • 9999 Westheimer Social Hour 5:30–6:30 p.m. Dinner 6:30–7:30 p.m.

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The Appalachian Basin, Shale Capital of the World

It is well known that the modern oil and gas industry in the U.S., if not the world, was started in 1859 in Titusville, Pennsylvania, when Colonel Drake drilled his first oil well. That oil was sourced from the Devonian shale. What isn't as well known is that commercial oil and gas production from shale also got its start in the Appalachian Basin. The first shale gas well drilled for commercial production was in 1825 in Fredonia, New York, producing from the upper Devonian Dunkirk shale. Eighty-nine years later production from upper Devonian shales was established in eastern Kentucky and spread into neighboring West Virginia. This became known as the Big Sandy Field and has produced an estimated 23 TCFG since its discovery.

In 2003, Range Resources drilled a deep exploratory well in Washington County, Pennsylvania. The deeper targets were not productive, but there were strong shows in the middle Devonian Marcellus Shale. Horizontal drilling in the Barnett Shale, in the Fort Worth Basin, had kicked off in a year or two earlier and news of this was spreading throughout the industry. In 2004,

Range tested the Marcellus Shale in this well and it showed a lot of potential. Once word of this discovery broke, the play took off quickly with many operators from all over the country, and eventually the world, entering the basin. The Energy Institute of America (EIA) estimates about 410 TFG in reserves from the Marcellus.

In the past five years, a new play has emerged in the Ordovician-age Utica Shale. Due to low gas prices and the Utica containing more liquids towards the western portion of the play, most of the activity has been in far eastern Ohio. Recently, several operators have started testing the dry gas portion of the play with a high rate of success.

Biographical Sketch

LINDELL BRIDGES received both his Bachelor of Science and Master of Science degrees in Geology from the University of Arkansas at Fayetteville. He was a geologist for Union Oil Company of California (UNOCAL) in Oklahoma City for 10 years, where he was responsible for exploration and



HGS General

Dinner Meeting

Lindell C. Bridges

development in the Illinois, Michigan, and Appalachian basins, as well as exploration in Arkansas, Oklahoma, and Texas. While at Unocal he drilled his first shale wells in 1987 in West Virginia. After Unocal, Mr. Bridges was an independent consultant for 11 years working projects in several basins, including the Appalachian, Illinois, Michigan, Anadarko, and Arkoma basins. He joined Chesapeake Energy in October of 2002, and successfully drilled Fayetteville Shale discovery wells in White County, Arkansas, extending the play more than 40 miles east of the established core area. In 2006, he was promoted to Geological



Figure 1. Dr. Gary Lash, SUNY Fredonia, examining a natural gas seep in New York.

Manager of Chesapeake Appalachia in Charleston, West Virginia, following their acquisition of Colombia Natural Resources (CNR), where he kicked off their Marcellus play and started research on the Utica Shale. In October, 2007, he was hired by EOG Resources in Fort Worth, Texas, as Exploration Manager for the oil producing area of the Barnett Shale (combo play). In March of 2009, he joined EQT Production as Senior Vice President of Geoscience. In this position, Lindell introduced technology that increased production and reserves of the Marcellus Shale by an order of magnitude. In July, 2011, he formed Pure Earth Resources, a geoscience consulting firm based in Sharpsville, Pa. In June, 2015, he started Lola Energy Operating Company, based in Wexford, Pennsylvania, with three other former EQT executives.

HGS General Dinner continued on page 18



Figure 2. Upper Devonian shale crops out along the Lake Erie shore.



Figure 3. Devonian stratigraphy of the Appalachian basin.



Figure 4. Transgressive-regressive systems tracts in the lower Marcellus shale.



Figure 5. Upper Ordovician Dolgeville formation outcrop along I-90 in New York state.



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Wednesday, January 11, 2017

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

Cost: \$30 Preregistered members; \$35 non-members/walk-ups

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ETHICS MOMENT

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

Field Safety at Environmental Assessment and Remediation Sites: The Use of Situational Awareness and Operational Discipline in Combating the Normalization of Deviance

Then conducting environment site assessments and remediation projects, field crew health and safety should always be a primary concern of project managers and site supervisors. This is true during the planning phase, during the actual execution of project tasks, and throughout the duration of the project.

On a daily basis, field crews confront a variety of situations where their safety may be adversely impacted by the behavior of their co-workers. These adverse behaviors often start imperceptibly, but over time become generally-accepted or "normalized" deviant behaviors.

The importance of maintaining situational awareness during all field activities completed at a site as well as retaining the operational discipline for each and every task, are the key components to minimizing or even perhaps eliminating, the normalization of deviance at field project sites. Several examples illustrating the use of operational discipline will be discussed during this presentation.

Biographical Sketch

GORDON S. MAGENHEIM is the MidContinent Regional Safety and Health Manager for GHD (formerly Conestoga-Rovers & Associates) in Houston, He is responsible for approximately 250 GHD employees at ten offices located in Oklahoma and Texas. Gordon is a registered/licensed professional geologist in 14 states as well as a Certified

HGS Environmental & Engineering



Gordon S. Magenheim

GHD

Professional Geologist, a Certified Hazardous Materials Manager, and a Construction Health and Safety Technician. Over his 38-year career, he has worked on a variety of environmental and remediation projects including early career experience as a lignite and coal-mining geologist in Texas and the Powder River Basin of Montana and Wyoming. Concurrent with his career as a professional geologist and safety technician, Gordon completed 28 years of active duty and reserve service as a commissioned officer in the U.S. Army, with his initial branch classification as a Corps of Engineers officer. Gordon holds a BA in Geology from the State University of New York at New Paltz, a MS in Environmental Science from the University of Houston at Clear Lake, and a MA in Emergency and Disaster Management from the American Military University.





Monday, January 16, 2017

Westchase Hilton • 9999 Westheimer Social Hour 5:30–6:30 p.m. Dinner 6:30–7:30 p.m.

Cost: \$45 Preregistered members; \$50 non-members/walk-ups

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Expulsion and Migration Associated with Unconventional Petroleum Systems

xploitation of unconventional resources has revived $\mathbf{L}_{ ext{questions on the overall efficiency of hydrocarbon}}$ expulsion (or primary migration) and has provided an impetus for renewed study of this issue. Much of the literature has suggested that expulsion is quite efficient, with most of the generated products exiting the source. This, however, appears to contradict the estimated volumes from unconventional resources, which often represent a self-sourced petroleum system and require generated hydrocarbons be retained within the source rock itself. This conundrum may have its root-cause in semantics. Expulsion has been defined as either the movement of hydrocarbons out of the kerogen or out of the source rock. These two processes are distinctly different. The former is discussed without consideration of rock properties, while the later takes into consideration rock fabric and is more directly tied to both conventional and unconventional resource assessment.

Examination of unconventional plays suggests that there are three primary models for expulsion. The first model is represented by a "massive" source, where hydrocarbons "bleed" from the source rock's edge. This system is represented by such units as the Marcellus Formation (Appalachian basin; **Figure 1**). Within such systems the generated hydrocarbons are largely retained in the source rock, and the overall expulsion efficiency is limited. As there is little potential for secondary migration, this leads to development of excellent shale plays and somewhat limited conventional resources. The effectiveness of such systems

is controlled by the thickness of the source interval. The second model is when a reservoir, conventional or unconventional, is sandwiched between organic-rich source intervals. The expulsion efficiency of such a system is greater than the "massive" system, with the upper and lower source intervals feeding into a common reservoir, but still may be limited. This type of system is represented by plays such as the Bakken Formation (Williston basin; **Figure 2**). Depending on the nature of the reservoir/carrier,

Gamma Ray

Figure 1. The Marcellus Shale represents a "massive shale" where hydrocarbons are largely trapped within the source sequence. The hydrocarbon potential is thus proportional to the organic richness of the source. (Data from Chen and Sharma, 2016.)

secondary migration may occur and the maturity of the reservoir may be less than that of the produced product. The third model is where the source and reservoir (or carrier) are interbedded. This model leads to the highest expulsion efficiency and may be represented by the Wolfcamp Formation (Permian basin; **Figure 3**). Secondary migration may occur in this system and it may be difficult to define the net reservoir interval.

HGS International Dinner continued on page 24



Figure 2. The Bakken Formation represents a "sandwiched reservoir" where hydrocarbons are effectively expelled into the reservoir that is bracketed by the source rock intervals. (Data from, 2011 and Webster, 1987.)



Figure 3. The Wolfcamp Formation represents an interbedded source-reservoir system, where the high frequency interbedding results in efficient expulsion, "amplifying" the relatively modest organic carbon contents. (Data from Baumgardner et al., 2014.)

References

Baumgardner, R. W., Jr., Hamlin, H. S., and Rowe, H.D., 2014. High-resolution core studies of Wolfcamp/Leonard basinal facies, southern Midland basin, Texas, Part 1: Context of high-resolution study. Search and Discovery Article #10607.

Chen R. and Sharma S., 2016. Role of alternating redox conditions in formation of organic-rich intervals in the Middle Devonian Marcellus Shale, Appalachian Basin, USA. Palaeogeography, Palaeoclimatology, Palaeoecology, 446: 85–97.

Sonnenberg, S. A., 2011. TOC and pyrolysis data for the Bakken shales, Williston basin, North Dakota and Montana. In: J. W. Robinson, J.A. LeFever, S. B. Gaswirth (eds.), The Bakken-Three Forks Petroleum System in the Williston Basin, Rocky Mountain Association of Geologists, 308-331.

Webster, R. L., 1987. Petroleum source rocks and stratigraphy of the Bakken Formation in North Dakota. In: J. A. Peterson, D. M. Kent, S. B. Anderson, R. H. Pilatzke, and M. W. Longman (eds.) Williston Basin: Anatomy of a Cratonic Oil Province. Rocky Mountain Association of Geologists, 269-286.

Biographical Sketch

BARRY KATZ received his BS in geology from Brooklyn College in 1974 and his PhD in marine geology and geophysics from the University of Miami in 1979. After receiving his doctorate, he joined Texaco's Bellaire Research Center where he held numerous technical and supervisory positions. He continued with Chevron after the merger in 2001, where



he has been part of Chevron's Energy Technology Company. He currently serves as a team leader and Chevron Fellow. His work has focused on the applications of geochemistry to petroleum exploration and development. He has been engaged in both research and technical support, working in approximately 50 basins around the world. Barry has authored more than 75 peerreviewed papers. He serves as editor of the *AAPG Bulletin* and the *GCAGS Journal* and is on three other editorial boards. He has edited four books and has also made more than 100 presentations at various at local, national, and international conferences. He was named an Honorary AAPG Member in 2011, and he is in his second term as a member of the House of Delegates. He served as Editor and President of the Houston Geological Society, and he also was an AAPG Distinguished Lecturer.



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HGS Northsiders Luncheon Meeting

Tuesday, January 17, 2017

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

Cost: Active/Associate Members - \$30, Emeritus/Life/Honorary - \$25 Students who are members of HGS - \$10, Non-members - \$40

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.

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HGS Northsiders Luncheon Meeting

Sweta Bose and Scott Jacobsen Southwestern Energy

Case Study: Application of Multicomponent Induction Tool Inversion to Natural Fracture Characterization in a Resource Play

A aturally occurring fractures often play a very critical role in defining a shale play, and fracture identification, typically from image logs, has become a key component in a range of situations from efficient drilling design to reservoir development. In this vein, to complement the usage of image logs in fracture detection work, recent applications of multi-component (or triaxial) induction log data were investigated in a four-well US resource play case study.

The multi-component induction tool data were acquired in all four vertical wells in the study. All of these were drilled with oilbased mud systems. Additionally, electrical and acoustic imaging logs were run in three of the wells to compare the fracture indications between the various tools. Whole core was also available to provide visual physical evidence of fracture existence and features.

Inversion of multi-component induction data normally yields bedding dip magnitudes and azimuths. An extension of this inversion technique provides a qualitative indicator of highangle fracture presence and intensity from the same data. These fracture planes do not have to intersect the borehole, but can be several feet away and still be detected.

The focus of this work was to benchmark induction tool-based fracture characterization in oil-based mud against both slabbed core and traditional wellbore imaging log interpretation. In one of the wells where operational problems precluded image log acquisition, only the induction data were available. In this case, we found an important correlation between the induction log fracture derivation and drilling events and data.

We assert that this new process promises to be an important tool for the recognition and characterization of natural fractures, especially in conditions where pad-contact image logging tools are sensitive to washouts, rugose borehole, deviated wellbores and other adverse borehole conditions, and especially in heavy oil-based mud where acoustic and electrical data quality is often compromised.

SPWLA publication, reference SPWLA-2016-1537

Biographical Sketches

SWETA BOSE was a Senior Petrophysicist with Southwestern Energy in Houston. Prior to that, she worked for ExxonMobil Company in Houston and Schlumberger DCS Denver as a Senior Petrophysicist and Borehole Geologist respectively. She has a PhD in Environmental Sciences (Inorganic Geochemistry) from Wright State University, USA and a MS in Geology from University of Calcutta, India. She is a member of SPWLA.

SCOTT JACOBSEN is a Sr. Staff Petrophysicist with Southwestern Energy in Houston. Prior to that, he worked for Schlumberger for 35 years in various log interpretation development areas and retired in 2010 as a Petrophysical Advisor. He has a BS in Electronics Technology from Northern Illinois University and a BS in Electrical Engineering from the University of Notre Dame. He is a member of SPWLA.

Monday, January 23, 2017

Westchase Hilton • 9999 Westheimer Social Hour 5:30–6:30 p.m. Dinner 6:30–7:30 p.m.

Cost: \$45 Preregistered members; \$50 non-members/walk-ups

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HGS North American Dinner Meeting

Tad Smith Apache Corporation

Practical Seismic Petrophysics: The Effective Use of Log Data for Seismic Analysis



The conditioning and analysis of log data for quantitative seismic interpretation are often simply categorized as "rock physics." Unfortunately, rock physics workflows often overlook or oversimplify the proper editing and interpretation of log data, and the result can be unrealistic expectations and interpretations of seismic amplitude responses. The more encompassing phrase "seismic petrophysics" better describes the necessary linkage between petrophysics and rock physics. Seismic petrophysics not only includes rock physics, but also the proper conditioning and interpretation of log data that should occur prior to the application of rock physics and seismic models. This is especially true in conditioning log data for shear-wave velocity estimation,

fluid substitution calculations, and AVO modeling.

This talk will focus on the important role of "seismic petrophysics" in the quest to extract additional information from subtle seismic responses. Topics covered will include various aspects of log editing, petrophysical interpretation (including integration of other data sources- core, fluids, pressures, etc.), and some common pitfalls associated with the "workhorses" of rock physics (invasion corrections, shear velocity estimation, and elements of fluid substitution). It is important to recognize that log data should not simply be recomputed to fit prior expectations as defined by a rock physics model. Instead, rock physics models should be used as templates, which allow the interpreter to understand the underlying physics of observed log responses and how they are governed by local petrophysical properties. Case studies will be used to reinforce critical concepts.

Biographical Sketch

TAD SMITH is Director of Geoscience, E&P Technology, at Apache Corporation. Prior to joining Apache, Tad held a variety of positions as a geologist and petrophysicist at various companies, including Amoco, BP, Newfield Exploration, VeritasDGC, CGGVeritas, and ConocoPhillips. In 1995-1996, he participated in the Amoco Petrophysics



Training program, where he developed a keen interest in

petrophysics and seismic rock properties ("seismic petrophysics"). Since then he has been actively engaged in the process of integrating petrophysical data into geophysical work-flows. In 2011, he was the North American Honorary Lecturer for the Society of Exploration Geophysicists, with the topic of his tour being "Seismic Petrophysics". Tad was President of the Geophysical Society of Houston during the 2013-2014 term. From 2010-2014 he served on the editorial board for The Leading Edge, a leading industry publication, and served as the Editorial Board chair during the 2013–2014 term. Tad has a PhD in geology from Texas A&M University (1991), an MSc from Washington State University, and a BA from Ohio Wesleyan University. He is a member of AAPG, SEG, SPWLA, SPE, GSH, and the HGS. When he's not working on interesting petrophysical problems, he enjoys time with his wife and son, riding bikes, spending time with good friends, and listening to good music.



HGS Tennis Tournament

Dear Geoscientist,

Houston Geological Society is organizing a tennis tournament for its members and colleagues in the industry as a fun and active networking event during late Spring 2017. At this time we are looking for volunteers to help set up and run the event: find sponsors and vendors, decide on tennis facility, etc. Knowing the sport of tennis is a helpful but not mandatory for the tasks at hand.

Interested parties should contact Constantin Platon at platonpc@gmail.com for more details and how to get involved. Thank you!

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Provide regional chronostratigraphic framework necessary to construct accurate time structure and seismic facies maps to ensure reservoir facies are properly correlated. Over 10,000 feet analyzed, marker species, unc, 53 SB, 52 MFS tied to wells on seismic panels. Balam-101, Maloob-101,

Northern Mexico Offshore Lease Sale Alaminos Canyon MFS Correlation COST: \$10,900

Up to 10 MFS tied (8) wells in Alaminos Canyon/Mexico associated with lease sale and "farm-in" with Trion Field area eight (8) summary well charts and tables, wells with numerical age, well-log, fossil abundance, paleobathymetry, MFS correlation cross section. MFS can be tied to seismic for accurate correlation in deep water. AC 557-1, 600-1, 731-1, 857-1, 903-1, 903-2, 818-1, 859-1



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Cost: \$45 Preregistered members; \$50 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.

The Role of the Western Interior Seaway as a Paleoceanographic Corridor in the Deposition of the Organic-rich Eagle Ford Shale in South Texas

he Cenomanian/Turonian (C/T) boundary marine strata l of the Late Cretaceous Western Interior Sea (WIS) exhibit a positive carbon isotopic excursion in the bulk-carbonate and organic carbon. This excursion marks the Oceanic Anoxic Event 2 (OAE 2), which spans the uppermost part of the Hartland

Shale and one-third of the overlying Bridge Creek Limestone members of the Greenhorn Formation in the WIS and most of the Eagle Ford Shale in the proto-Gulf of Mexico. The interval is characterized by alternating beds of light-colored limestone and dark-colored marlstone and calcareous shale. These lithologic couplets have been related to Milankovitch orbital cyclicity. Foraminiferal assemblages from five selected sites indicate major perturbations in paleoceanographic conditions associated with eustatic sea level rise and global warming. These sites include the C/T boundary Global Boundary Stratotype Section and Point (GSSP), the Rock Canyon anticline near Pueblo in central Colorado, the Cuba section in north-central Kansas, a section near Sioux City in northwest Iowa, the Anderson et al. Paradise 10-22-47-3W4 core in Northeast Alberta, and a core from an undisclosed location in southern Texas (Figure 1). Despite the global nature of the OAE 2, the strata in the WIS indicate a local geological and oceanographic imprint. The north-south configuration of the WIS and the influence of southern Tethyan and northern Boreal water masses on the sedimentological, geochemical, and paleontological character of the seaway created a unique geological record with cycles of enhanced organic matter concentration that are key for hydrocarbon productivity prediction in Texas and the Gulf of Mexico. Foraminiferal assemblages of the Bridge Creek Limestone in the basin center record subtle cyclical alternations between limestones and adjacent marlstones or calcareous shales (Figure 2).

The similarity of the structure of foraminiferal assemblages and their response to climatic perturbations associated with OAE 2 in the central and eastern parts of the seaway suggest that both sides were under the influence of the same warm, southern water mass.



HGS General

ALS

Khalifa Elderbak



Figure 1. Map of the Western Interior Seaway during Greenhorn maximum transgression in the early Turonian connecting the Boreal Sea and the Proto-Gulf of Mexico. The figure also shows the location of studied sections (red dots).



Figure 2. Changes in major benthic and planktic foraminiferal morphogrouops through the Cenomanian – Turonian boundary interval of the Rock Canyon section and main biostratigraphic events observed. Total organic carbon (TOC %wt) is from Caron et al. (2006).

The organic-rich strata associated with OAE 2 in the WIS have been attributed either to enhanced surface water productivity or to oxygen depletion of bottom waters as a result of fresh water runoff and water column stratification (Figure 3). In addition, different oceanographic scenarios have been proposed to explain the stratal and faunal variations of the Cenomanian-Turonian strata. Each of these scenarios, however, has its complexity. This study proposes an oceanographic model that invokes a cyclonic gyre operating in two different modes (strong and weak) to explain the lateral and temporal lithofacies and biofacies variations (Figure 4). The weakening and strengthening of the gyre circulation and the changes in nutrient availability in the surface water resulted in deposition of organic-rich marlstone and limestone beds respectively. Sea level rise during late Cenomanian and early Turonian time, and the increasing size of the WIS reduced the effect of water column mixing in the basin center by increasing the preservation potential of organic matter. The correlation of the sequence of events associated with the OAE 2 in the WIS to equivalent strata in Texas, in Eastbourne, UK, and at the Ocean Drilling Program Site 1260 in the Demerara Rise Basin of the tropical Atlantic reveals the global nature of these events and the importance of the WIS as an important northsouth paleoceanographic corridor. During the C/T boundary interval, the WIS may have transported heat to Boreal basins as a component of Northern Hemisphere surface ocean circulation, and the WIS may have exported intermediate waters to the Proto-Gulf of Mexico and western Tethys.

Biographical Sketch

KHALIFA ELDERBAK is a professional geologist with over 20 years of geological experience in academia, the environmental sector, and the oil and gas industry. He has been a staff biostratigrapher at ALS Oil and Gas since March 2013. He previously worked as a consultant biostratigrapher onshore and offshore in the Gulf of Mexico



and northern and western Africa. He graduated with a B.Sc. in Geology from Alfateh University, Tripoli, Libya in 1993, and M.Sc. in Earth Sciences from Carleton University, Ottawa, Canada in 2004. He obtained his Ph.D. in Geosciences from the University of Massachusetts, Amherst, USA in 2014. He has published and coauthored three peer-reviewed papers on the Cretaceous Greenhorn and Niobrara cycles in the Western Interior seaway.





Figure 3. Dilution model (Pratt, 1981, 1984) vs. productivity model (Eicher and Diner, 1985, 1989) to account for the cyclical pattern of bedding couplets in the Bridge Creek Limestone Member of the Greenhorn Formation. This pattern of the deposition has been closely tied to orbital forcing of climate [e.g., Sageman et al. (1998); Meyers et al. (2001, 2012); Sageman et al. (2006)].



Figure 4. Surface circulation in the WIS during late Cenomanian-early Turonian and the relation between the WIS and the Proto-Gulf of Mexico (GoM). The pressure gradient was strong (left panel) due to high (P-E), allowing development of a strong counterclockwise gyre to operate within the seaway. The gyre drew southern, warm, normal saline Tethyan watermass (red arrows) into the basin along the eastern margin of the seaway, bringing with it a great amount of calcareous plankton and allowing deposition of limestone beds in the WIS. The cool, brackish Boreal watermass (blue arrows) was drawn into the basin along the western margin. The mixing of the two watermasses along an oceanic front allowed the formation of a denser third watermass that sank, ventilated the seafloor, and flowed toward the open ocean. During the weaker phase of the gyre (right panel), due to development of wet climatic conditions at the southern end of the WIS (low = P-E), the gyre drove less southern watermass and less calcareous plankton into the WIS allowing the deposition of marlstone beds. After Elderbak & Leckie, 2016.

January 2017

Monday

Sunday

Tuesday

Wednesday

1	2	3 HGS Board Meeting 6 p.m.	4
8	9 HGS General Dinner Meeting "The Appalachian Basin, Shale Capital of the World," Lindell C. Bridges Page 17	10	11 HGS Environmental & Engineering Dinner Meeting "Field Safety at Environmental Assessment and Remediation Sites: The Use of Situational Awareness and Operational Discipline in Combating the Normalization of Deviance," Jeff Linder Page 21
15 March 2017 Bulletin CONTENT DUE	16 HGS International Dinner Meeting "Expulsion and Migration Associated with Unconventional Petroleum Systems," Barry Katz, Page 23	17 HGS Northsiders Luncheon Meeting "Case Study: Application of Multicomponent Induction Tool Inversion to Natural Fracture Characterization in a Resource Play," Sweta Bose and Scott Jacobsen Page 27	18
22	23 HGS North American Dinner Meeting "Practical Seismic Petrophysics: The Effective Use of Log Data for Seismic Analysis," Tad Smith, Page 28	24	25 HGS General Luncheon Meeting "The Role of the Western Interior Seaway as a Paleoceanographic Corridor in the Deposition of the Organic-rich Eagle Ford Shale in South Texas," Khalifa Elderbak Page 31
29	30	31	



T h u r s d a y	Friday	EOEVENTS Saturday	
5	6 Don't wait, make your reservations online at hgs.org	7	January 10, 2017 AAPG Petroleum Economics Denver, CO January 15, 2017 K-12 Teacher of the Year Nominations Deadline January 24-25, 2017 AAPG Geosciences Technology
12	13	14	Workshop Deepwater and Shelf Reservoirs: New Technologies for New Understanding, Houston, TX February 22, 2017 AAPG Playmaker's Forum Midland, TX
19	20	21	March 7-8, 2017 HGS Applied Geoscience Conference April 2017 HGS Shrimp Peel & Crawfish Boil <i>Bear Creek Park, Houston, Texas</i> April 2-5, 2017 AAPG ACE Annual Convention &
26	27	28	Exhibition Houston, TX April 26-28, 2017 Seapex Exploration Conference Singapore, Asia April 28-30, 2017 AAPG Hedberg Conference Beijing, China
Reserva The HGS prefers that you make your reserv www.hgs.org. If you have no Internet access office at 713-463-9476. Reservations for HGS date shown on the HGS Website calendar, n the last business day before the event. If you email, an email confirmation will be sent to yo with the Webmaster@hgs.org. Once the me- prepared, no more reservations can be added of	Itions: ations on-line through the HGS website at , you can e-mail office@hgs.org, or call the meetings must be made or cancelled by the ormally that is 24 hours before hand or on make your reservation on the Website or by u. If you do not receive a confirmation, check als are ordered and name tags and lists are even if they are sent. No-shows will be billed .	Members Pre-registered Prices: Dinner Meetings members	Spring 2017 HGS Tennis Tournament Houston, TX August 18-22, 2017 AAPG Geosciences Technology Workshop Astrogeology Total Solar Eclipse Field Seminar, Casper, WY

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Earth Science Celebration at HMNS October 8, 2016

by Sharon Choens and Inda Immega

The Houston Geological Society (HGS) and Houston Museum of Natural Science (HMNS) hosted Houston's seventeenth annual Earth Science Celebration at the HMNS on October 8, 2016. The event kicked off Earth Science Week, an international week-long celebration of earth science coordinated by the American Geosciences Institute (AGI).

Over 460 children and their families explored this year's theme "Our Shared Geoheritage." The participants received a "passport" which guided them through the eight passport stations located in the HMNS exhibit halls. The participants interacted with geoscience experts and were able to ask questions about our geoheritage.

Teachers attending the event received an AGI Toolkit for their classrooms.

HGS volunteers, **Sharon Choens** and **Inda Immega**, served as event Chairs. Many thanks to the HMNS staff for their support and to the more than 60 volunteers who assisted with the event.

A special thanks to the participating groups who organized and staffed "passport stations": Oxy Women's Geoscience Group, AWG, HGMS, GCSSEPM/



NAMS, GSH/SEG, CEA, UH SEG Wavelets, and to our UH students, HGS and Museum volunteers.

We are looking forward to the opening of the new Wiess Energy Hall in 2017, which will provide even more scope for teaching about Geoscience.



Young visitors doing a little exploration at the Geological Society of Houston station.

The HGS K-12 Booth at the Houston Gem and Mineral Society Show

by Janet Combes



The museum tables and the HGS area amid the "tsunami".

The Houston Gem and Mineral Show (HGMS) was held November 11-13, 2016 at the Humble Civic Center. The Houston Geological Society (HGS) had its revamped K-12 display set up to discuss geoscience with the visitors, especially the school kids on field trips and boy scouts working on a badge.

Volunteers included Joyce Smith, Dustin Young, Beverly DeJarnett, Ken Williams, Elizabeth Baker, Dave Reynolds, Suzie Reynolds, Bob Moore, Nancy Engelhart-Moore, Huw James, Aaron Ruse, Julia Waldsmith, Laurie Green, Michelle Pittenger, Stefania Laronga, Sarah Heinlein, Shawn Wright, Ken Green and Janet Combes. Prep work was done by Jennifer Burton; she searched out the new exhibit display and recreated the posters after the previous ones were destroyed in the taxday flood. John Adamick (along with TGS) provided a seismic line to use in the new geophysics poster and Jim Flis provided the 3D maps and 3D glasses. United Salt Corporation's Hockley Salt Mine provided multiple bags of salt to use as giveaways to attendees; Chuck Caughey and Marsha Bourque helped break up the salt and put into baggies with labels. The hand lenses for viewing the rock samples were from OXY and a sample log was given by Neurolog. Neal and Inda Immega helped out through all

the prep work and handled the staffing of the adjacent booth from the Houston Museum of Natural Science. **Laurie Green** brought her digital portable microscope that generated a lot of interest.

Total attendance at the show over the 3 days was about 2,000 children and 3,100 adults. On Friday, 1,650 students from public and private schools and homeschools attended. One volunteer said: "I was a bit surprised by the tsunami of students that came in several waves with each crescendo being greater than the previous one. There were about 5 main waves before all quieted down when the busses arrived to return them to school." Another volunteer described the student groups as arriving in "avalanches".

On Saturday and Sunday, the number of boy scouts was lower than the previous year, but enough came by the HGS booth to keep the volunteers busy. As one of the volunteers said "It was nice to see the curiosity of all those little faces enjoying to play with the pumice and using the magnifying glass to look at fossils." Several volunteers mentioned that it was really nice to share the space with the Museum of Natural Science as it was also attracting quite a bit of crowd of kids and families.



Inda Immega at the Museum of Natural Science area next to that of the HGS — we got all age visitors...



Beverley de Jarnett and Joyce Smith, in between the waves of people on Friday morning.



Laurie Green and Stefania Laronga on Saturday afternoon.



Sunday visitors looking at the 3D maps before turning around to the petroleum geoscience posters.



Dustin Young pointing out a fossil in the limestone on Sunday.

2016 Outcrop Family Campout

By Shannon Lemke



"My wife, Maricel, my children, Carlos and Dora, and I had a great time at the HGS family trip. We did so many things and we had so much fun. We really had a great time and can't wait to do it again next year!"

The first annual HGS "Take a Kid to the Outcrop" campout at Camp Cullen YMCA in Trinity, Texas, took place October

14-16. There were a total of 8 families (37 people camping), with children ranging in ages from 4 months to 16 years old. Check-in took place Friday evening and all of the families were housed in 2 cabins, with each family having a private sleeping bunk area and bathrooms within the cabin. Kids took advantage of the

board games and snacks available in the dining hall that night before turning in.

Saturday morning started bright and early with the kids discovering the tire swing zip-line before heading to breakfast in the dining hall at 8 AM. After breakfast, the morning activities available included archery, alpine climbing tower, canoeing or kayaking, arts & crafts and the geology lab. The kids took the lead in deciding which activity to try first, with an even split between archery and the climbing tower. The excellent camp setup meant that families crossed paths multiple times during the morning and there was plenty of time to try every activity at least once.

Everyone was happy to cool down and take a break for lunch at noon before starting the afternoon activities, which included the

1000 foot zip-line, riflery range, the marathon pipeline slide, gold panning and the rock quarry. Riflery mentors taught basic gun

"Can't wait to do it again next year!" ~Carlos Cabarcas safety before teaching how to shoot pellet guns. Adults and kids alike had fun trying to shoot playing cards hung in the shooting gallery. The gold panning station was a big hit with lots of good pieces of pyrite for the kids to find. Both the zip line and pipeline slide elicited hoots and screams from all the riders. There was

also the opportunity to explore the quarry that is on the camp grounds. Students from Sam Houston State University have done a spectacular job of building exhibits to explain the different geologic features found in the quarry, making it easily accessible and understandable for school-aged children. There was plenty to see and learn in the quarry!

After dinner all the kids from the different families got together for a gaga ball tournament that lasted until it was too dark to see. The evening was concluded with a campfire and s'mores. Soon after that, the camp was silent after the long and fun day.

Sunday morning, we had breakfast and said our goodbyes. Everyone agreed that it was a great weekend and that HGS should definitely host another family camp out next fall!



Emmet Lemke and David Lang attempt to conquer the alpine tower.



S'mores, the perfect end to a fun day at Camp Cullen.



Sharp shooters at the riflery range.



HGS Welcomes New Members

New Members Effective November 2016

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STUDENT MEMBERS

Welcome New Members



About the Cover

The photo, *Duality*, was captured during my first vacation alone with my wife since our honeymoon, over 5 years ago. She knew I wanted to climb the rock and take some photos; I took a few sunset images, and also did a spontaneous portrait of a group of strangers at sunset. We stayed after dark just so I could get the Milky Way from the top of the rock.

Enchanted Rock is a recognized Dark Sky park, and after the sun set, the stars and the Milky Way were *AMAZING*. You could clearly see the brighter parts of our galaxy stretched from horizon to horizon. Being on top of Enchanted Rock with my wife and laying down under the blanket of stars was a memory I will cherish for the rest of my life. I highly encourage anyone to stay after dark, maybe not on top of the rock, but just at the park in general. The views are breathtaking.

-Matt Smith

matt@bigtexstudios.com www.Bigtexstudios.com Instagram: Bigtexstudios





Government Update

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

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

AGI Geoscience Policy Monthly Review (September 2016)

Senate Committee Passes Two Bills on Women in STEM

The Senate Commerce, Science, and Transportation Committee considered two House bills promoting women in Science, Technology, Engineering and Mathematics (STEM) fields on September 21, 2016. The bills considered include the Inspiring Next Space Pioneers, Innovators, Researchers, and Explorers Act (INSPIRE) (H.R. 4755) and the Promoting Women in Entrepreneurship Act (H.R. 4742). The two bills were passed in the House simultaneously on March 22, 2016, and were approved by the Senate committee during the markup session. The next step will be consideration by the full Senate.

According to a 2011 report by the Department of Commerce, women hold less than 25 percent of STEM jobs in the U.S. The INSPIRE Act, introduced by Rep. Barbara Comstock (R-VA), serves to encourage and support young students, particularly women, in STEM career endeavors. The bill also refers to the National Aeronautics and Space Administration (NASA) GIRLS and NASA BOYS programs as exemplary efforts to open science careers to young students. In addition, Section 4 of the bill outlines a plan to institute a program involving current and retired scientists engaging with K-12 female STEM students.

The Promoting Women in Entrepreneurship Act asserts that "technology and commercialization ventures are successful when women are in top management positions," and calls upon the National Science Foundation (NSF) to, "support women in STEM disciplines," as outlined in its 2011-2016 Strategic Plan.

Specific new programs that will be introduced as a result of these bills are yet to be established, but the INSPIRE Act requires NASA to develop a plan for the future of these proposed programs.

House Subcommittee on Research and Technology Holds Hearing on Academic Research Regulations

On September 29, 2016, the House Science, Space, & Technology Subcommittee on Research and Technology held a hearing on restrictive and costly academic research regulations. Chairwoman Barbara Comstock (R-VA) opened the hearing with a statement declaring the need to "cut the red tape to optimize our nation's investment in scientific research." According to House Science, Space, and Technology Committee Chairman Lamar Smith (R-TX), up to 25 percent of federal grant funding is spent on complying with research regulations. While this funding is required to satisfy such regulations, its value is removed from the research budget provided by the grant, lessening its support for scientific research. Hearing witness, Dr. Angel Cabrera, George Mason University (GMU) President, stated that while "no one is advocating for weak accountability," his university could save an estimated \$50,000 in grant funds for scientific research per year if unnecessary regulations were addressed. One such regulation that is blamed for these costs is the Micro-Purchase Threshold, which requires documentation of multiple bids for research equipment that costs over \$3,000.

Research regulations were addressed in the University Streamlining and Harmonization Act of 2016 (H.R.5583), which calls for the creation of a Research Policy Board housed within the Office of Management and Budget and which is tasked with overseeing research regulations and policies to cut costly and unnecessary compliance measures. Additionally, the bill would raise the Micro-Purchase Threshold to \$10,000. The bill was introduced on June 24, 2016 by Rep. Daniel Lipinski (D-IL) and was referred to the House Committee on Oversight and Government Reform.

House Subcommittee Discusses U.S. Energy Security

The House Energy and Commerce Committee's Subcommittee on Energy and Power held a hearing this September to discuss the Department of Energy's (DOE) role in national, economic, and energy security. Although Secretary of Energy Ernie Moniz provided testimony on topics covered in the Obama Administration's first Quadrennial Energy Review, including energy transmission, storage and distribution infrastructure, much of the conversation focused on the struggles currently facing coal-dependent communities.

During the hearing, Sec. Moniz and Congressman David McKinley (R-WV) discussed the costs and benefits of carbon capture and storage (CCS) versus less expensive high-efficiency coal-fired power plants. Sec. Moniz reiterated DOE's commitment to CCS, and emphasized that CCS can be employed for energy types other than coal, including natural gas, and other industrial applications. Rep. McKinley expressed his desire to continue using coal as part of an all-of-the-above energy strategy, and **Government Update** *continued on page 44* Members of the Subcommittee also voiced general concern over the economic downturn recently experienced in coal-dependent communities.

The rise of renewable energy technology was also discussed during the hearing. Sec. Moniz argued that renewable energy could contribute to national security since, "There's no issue of importing or exporting the fuels." He also argued that the growth of the renewable energy sector could help counter to job losses within the coal industry. Sec. Moniz suggested that the U.S. take advantage of the rise in renewables as an opportunity for significant economic growth.

California Court Orders Obama Administration to Conduct Fracking Review

On September 6, 2016 the U.S. District Court for the Central District of California issued an order to the Obama Administration calling for further environmental review of the effects of hydraulic fracturing, or fracking, in California.

The order comes in the wake of a Bureau of Land Management (BLM) resource management plan (RMP) for Bakersfield, California, which does not contain language regarding the potential impacts of fracking. The court found that the RMP had insufficiently examined the potential impacts of fracking

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in central California, and required BLM to conduct an environmental impact statement (EIS), which would provide further insight into the potential impacts of fracking in the area.

Opponents of fracking have voiced concerns over groundwater contamination that may result from the process, which would diminish California's water supply. Proponents of fracking argue that the technique provides significant economic benefits. The ruling will ensure that land covered in the RMP is properly assessed to determine whether fracking could be environmentally harmful in the region.

President Obama Signs Climate Change Memorandum

On September 21, 2016, President Obama signed a memorandum addressing national security concerns posed by variations in Earth's climate. The memorandum was released alongside a report authored by the National Intelligence Council (NIC), which specifies and goes into greater detail on the largest threats.

Specific topics in the documents include short- and long-term weather and climate anomalies ranging from rising temperatures to increases in natural hazards like flooding. The memorandum calls for the creation of a Federal Climate and National Security Working Group to bring together more than 20 federal agencies to identify future risks associated with climate changeinduced hazards and to foster interagency communication and collaboration.

The NIC report projects that enforcement of effective environmental policies would help stabilize global surface temperatures in as soon as two decades.

Congressional Briefing Held on Ocean Acidification

The Consortium for Ocean Leadership (COL) held a briefing on the economic impacts of ocean acidification (OA), or the process in which the ocean absorbs CO_2 from the atmosphere, making its pH slightly more acidic.



Before the briefing began, Congressman Sam Farr (D-CA) spoke about the importance of his bill, the Federal Ocean Acidification Research and Monitoring Act (H.R. 2717), in combating OA. Rep. Farr argued that the lack of attention on OA was a geographical issue, noting "There is no ocean policy in Midwestern states." However, he emphasized the importance of preserving the ocean for aesthetic and conservation purposes for all.

During the briefing, three panelists presented their research on how OA affects various fisheries across the country. Dr. George G. Waldbusser from the University of Oregon discussed the effects on oyster fisheries in Washington State, Dr. Thomas Miller from the University of Maryland discussed the effects on blue crab populations in Maryland, and Dr. Dwight Glenhill discussed the effects on the commercial fishing and tourism industries in New England. All three panelists noted the detrimental impacts of OA on their respective fisheries, and agreed that unless something is done to combat OA, the fisheries will continue to decline.

Volcano Early Warning and Monitoring Bill Discussed in Senate Hearing

On September 17, 2016 Senate Committee on Energy & Natural Resources Chairman Senator Lisa Murkowski (R-AK) and Ranking Member Senator Maria Cantwell (D-WA) introduced their National Volcano Early Warning and Monitoring System Act (S.2056). On September 22, 2016 they discussed the bill in a hearing with the committee.

If enacted, the bill would instruct the U.S. Geological Survey (USGS) to establish a National Volcano Early Warning and Monitoring System to monitor volcanoes and warn citizens of impending volcanic activity. It would include a 24-hour volcano watch office and a national volcano data center. It would also establish a grant program to fund further research into volcano monitoring and support efforts to continually modernize the system as relevant technology develops.

During the hearing, Sen. Cantwell explained the importance of monitoring volcanic hazards. Sen. Cantwell went on to say that while these hazards may seem distant and far away for her colleagues representing more eastern jurisdictions, "we need the science to help guide us here [in the Pacific Northwest]."

The bill still needs to pass the Committee before it can be considered by the full Senate. If the bill is enacted, the USGS would have only 90 days to come up with a plan to implement the bill.

House Subcommittee on Space Holds Hearing on Commercial Remote Sensing

The House Science, Space, and Technology Committee's Subcommittee on Space held a hearing on September 7, 2016

which assessed how previous legislation has impacted the private sector's ability to obtain licenses and data for commercial remote sensing purposes.

Witnesses and Members of Congress alike voiced concerns that legislation, such as the Commercial Space Launch Competitiveness Act (H.R. 2262), unnecessarily restricts data and extends waiting periods for private remote sensing license applications. According to the National Oceanic and Atmospheric Administration (NOAA), the approval period can last up to 120 days, which puts strain on businesses that have invested in remote sensing technology.

Proponents of the current regulations argue that they are necessary to protect sensitive geospatial data and enhance national security. Opponents, however, argue that the regulations have hampered government's ability to keep up with the rapidly growing commercial remote sensing industry.

Full Committee Chairman Lamar Smith (R-TX) insisted that government regulations must be updated to meet today's needs. He and others argued that restrictive regulatory procedures not only inconvenience license applicants, but also affect the ability of the U.S. to maintain its position as a world leader in remote sensing. Furthermore, they argued that the private sector's access to remote sensing data will enhance, not hinder, national security by providing additional sources of important information.

NOAA is expected to complete a report on the Commercial Space Launch Competitiveness Act suggesting updates to licensing regulations by November 25, 2016.

Senate Meets to Markup NASA Reauthorization Bill

On September 21, 2016 the Senate Commerce, Science, and Transportation (CST) Committee convened a full committee markup on several bills, including a bill to reauthorize NASA, known as the NASA Transition Authorization Act of 2016 (S.3346).

The bill received bipartisan support and was unanimously approved by voice vote. It authorizes \$19.508 billion dollars for NASA for fiscal year 2017.

Sen. Ted Cruz (R-TX), Chairman of CST's Subcommittee on Space, Science, and Competitiveness, introduced S.3346 on September 15, to reauthorize NASA and minimize any difficulties the agency might encounter during the upcoming presidential transition. The new bill includes language regarding the International Space Station (ISS), future human exploration of Mars, and improved oversight of IT and cybersecurity within the agency.

Government Update continued on page 46

Government Update continued from page 45_

Sen. Cruz thanked the Committee for their support of S.3346, specifically Section 433 of the bill, which addresses research and diagnoses for ailments associated with long-term space flight, such as cosmic radiation.

Not all Committee Members were in support of every aspect of the bill; Sen. Edward J. Markey (D-MA) expressed concern over a \$200 million cut in funding for science, and a \$7 million cut for education.

Senate and House Pass Water Resources Development Act

On September 15, 2015 the Senate passed the Water Resources Development Act (WRDA) (S. 2848), marking a major milestone in the two-year water policy bill. The bill passed with a final vote of 95-3. The House version of the bill was voted upon once an amendment authorizing funding to aid Flint, MI, was approved, and it passed on September 28, 2016 with a final vote of 399-25.

In a press release, Senate Environment and Public Works Committee Chairman and sponsor of WRDA, Sen. Jim Inhofe (R-OK), praised the Senate's response: "With strong bipartisan support, the Republican-led Senate has once again moved an economy-boosting infrastructure bill with the passage of WRDA 2016". Inhofe highlighted the benefits that WRDA provides to American water infrastructure through funding for waterquality projects and aid. The ongoing water-quality issues in Flint, MI, provided a strong impetus for the bill's passage in the Senate, with the authorization of \$220 million in aid going toward emergency water supply efforts, particularly in areas with contaminated drinking water. The bill authorizes the US Army Corps of Engineers to initiate various water resources development and conservation projects.

Critics of the Senate bill have voiced concerns over language regarding coal ash and increased federal involvement in local programs involving water quality. Other than these provisions, the bill re-authorizes the Great Lakes Restoration Initiative Act (GLRI) (S.1024) through fiscal year (FY) 2021, the Lake Tahoe Restoration Act (S.1724) through the next ten years, and the Long Island Sound Restoration and Stewardship Act (S.1674) through FY2020. The bill also contains language regarding natural disaster risk reduction including floods, hurricanes, and storms.

The bill will go on to a conference committee, where its House and Senate counterparts will be reconciled.

Three Students Recognized for Outstanding Research Posters at Annual Sheriff Lecture – November 7, 2016

Three Department of Earth and Atmospheric Sciences students were recognized for outstanding research posters at the joint EAS-Houston Geological Society Annual Sheriff Lecture on November 7. A panel of 12 judges, including EAS faculty and oil industry experts, evaluated the 47 student entries. Students were separated into three tiers based on their academic level, with one winner selected from each group. Each winning student received a cash prize. New EAS faculty member Daniel Hauptvogel coordinated the organization and judging of the event.

> **Tier 1 (Advanced Ph.D.) – First Place (\$1,000)** *Yiduo "Andy" Liu* Title: "Post-breakup magmatism in the

> > northern Gulf of Mexico"



Tier 2 (Advanced M.S./Beginning Ph.D.) – First Place (\$750) Yi-Wei Chen

Title: "Seismic tomographic constraints on plate-tectonic reconstruction of Nazca subduction under South America since late Cretaceous (~80 Ma)"

Tier 3 (Undergraduate) – First Place (\$500)

Karissa Pepin, Geophysics Major Title: "Rayleigh wave phase velocities in Alaska from ambient noise topography"

Special thanks to all the poster judges and volunteers for sharing their time and expertise with the poster presenters: Hannah Dahdouh (EAS – Logistics Coordinator) Daniel Hauptvogel (EAS – Judging Coordinator)

J	udges
Jinny Sisson (EAS)	Rob Stewart (EAS)
Jonny Wu (EAS)	Kush Tandon (Consultant)
Yingcai Zheng (EAS)	Shuhab Khan (EAS)
Heather Bedle (EAS)	Steve Naruk (Shell)
Joel Saylor (EAS)	Alex Robinson (EAS)
Bob Wang (EAS)	Alex Barnard (HEI)
(O) 11 E40	

Event Organized by EAS and Houston Geological Society



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 hardcopy 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.

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