HGS Bulletin
Houston Geological Society
Volume 61, Number 5
January 2019

GCAGS 2019 Call for Talks and Posters Deadline March 4

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Fluvial Tapestries: GeoArt of Hurricane Harvey

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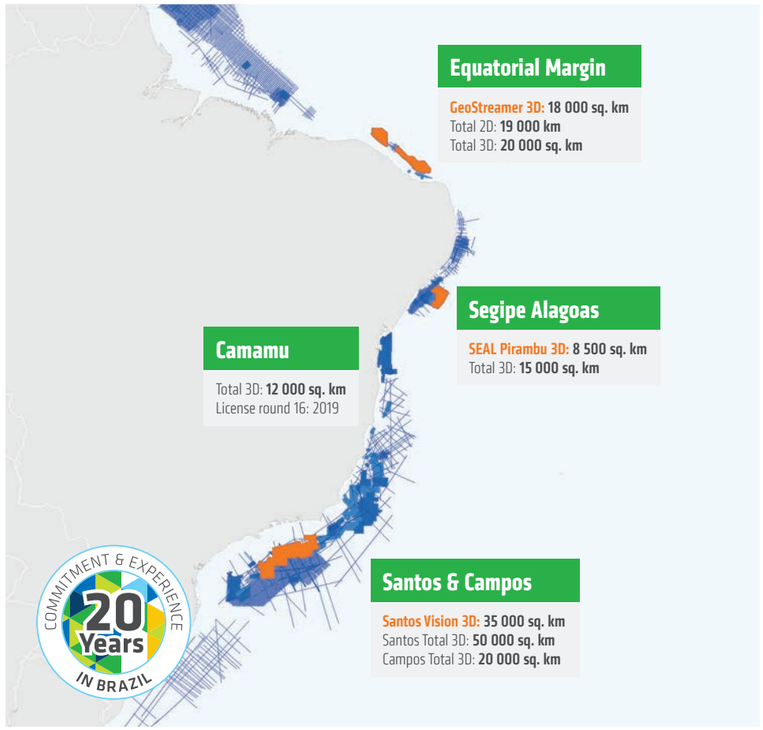
Make Better Decisions

on Brazil Exploration Opportunities



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The Bulletin
Houston Geological Society

Volume 61, Number 5 — January 2019

In Every Issue

Houston Geological Society

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Technical Meetings

Other Features

About the Cover: : 0.5 m by 0.5 m portion of a sand peel from bar deposited along Buffalo Bayou by Hurricane Harvey. Net flow was toward the viewer. The lower ¾ of the peel shows broad planar stratification, changing to shorter wavelength ripples near the top. This is interpreted as deposited during waning flow. The small faults in the upper half of the image probably formed ~ 30-40 days after Harvey while a channel cut across the bar, as Buffalo Bayou adjusted and recovery efforts began.

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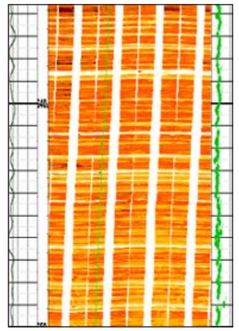

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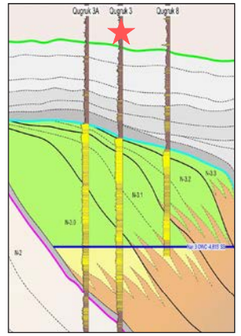

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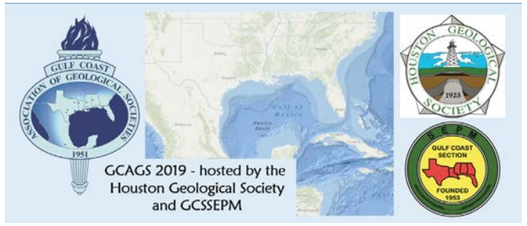
GCAGS 2019 Call for Talks and Posters Deadline March 4

By Linda Sternbach

The Gulf Coast Association of Geological Societies (GCAGS), partnering with GCSSEPM and the Houston Geological Society, are planning the 69th Annual Convention to be held October 23-25, 2019 at the Westchase Marriott hotel, on Briarcrest and Westheimer, in west Houston.



The Technical Committee has opened the Call for Papers, looking for oral presentations and poster presentations from the local Gulf Coast geoscience community on ten key themes. To submit a 300 word (maximum) abstract on a Gulf Coast topic, please visit the convention website https://2019.gcagshouston.com, and download the abstract form in Microsoft Word format. The abstract typed into the Word document can be emailed to Technical Chair Linda Sternbach at linda.sternbach@gcagshouston.com. The deadline is March 4 to submit a paper or poster abstract. Acceptance notices will be emailed March 25. Accepted presenters will have the opportunity to submit an expanded abstract (more than 300 words, and including figures) or full paper to the GCAGS Transactions, which is coordinated and edited by James Willis at james.willis@gcags.org.

GCAGS has a rich history of geoscience publications. Check out past GCAGS convention papers and abstracts available for download at https://www.gcags.org/exploreanddiscover/exploreanddiscover.html

Geoscience students are encouraged to submit one-panel posters to the technical program. Student posters can be on any topic, but professional talks and posters will be limited to onshore/offshore Gulf Coast and Mexico/Caribbean topics. There will be prizes at the convention for best student posters in several experience-level categories. Winning a poster prize is a great resume builder for young professionals!

The GCAGS planning committee includes Convention Chair - Mike Erpenbeck, Vice Chair - Larry Bartell, GCAGS President - Deborah Sacrey. The Technical Committee is Linda Sternbach, Chair; Vice Chair is Bob Wiener. Short Course Chair is J. Carl Fiduk, Field Trips co-chairs are Joel Saylor and Jinny Sission (U of H), Poster Chair is Sharon Cornelius (U of H), Judging Chairs are Sandy Rushworth and David Risch, Core Exhibits chair is Beverly DeJarnett (BEG). GCSSEPM convention planners include Tom Demchuk, Jory Pacht and Dorene West.

If HGS members would like to be session chairs, or coordinate programs during the convention please email Linda.sternbach@gcagshouston.com , or Deborah Sacrey at dsacrey@auburnenergy.com, or Mike Erpenbeck at mike.erpenbeck@hotmail.com. The short course and field trip committees will also need volunteers close to convention time in October 2019.

The ten themes for the GCAGS 2019 convention are:

1. Unconventional GOM Mudrocks and Shale Plays
2. Onshore GOM Conventional Plays – Discoveries and Case Studies
3. Offshore GOM Exploration and Production Studies
4. Over the Border: Mexico Geology and Exploration, Caribbean Exploration
5. Structural Geology, Gravity, and Magnetics.
6. Gulf Coast Environmental Geology.
7. Petroleum Engineers and Geologists Working Together for Better Answers
8. Seismic Technology and Salt Tectonics
9. Understanding Big Data and Computer Aided Interpretation
10. The Road to Business Success

Cheryl Desforges
President@HGS.org

HGS Volunteer Days Community Service Projects that Promote Geology

Volunteering is in the genetic makeup of HGS members. After all, HGS is a volunteer driven organization that would not exist in its current form without volunteers. But volunteering for internal HGS functions is only one category of our member's volunteer efforts. Another important volunteer category involves community service projects that help expose the general public to geologists and geoscience. Look for an article on some of these during 2018 elsewhere in this *Bulletin*. Those projects often have the most enduring impact to promote our discipline.

Another important volunteer category involves community service projects that help expose the general public to geologists and geoscience.

Over time there have been many community service work days participated in by HGS. But one such community service project becoming an annual event is the Work Day at the YMCA Camp Cullen in Trinity, Texas on Lake Livingston. Last year the Neogeos spear-headed the work day, where they worked on the **Geological Discovery Zone** at the Camp, which is a geology lab with age appropriate activities designed to pique the interest of children in geology. Those activities include gold panning, fossil hunting and other activities. Thanks to Camp Cullen, over 2,000 kids learn a bit of geology each year. Last Spring at the **HGS Outcrop Family Campout Event** (April 27-29, 2018), I saw first hand how much fun children of all ages were having in the Geological Discovery Zone. I hope you will bring your family **this year, April 12-14, 2019, for the Outcrop Family Campout** for a weekend that will be jam-packed with fun, including a zip line, archery, riflery, arts and crafts, Marathon pipeline slide, canoeing, Gaga ball, campfires, and basketball, in addition to the Geological Discovery Zone. But to help get the camp ready, **please join us for our upcoming work day this year on Sunday, February 16** (https://www.hgs.org/civicrm/event/info?id=2058).

Why would our members invest their personal time volunteering to give back to our community? According to Wikipedia, "volunteering is generally considered an altruistic activity where an individual or group provides services for no financial or social gain "to benefit another person, group or organization". *But that's not really the whole story*. Volunteering has many positive benefits for the volunteer, as well as for the community served. Probably the two things at the top of the list for individuals are the feeling it provides of ***doing good*** by giving something back to the community and the ***networking*** opportunities with new connections it provides. There is also the fun of spending the day in a nice place, such as Camp Cullen.

As far as future additional volunteer projects, I'm currently working on organizing a work weekend at the Big Bend Ranch State Park for next fall. Did I mention spending time with new and old friends in a nice place? If you know of a community service project that will help promote geoscience, please let me know. HGS can make the opportunity known to all our members.

HGS Scholarship Night & Dinner Meeting

HGS Foundation Scholarship & Calvert Memorial Fund February 11, 2019
Speakers: Cindy Yeilding, Senior VP for BP and Robert Ryan, former VP of Global Exploration for Chevron
Location: The Norris Center, City Center, 816 Town and Country Blvd. #210

SPONSORSHIP FORM

All event profits benefit the HGS Scholarship Funds.

Corporate Platinum Sponsor - $10,000
- Dedicated table with company logo
- 10 complimentary dinner registrations
- Drink Tickets for Icebreaker reception
- Formal recognition at event
- Company name & logo listed as sponsor on online registration page and in related HGS articles

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- Drink Tickets for Icebreaker reception
- Formal recognition at event

Corporate Gold Sponsor - $5,000
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- Drink Tickets for Icebreaker reception
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Corporate Bronze Sponsor - $1,000
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- Drink Tickets for Icebreaker reception
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Jim Tucker
editor.hgs@hgs.org

The New Year

The Houston Geological Society yearly cycle is half over, and it has been quite a whirl so far. We have had a range of technical topics at our meetings, and the successful biennial Africa Symposium and social events. More topical technical seminars are coming, along with the usual variety of technical meeting presentations. The late summer excitement about the possible sunsetting of the legislation authorizing the Texas Board of Professional Geoscientists demonstrated the effectiveness of concerted action by many geoscientists of varied technical occupations. Geoscience licensing in Texas looks like it will be reauthorized in the coming legislative session, but is not approved yet. We will keep *Bulletin* readers informed.

If you think you know your large oil fields and like word games, here is one from ExxonMobil: https://energyfactor.exxonmobil.com/news/circling-the-field/?utm_source=taboola_EF&utm_medium=cpc&utm_campaign=CirclingtheField&utm_content=core_XOME_ACX&utm_source=taboola&utm_medium=referral

Finally, have you seen any good geo vanity license plates lately? If so, send along a picture. Here is one, courtesy of Wayne Camp.

And volunteer for something this month. ■

The Houston Geological Society Continuing Education Committee Presents

Groundwater Hydrogeology

A Two-Day Short Course

by Dr. Christopher C. Mathewson, Regents Professor Emeritus, TAMU
Senior Training Specialist, TEEX

Monday-Tuesday, January 21-22, 2019 • 8 am

Pricing
$250.00

NO WALK-UPS ACCEPTED

Seating is limited to 49.

Registration: by January 15, 2019 or until the maximum registration of 49 attendees is reached.

Includes: Notebook, **Continuing Education Certificate–16 CEU**, Networking Lunch, Continental Breakfast, Coffee and Break refreshments.

This course is a fund-raiser for the Texas Geoscience Council, the state-wide umbrella coalition of geoscientific firms, professional organizations, and independent geoscientists, established on August 18, 2018 to "support the protection of the health, safety and welfare of all Texans through public education about geoscientific work and advocacy for professional geoscientist licensure in the Lone Star State.

Advisian
WorleyParsons Group

INTECSEA
WorleyParsons Group

Date: Monday-Tueday, January 21-22, 2019 • 8:00 am (Doors open at 7:00 am)
Location: WorleyParson, Suite 100, Energy Center II
575 North Dairy Ashford Road, Houston, Texas 77079
Please make your reservations on-line through the Houston Geological Society website www.hgs.org
For more information about this event, contact HGS Office 713-463-9476 • office@hgs.org

Course Description

This course exposes participants to the geological aspects of groundwater studies and relates the geology to practical aspects of groundwater investigations to develop basic problem solving and interpretative skills needed in the protection of human health and well-being. The curriculum consists of:

1. an introduction to the geology of groundwater systems and to the interpretation of the three-dimensional characterization of an aquifer system,
2. a discussion and hands-on exposure to techniques used in groundwater investigations,
3. techniques used in the characterization of groundwater systems
4. a discussion and demonstration of various well drilling and completion methods, and
5. an introduction to groundwater sampling and contaminant transport, with an emphasis on human induced errors in contamination evaluations.

Participants will gain hands-on exposure to groundwater hydrogeology theory and practice and the opportunity to learn about hydrogeological assumptions and errors that potentially impact public health, safety and well-being. Particular attention is given to the development of basic knowledge skills needed to evaluate and interpret groundwater systems and to assess human induced errors and complications in the interpretation and analysis process.

Course Objectives

The course objective is designed to present the basic geologic and porous media flow theory and concepts such that the participant can apply this information to the interpretation and analysis of groundwater systems. The course emphasizes the practical application of the theory and concepts of groundwater hydrogeology to the protection of the public health, safety and well-being. The teaching methods achieve this objective through hands-on activities throughout the course.

Topics Covered

- Course Administration and Introduction
- Hydrologic Cycle: Module 02
- Groundwater Systems: Module 03
- Groundwater Exploration: Module 04
- Environmental Drilling: Module 05
- Water/Monitor Well Design: Module 06
- Well Development and Testing: Module 07

Learning Objectives

Hydrologic Cycle

At the completion of the module, students will be able to 1) describe and understand the hydrologic cycle, 2) describe and understand moisture balance, 3) discuss severe meteorological processes and 4) Relate water rights

Groundwater Systems

At the completion of the module, students will be able to 1) define and recognize aquifer types, 2) understand and use environment of aquifer formation, and 3) relate geologic setting to predict aquifer characteristics

Groundwater Exploration

The educational objectives of this module are to introduce the student to groundwater exploration technologies and methods, including: 1) design and plan exploration and field operations, 2) apply aerial photography and photogrammetric techniques, 3) understand and apply various image analysis techniques and 4) use and assess geophysical investigation techniques

Environmental Drilling

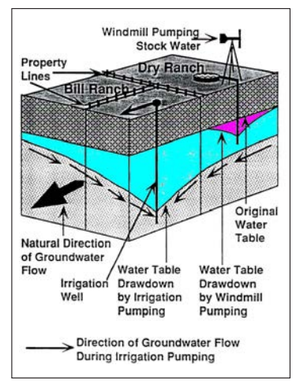
Students will learn about the various drilling techniques and their advantages and disadvantages in this module including the ability to 1) define the advantages and disadvantages of various drilling techniques and 2) evaluate drilling problems and operational safety

Water/Monitor Well Design

At the completion of the module, students will be able to 1) define the design parameters for various well purposes and uses, 2) estimate well performance and 3) assess design factors affecting well performance

Well Development and Testing

At the completion of the module, students will be able to 1) evaluate the degree of development of a well, 2) evaluate monitor/production well design and development techniques and 3) analyze external factors affecting well performance and aquifer test results



Target Audience

Geologists, geophysicists, and engineers preparing for initial licensing examination and experienced professionals wanting a review. This is a fundamental course particularly well suited as preparation for the ASBOG Hydrology Domain Exam.

Biographical Sketch

Christopher C. Mathewson has specialized in Engineering Geology at Texas A&M University, College Station, Texas since 1971. Professor Mathewson received a Bachelor of Science degree in Civil Engineering from Case Institute of Technology in Cleveland, Ohio, in 1963; and his Master of Science and Doctoral degrees in Geological Engineering from the University of Arizona in 1965 and 1971. Dr. Mathewson served as a commissioned officer in the National Ocean Survey from 1965 to 1970, working on ocean charting and marine geophysical surveys in the Pacific and on coastal hazards in Hawaii. At Texas A&M, he has carried out research on coastal and river processes, expansive soils, urban planning, surficial processes, groundwater resources and protection, natural hazard analyses and mitigation, archaeological site preservation and engineering geology of surface lignite mines.

He has presented over 400 papers, published over 90 technical papers, edited 4 technical volumes and is the author of a textbook in Engineering Geology. In addition, he is active in the profession, having served as President of the American Geoscience Institute – President of the Association of Environmental and Engineering Geologists – Chair of the Engineering Geology Division, Geological Society of America –Chair of the U.S. National Group, International Association of Engineering Geology, and the Environment, among many other society positions. Governor Perry appointed him to the Texas State Board of Professional Geoscientists in 2012. He has served on the Council of Examiners of the National Association of State Boards of Geology where he assists in the writing and review of the national Geologist Licensure Examination since 1992.

He has received many awards, including: the Faculty Distinguished Achievement Award in Teaching and the Robert C. Runnels Excellence in Advising Award from Texas A&M University – the Claire P. Holdredge Award, the Floyd T. Johnston Service Award, and the Karl and Ruth Terzaghi Outstanding Mentor Award from the Association of Environmental and Engineering Geologists and the Meritorious Service Award from the Engineering Geology Division of the Geological Society of America.

GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES

CALL FOR PAPERS
for the
GCAGS JOURNAL

The peer-reviewed journal for Gulf Coast geoscience.

GCAGS JOURNAL

Open Access • Fast Track • No Page Charges

The GCAGS Journal, the Journal of the Gulf Coast Association of Geological Societies, is soliciting manuscripts for the 2019 edition (our 8th volume). This peer-reviewed journal is focused on publishing studies of the geology of the onshore and offshore Gulf of Mexico. For the 2019 Journal, we are soliciting manuscripts particularly focused on the following themes, although other themes are welcome: Deepwater Gulf, Modern Technologies, Shale Play Assessment, Oil and Gas Field Studies, and the Mexico portion of Gulf of Mexico Basin.

Please submit an extended abstract of at least 600 words, including 1–2 representative figures, to the GCAGS Journal Editor, Bob Merrill, at rmerrill@catheart.com by December 15, 2018. Once topic is approved, a full manuscript must be submitted by April 2, 2019. GCAGS Convention presentations of Journal submissions are encouraged but not required. The 2019 Convention is scheduled for Houston, Texas.

Please visit www.gcags.org for open access to our seven previous volumes.

INTERESTED IN SERVING AS AN ASSOCIATE EDITOR?

The GCAGS Journal, a peer-reviewed Journal published yearly by the Gulf Coast Association of Geological Societies, is soliciting member societies for associate editors. You would be involved with managing the peer-review process for 1 to 3 manuscripts that are submitted for publication in the GCAGS Journal. Ideally associate editors will contribute their local knowledge and expertise to the editorial process. If you are interested in being an Associate Editor for the GCAGS Journal, please contact Bob Merrill at rmerrill@catheart.com.

CONGRATULATIONS! PRESIDENT'S AWARD FOR OUTSTANDING PAPER, GCAGS JOURNAL

The Gulf Coast Association of Geological Societies would like to congratulate Lauri A. Burke and co-authors Ofori N. Pearson, Scott A. Kinney, and Janet K. Pitman for their paper, "Methodology for correcting bottomhole temperatures acquired from wireline logging measurements in the onshore Gulf of Mexico Basin, USA" which was chosen to receive the President's Award for Outstanding Paper, GCAGS Journal (2018, vol. 7).

2019 Applied Geoscience Conference
1st "Subsurface Intelligence and Analytics" Conference

FIRST ANNOUNCEMENT

Houston Geological Society
2019 Applied Geoscience Conference

1st "Subsurface Intelligence and Analytics" Conference

Call for Content Papers

5th – 6th March 2019
Anadarko Petroleum Allison Tower
The Woodlands, TX

HGS Technical Committee
Rebecca Morgan, Co-Chair
Jason Simmons, Co-Chair
With Subsurface Digital Industry Experts

Deadline for Submission: Nov. **16th 2018**

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https://www.hgs.org/

Conference Overview

The 1st HGS Applied Geoscience Conference on Subsurface Intelligence / Digital Oil and Gas will be held in The Woodlands, TX in March 2019.

Digital Transformation of the Geoscience- hype or hope? When you ask an industry professional to define digital transformation, you find that the words mean something different to everyone. **However, one idea permeates, this could be a potential paradigm shift in the industry. How do we get from bytes to barrels, particularly in the Applied Geosciences field?**

A report from the World Economic Forum in 2017 states that Digital Transformation in the Oil and Gas industry could generate between $1.6 to $2.5 trillion for the industry, customers, and greater society over the next decade. **The Economist (May 6, 2017) recently stated that "the world's most valuable resource is no longer oil, but data."** What direction is the industry heading? What initiatives are currently ongoing?

The Two-day conference will cover the questions above and key issues related to the Applied Geosciences field: big data and advanced analytics, reliability and productivity, data storage, the changing workforce and digital transformation of the Geoscience disciplines. The workshop is open to a variety of topics and ideas, both from the industry and academia.

Conference Objectives

The main objective of this is to **achieve a better understanding of current digital work flows in the Geoscience disciplines as well as the latest advancements in utilizing new Digital Technologies.** We hope to create a collaborative environment between Geoscience and Industry professionals to present and discuss the Digital Transformation and fresh ideas that may apply to your workflows.

Who Should Attend

The list of topics will focus on Applied Geosciences and new digital technology, but will include discussions across the E&P lifecycle. **Consultants, Academics, Technology, and Industry professionals will all be suited for this event.**

2019 Applied Geoscience Conference
1st "Subsurface Intelligence and Analytics"

Theme & Schedule	Main Topic	Topic Focus Areas
Opening	Opening and Keynote Address Session	
Theme 1	**Digital Transformation – The Changing Workforce**	This theme focuses on the digital workforce and the skill sets needed for transformation. The session could be also open to HR professionals and will allow **technical discussion on the necessary skills and competency for Digital Transformation and the fears around workforce replacement.**
Theme 2	**Machine Learning and Data Analytics in Exploration and Production**	New technologies and advanced analytics are leading to updated workflows. Are we becoming more efficient in our workflows? How do we find more in Exploration? How do we produce more in Production? **How are the subsurface data being transformed and utilized in modern workflows?**
Theme 3	**Automation– Reliability and Productivity**	The challenges to increase reliability and productivity through automation in the digital world. This theme will explore how the Geosciences are turning to automation for faster decision-making. **Ideally the session will capture where industry-leading automation is occurring in the Geoscience field.**
Theme 4	**Leveraging Cloud and Machine Learning to Transform How Geoscientists Work Data**	With more and more data being captured, how are companies storing and accessing the data? This theme will examine how Geoscience databases are changing and the latest topics for streamlining data in different workflows. **What are the best approaches to storing and accessing Geoscience data?**
Theme 5	**Digital Transformation of the Geosciences - Hype or Hope**	The theme focuses on the Geoscience disciplines (Geology, Petrophysics, Reservoir Engineering, Geophysics, and Geochemistry) **and new digital efforts ongoing in each of them.**
Posters	**Student Poster Session**	
Closing	**Speaker and Poster Awards**	

2019 Applied Geoscience Conference
1st "Subsurface Intelligence and Analytics"

Submission Guidelines

We welcome submissions of all types, such as papers, case studies or reviews of new industry digital trends. We invite speakers to submit an abstract of maximum one (1) page (not exceeding 300 words). The information contained in your abstract is the basis for the acceptance of your paper into the program. The technical committee will look for content containing strong technical and innovative content.

We ask you to refrain from commercialism and focus on the promotion of subsurface intelligence and digital transformation as it applies to Geoscience. Submissions will be accepted online by emailing us at **AGC2019@hgs.org** . Abstracts submission deadline is **Friday, 16th November 2018**.

Important Dates

Registration open	31st August 2018 31st
Early bird deadline	December 2018 25th
Registration deadline	February 2019
Walk-up Registration	With availability

Fees

HGS members Early Bird $400 / Non-member $500

General Registration HGS members $450 / Non-member $550

1 Day HGS Member Registration $200 / non-member $250

Student Registration $100

Sponsorship

Enhance your visibility and corporate image by participating as a "Conference Sponsor" and presenting your technical expertise to a focused and exclusive regional audience. The conference offers a variety of sponsorship categories on a first-come basis. Companies interested are invited to Contact Thomas Reed @ thomasreed979@gmail.com or Andrea Peoples at andrea@hgs.org or call the HGS office at 713-463-9476

2019 Applied Geoscience Conference
1st "Subsurface Intelligence and Analytics" Conference

Guidelines For Abstract Submission

Please submit your abstract for either an oral presentation by sending it, as an email attachment to AGC2019@hgs.org . Submissions should be sent as soon as possible and no later than November 16th 2018.

Assessment of the abstracts will be based upon the quality and relevance to the suggested topics below:

- **Digital Transformation - The Changing Workforce**
- **Machine Learning and Data Analytics in Exploration and Production**
- **Automation – Reliability and Productivity**
- **Leveraging Cloud and Machine Learning to Transform Seismic and Geoscience Data Use**
- **Digital Transformation of the Geosciences – Hype or Hope**

Abstracts should be:

- Length should be 1 page (8½" x 11"), no more than 300 words, and may include diagrams in color or black and white, and references.
- Submit as MS Word documents with embedded graphics.
- Each file name should include the principle author's surname.
- Include contact information (email address) for the principle author in the abstract
- Indicate the speaker with an asterisk (*) after their name in the author list.

The principle author of submitted abstracts will be notified of the committee's decision no later than **December 14th 2018.**

Accepted Submissions

Each author of an accepted submission is requested to submit an EXTENDED ABSTRACT for their oral presentation by January 14th 2019.

The extended abstract may contain references, appendices, figures and maps. Please indicate if you **do NOT** wish this to be part of proceedings of the event.

2019 Applied Geoscience Conference

March 5-6, 2019

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Brand your company with the premier event designed for integrated asset teams. To sponsor, please contact Thomas Reed at thomasreed979@gmail.com or Andrea Peoples at **andrea@hgs.org** or **713.463.9476**

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Advertisement in Program Book	Full Page	1/2 Page	1/4 Page	1/8 Page	
Complimentary Full Registrations	4	3	2	1	
Complimentary Vendor Booth	✔	✔	✔		
Recognition by HGS in Program Book, onsite signage, post show highlights and thank you in HGS Bulletin	✔	✔	✔	✔	✔
Recognition in Conference Announcements and Website (logo with hyperlink)	✔	✔	✔	✔	✔

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14811 St. Mary's Ln. Ste. 250
Houston, TX 77079

For more information and to register please visit: www.hgs.org

2019 Applied Geoscience Conference

March 5-6, 2019

1st Subsurface Intelligence and Analytics Conference

To sponsor, please indicate your sponsorship level _____ with payment (payable to HGS) to:

HGS, 14811 St. Mary's Lane, Ste. #250, Houston, Texas 77079, Attn: Andrea Peoples.
You may also email your completed sponsorship form to **andrea@hgs.org**.

Name **Phone** **Amt. Enclosed**

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ANADARKO CONFERENCE CENTER
1201 Lake Robbins Drive, The Woodlands, TX 77380

For more information please visit: www.hgs.org

Wednesday, January 9, 2019

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.

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Mike Allison
Raptor Aerial Services

Drones – A New Tool for the Environmental and Engineering Geology Professional

The use of UAVs, unmanned aerial vehicles or drones, as they are more commonly referred to, is rapidly growing in many industries including oil and gas. The first drones were used for military purposes. Today, even though there are over 20,000 drones used by various armed forces worldwide, most drones are used for civilian purposes. In a recent report, the estimated number of Enterprise or Commercial-use drone shipments in 2016 was 110,000. This number will reach over 800,000 by 2021. Consumer drone shipments are expected to be around 29 million by 2021.

This talk will briefly cover types of drones, how drones work, and how they are being utilized to solve business problems in a more efficient, safer manner, and at a lower cost than traditional methods. FAA, Federal Aviation Administration, requirements, and regulations will also be covered. Actionable data products generated from drone imagery include high-resolution aerial photos and videos, Orthomosaic (photo maps), digital surface elevation models (DSM, DTM), 3D models, detailed measurements, such as area, volume, length, surface profiles, and infrastructure inspections (optical zoom, thermal imaging). Discuss how drone data seamlessly integrates with other applications, such as GIS, geographic information systems. Specific applications in flood control and surface mining will be discussed. Show some examples of other types of sensors being used on drones including gas leak detection, air quality, Ground Penetrating Radar (GPR) and other geophysical applications. ■

Biographical Sketch

Mike Allison holds a BS and MS in Geology. He has 34 years of experience in the upstream oil & gas industry. Mike's experience and background in both Geoscience and IT make him uniquely qualified to recognize how technical solutions can solve E&P business problems. Much of Mike's experience has been focused on leading IT teams directly supporting key E&P departments including Geosciences, Engineering, Spatial/GIS, Land and SCADA. He has worked for different O&G companies including Majors (Gulf Oil and Chevron), Independents (Devon Energy and Fieldwood Energy) and several Service Companies (Exploration Logging, Landmark Graphics, Geoscience Data Management and Moblize).

After leaving Fieldwood Energy, he founded a drone services company named Raptor Aerial Services (RAS). His company provides aerial mapping surveys, stockpile volumetric calculations, inspections, data collection and marketing to a variety of industries. The company provides solutions focused on increasing sales, reducing costs, saving time and improving safety. RAS is fully insured and FAA Part 107 certified.

Mike is an active member of AAPG, HGS and SPE. He has served as the Treasurer-Elect and Treasurer on the HGS Board. As a member of the HGS Continuing Education committee, he conceived and initiated the recording of HGS presentations now available at https://www.hgs.org/multimedia_overview. Last October, Mike taught an HGS Continuing Education Course entitled, "Introduction to Drones (UAVs) for Surveying in the Energy Business". He has made a number of presentations on the use of drones to various industry groups including the Montgomery County Extension Office, Energy Drone Coalition Summit & Expo,, HGS Flood Conference and SIPES.

HGS Shrimp Peel & Crawfish Boil

Friday April 26, 2019
12:00 noon – 6:00pm

Bear Creek Pioneers Park, 3535 War Memorial Street, Houston, TX 77084
(Pavilion #6 is located off Bear Creek Drive)

- **Boiled Shrimp – Boiled Crawfish (Corn & Potatoes)**
- **Beer & Beverage – Live Music**

Ticket Cost

- **HGS Member pre-order $30**
- **Non-member pre-order $35**
- **Walk ups (if available) $45**

Register online at WWW.HGS.org
www.hgs.org/shrimp_peel_2019

- **Sponsorship Opportunities**

Shrimp Sponsor $2000.00 - 6 Complimentary event tickets
Crawfish Sponsor $2000.00 - 6 Complimentary event tickets
Beer & Beverage Sponsor $1000.00 - 4 Complimentary event tickets
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Silver Corporate Sponsor $500.00 - 1 Complementary ticket
Bronze Corporate Sponsor $250.00

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713-463-9476 or email andrea@hgs.org

Monday, January 14, 2019

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

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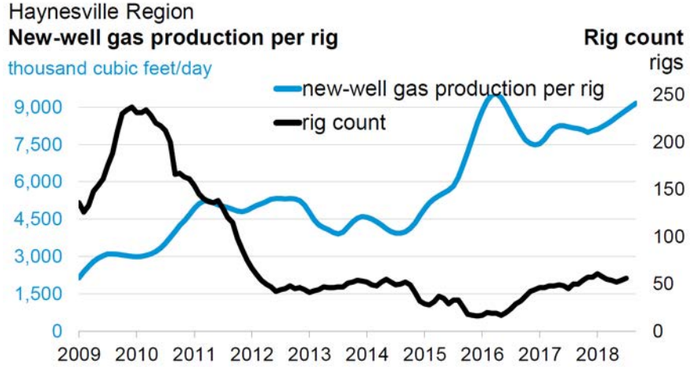
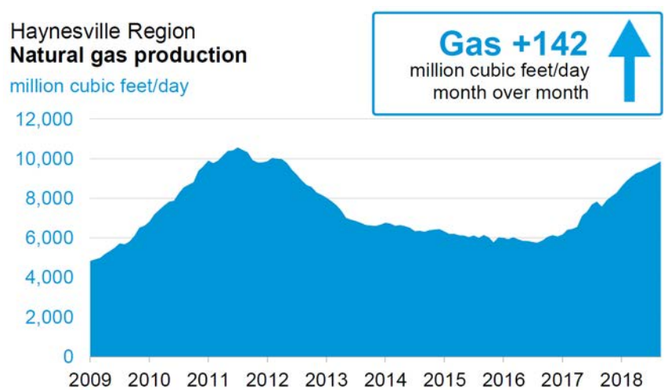
William D. DeMis
Rochelle Court, LLC

Haynesville Shale Gas Play: A U.S. Renaissance Driven by Technical Innovation

The shale-gas revolution continues despite the industry downturn. Lost among the recent headlines about exploding Permian Basin oil production and eye-popping deal valuations is the news that the Haynesville Shale has re-emerged as the major natural gas play in the US. Haynesville production has surged to a 3 year high of nearly 10 BCF/day, near its 2012 peak, whereas the number of rigs has only increased modestly. New wells production has doubled since 2016 to 8.6 million cubic feet per day. In addition to this good news are the surprising results from re-fracking existing horizontal Haynesville wells. The re-fracked wells are on track to produce more gas than the original completion.





The Haynesville geological properties make it a world class play: high porosity shown on logs (15%), high pressure (0.8 psi/ft or more), good thickness (200+ feet) and an excellent micro-pore system. Several non-geologic factors have driven the Haynesville Renaissance. Foremost are improvements in fracking technology. Fracture stimulations now use over 4,000 lbs per lateral foot. Second, Haynesville producers have easy access to gas pipelines that directly supply the re-emerging petrochemical industry of Louisiana, and the growing LNG export capacity of Southeast Louisiana. Haynesville gas has an advantage over Marcellus gas because of ample pipeline capacity without large deducts. Finally, Haynesville gas will be used for power generation in the Southeast US, displacing coal-fired power generation. Future demand for Haynesville gas will continue to grow.

The fracking revolution has been led by very small companies with limited staff who could quickly explore, innovate, and experiment to maximize returns for investors (e.g., Mitchell in the Barnett shale play, Southwestern Energy in the Fayetteville shale play, Petrohawk in the Eagle Ford, Lyco Enegy in the Bakken tight oil play of the Williston Basin). Now that proven, recoverable resources and their extraction method are documented, major companies are moving into resource plays (e.g., Exxon bought out Bass' acreage in the Delaware basin for $6.6 billion in 2017).

But the real story of the Haynesville is that American free-market capitalism and

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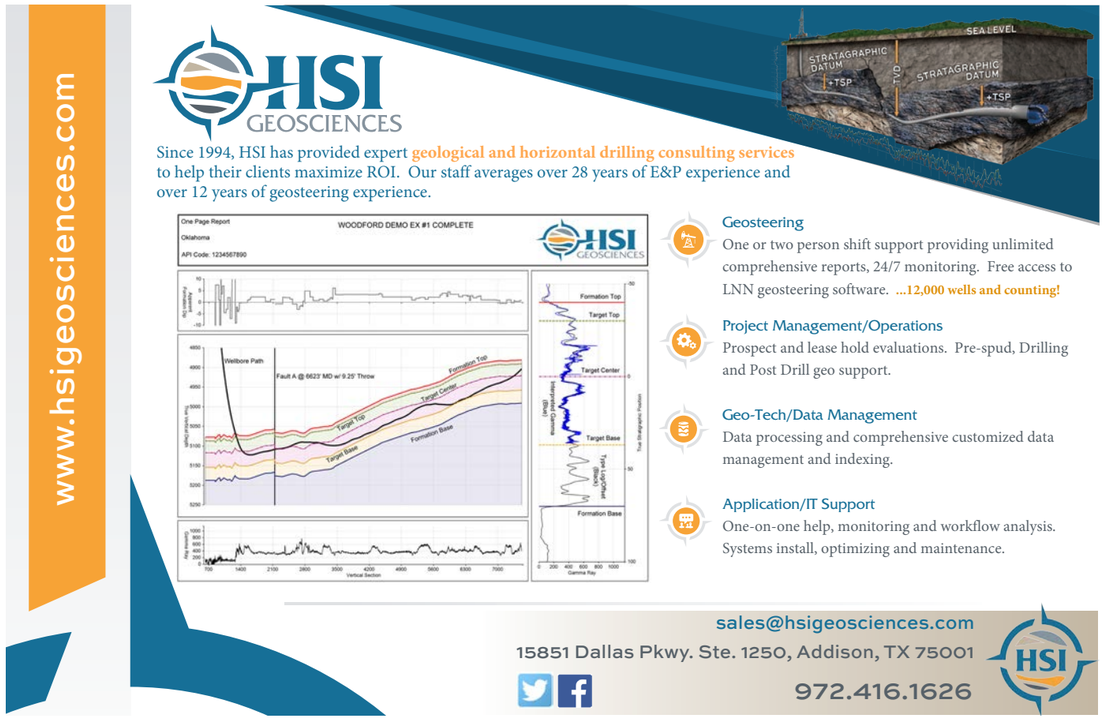
entrepreneurialism are – again - making the world richer and the planet cleaner (US CO_2 emissions have fallen since 2016. This drop is entirely because fracking-derived natural gas has displaced coal for power generation). The ever-improving frack designs and EURs seen in the Haynesville play are occurring in other resource plays, such as the tight oil plays of the Permian Basin. The techniques being refined in these tier-1 resource plays will ultimately propagate to less-profitable tier-2 and tier-3 shale plays. These lower tier shale plays will become America's production drivers of tomorrow.

Fracking is a disruptive technology, every bit as profound as Uber, Amazon, or Airbnb - it just isn't an app on a smart phone. America is now the largest oil producer on the planet. OPEC and Russia have been forced to cut oil production to maintain prices. In the 1970s, America and the world had to react to OPEC "oil price shocks". Today, OPEC has to deal with "American supply shocks". Who could have predicted this? American entrepreneurs continue to innovate and the world benefits greatly. ■

Biographical Sketch

William DeMis is President of Rochelle Court, LLC. He has over 30 years of industry experience with Pennzoil, Marathon Oil Company, Roxanna Oil, Southwestern Energy and Goldman Sachs. All of his work in the last 12 years has focused on unconventional plays. He has worked both domestic and international projects, and held a variety of technical and managerial positions. Bill was Exploration Manager (at Marathon), Exploration Vice President (at Roxanna Oil), and Senior Vice President and Chief Geologist (at Goldman Sachs). He has written papers on various topics in structural geology, subsurface geology, and oil prices. Bill was awarded AAPG National Awards for his analysis of US dollar exchange rates and the Real Global Price of oil in 1996 and 2000. He has won best paper awards from the GCAGS and the RMAG. In 2000, Mr. DeMis received the Dedicated Service Award from the West Texas Geological Society. Mr. DeMis received his Master's Degree from The University of Texas at Austin. Mr. DeMis an AAPG Charles Taylor Fellow, and has served as AAPG Books Editor, Associate Editor of the AAPG Bulletin, and chair of the publications committee. He is an AAPG Associate Trustee, a member of The University of Texas Littlefield Society, and a member of the RMAG and HGS.



Tuesday, January 15, 2019

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.

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Weixin "Wayne" Xu
Anish Kumar
Schlumberger

Identifying Geological Deformation Using High-Resolution Borehole Images in the Northern Gulf of Mexico Basin: Shale and Deformation Band Characterization

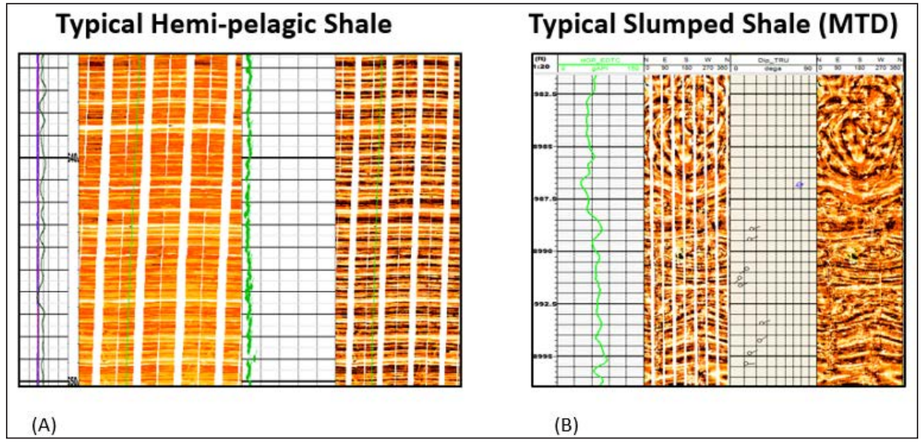

Figure 1. *Two types of shale observed with the new high-resolution borehole imager: (A) Hemi-pelagic shale, and (B) slumped (soft-deformed) shale.*

High-resolution borehole images have been applied to hydrocarbon exploration and field development for a few decades now and have been used to define sedimentary facies, lithology textures, paleo flow directions, faults, fractures, etc. Most wells in the Gulf of Mexico (GOM) are drilled with oil-based mud, and obtaining high quality borehole images was challenging. In 2014, a new high-resolution borehole image tool was introduced to the global geological community. Since then, the high quality borehole images have enabled tremendous progress in borehole image based geological interpretation in the deepwater GOM. This paper discusses two important geological phenomenon that ultimately could affect reservoir size, distribution, or quality.

One of the forefront areas of image interpretation is shale characterization. The drilling targets of wells in the GOM are typically reservoir sands. Not as much attention was paid to shales. Most shales encountered in deepwater GOM were considered to be hemi-pelagic that have relatively constant dip magnitude and dip azimuth (**Figure 1A**). The new images, however, reveal that large footages of shale penetrated by wells have slumped bocks, deformed bedding, distribution of broken beds, boulders, cobbles, etc., and show wide ranges of dip magnitudes and variable dip azimuths (**Figure 1B**). These shales, therefore, can be interpreted as either mass transported deposit or slumped (soft-deformed) shale. The dip information of these shales can be, and has been, used to predict sand distribution in mini-basins, and to better understand the impacts of mass transported deposits.

One of the major risks in the oil exploration and development in the GOM is compartmentalization, which can be caused by faults, lithofacies change, and deformation bands. The newly deployed high-resolution borehole imager can picture fractures and deformation bands much clearer than the legacy oil-based

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borehole imagers(**Figure 2**). Since those high-angle features can be interpreted as either deformation bands or conductive fractures, it is best to get core data to verify the interpretation. With the help of core data and a computer, the orientation of those features can be determined (**Figure 3**). The final interpreted results can be used in reservoir property modeling and simulation, and can be applied to an entire field.

Geological interpretation in the deepwater GOM can be extremely challenging. The new borehole images offer much needed detailed observations of the geology in the well. Understanding the shales that bound the reservoirs, and may even have direct influence on their size and distribution, is imperative. Baffling within in a reservoir caused by deformation bands affects the ultimate producible reserves. Understanding of deformation bands is also very important. With this added knowledge, the development geologist is far better equipped to make realistic field models than ever before. ■

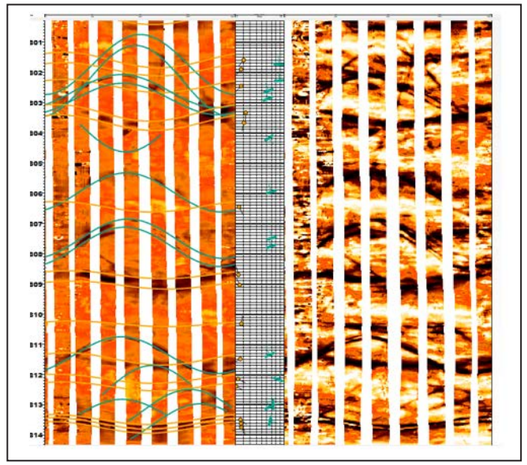

Figure 2. *Deformation bands observed on the high-resolution borehole image. Left column: Static image; Middle column: dip interpretation; Right column: Dynamic image.*

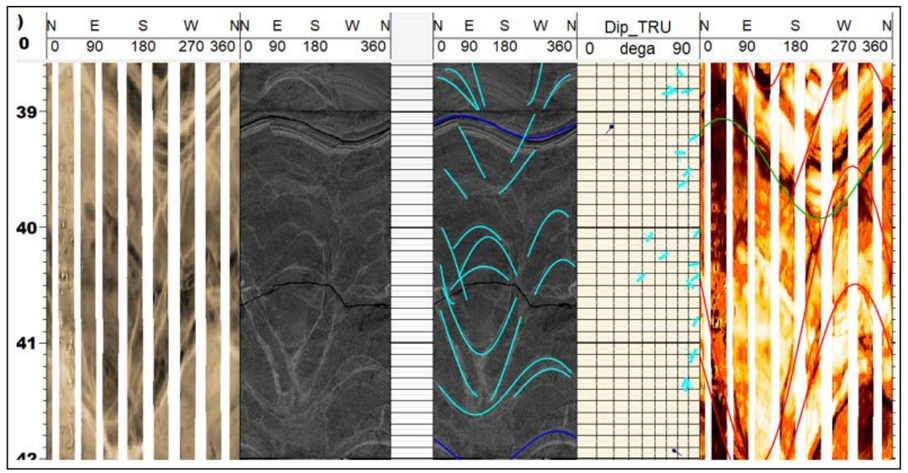

Figure 3. *Deformation bands observed on the high-resolution borehole image and core. Columns from left to right: 1. depth index; 2. enhanced high-resolution borehole image; 3. core photo; 4. core photo with dip interpretation; 5. dip interpretation; 6. high-resolution borehole image with interpretation.*

Biograhical Sketches

Weixin "Wayne" Xu holds a BS degree (Zhejiang University), a MS degree (Petrol China) and a PhD degree (University of Michigan), all in geology. He joined Schlumberger in 1998; and is a principal geologist in the company now. During the past 13 years, he has been interpreting logs for oil companies in the Gulf of Mexico area and other domestic and international basins. His main interest is integrated petroleum geology.

Anish Kumar received his PhD in Geology at Texas Tech University in 1997. He worked with Special Core Analysis Labs, Inc., Midland, Texas, as a Geologist and Lab Manager till 2001, when he began his career with Schlumberger in New Orleans as an Interpretation Development Geologist with a focus on Borehole Geology and deepwater deposits. Anish is currently based in Houston and is a Geology Domain Champion for Schlumberger's Western Hemisphere Wireline operation

HGS General Luncheon Meeting

Wednesday, January 23, 2019

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

Cost: $35 Preregistered members; $40 non-members/walk-ups

To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.
Pre-registration without payment will not be accepted.
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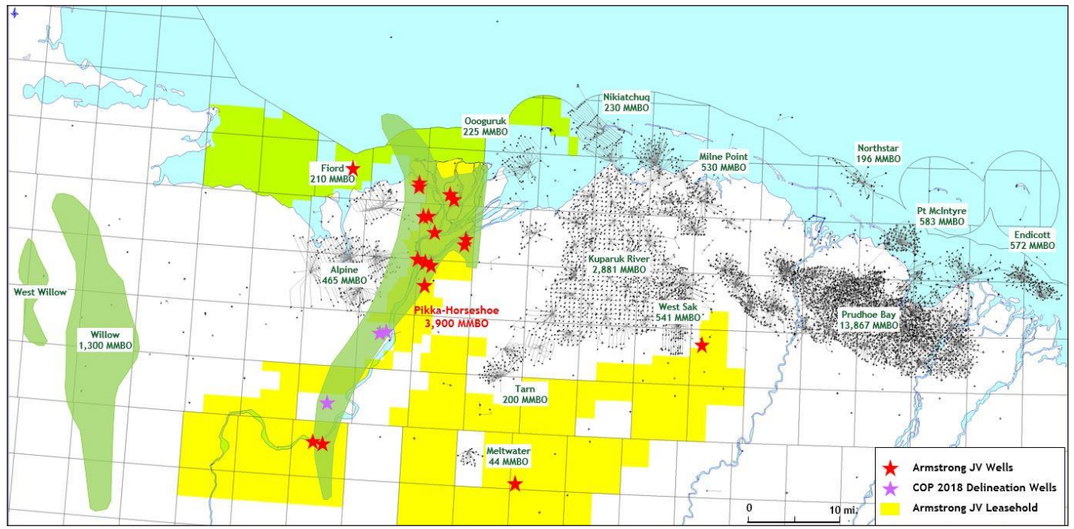
Matt Furin, Jesse Sommer, Jeff Lyslo, Colby Vandenberg, and Kevin Dorrington
Armstrong Oil & Gas

How The Giant Pikka Field and World Class Nanushuk Play Lay Hidden Within the North Slope Basin of Alaska

The North Slope of Alaska is a very prolific petroleum producing province that contains North America's largest oil field, Prudhoe Bay Field as well as a number of other giant to super-giant fields. Although the area was considered to be past its prime for exploration, in 2013 Armstrong/Repsol discovered the Pikka Field between two existing fields that were discovered in 1969 and 1994. The primary reservoir for the Pikka Field discovery is the Cretaceous Nanushuk Group, a previously under explored interval that lies above the historically productive zones. In 2017 Armstrong Energy drilled the Horseshoe #1 and 1A wells 22 miles south of the discovery well and confirmed super-giant status for Pikka Field. A total of 14 delineation and appraisal wells have been drilled to date in the field. The Pikka discovery also established the Nanushuk Group as a new "world class" play and in 2017 ConocoPhillips announced the Willow Nanushuk discovery 30 miles to the west. These discoveries led the USGS to revise their assessment for undiscovered resources in the Nanushuk play to 1.75 to 21.9 BBO with a mean of 8.8 BBO. This presentation will give a brief review of Armstrong's exploration history and the concept that led to the discovery. It will also detail the components of the Pikka trap, reservoir and geophysical response of the reservoir. ■

HGS General Luncheon *continued on page 26*



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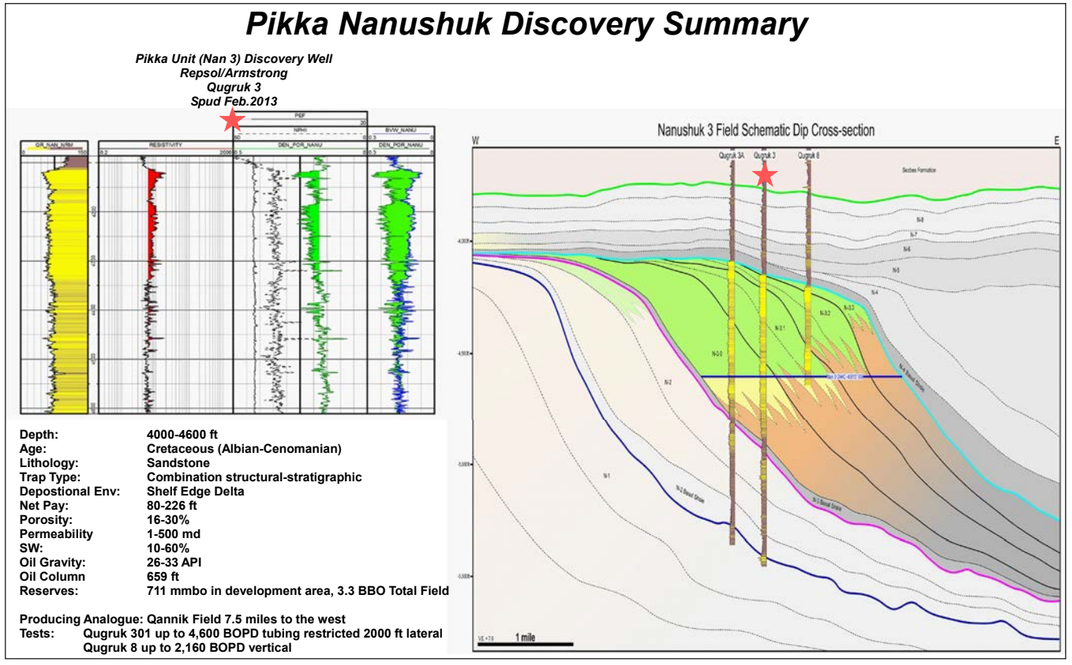

Biographical Sketch

Matt Furin

College History

Bachelor of Science, University of Dayton –1979

Master of Science, Northeast Louisiana University – 1981

Employment History

1981-1983	Exxon Production USA Andrews, Texas Permian Basin, Northwest Shelf
1983-1987	Exxon Production/Exploration Midland, Texas Permian Basin, Rocky Mountains
1987-1991	Exxon Exploration Spvsr Houston Texas Southeast Louisiana
1991-1993	Exxon Alaska Exploration Mgr Houston Texas North Slope Alaska, Interior Basins, ANWR
1993-1996	Gulf Coast Geoscience Production Mgr New Orleans, Louisiana Onshore Gulf Coast and Offshore Gulf of Mexico
1996-2001	ExxonMobil Exploration Company Mgr Houston Texas Europe/CIS New Ventures, EVCIS. Western Gulf
2001-Present	Armstrong Oil and Gas VP of Geoscience Denver, Colorado/Houston, Texas North Slope, GOM, Onshore Louisiana

Monday, January 28, 2019

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.
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James Pindell (speaker)
Rice University and Tectonic Analysis Ltd., Sussex UK
Brian Horn
ION Geophysical, Houston TX

The Greater Gulf of Mexico: What We Know, and What We Don't

This talk addresses the paleotectonic and paleogeographic evolution of the Greater Gulf of Mexico, covering the Gulf itself along with the Jurassic and Laramide events in Mexico and the progressive collision of the Antilles Arc with southern and eastern Yucatan and then the Bahamas Platform. An integrated evolutionary model for Gulf opening, supported by aeromagnetic and regional seismic reflection data sets, is set within the framework provided by Atlantic opening kinematics and the history of Caribbean-North American relative plate motion. For the Gulf of Mexico, we will review the extent of oceanic crust, image the sub-salt section, discuss pros and cons of various rift models, assess early subsidence history and some aspects of ongoing debate, timing of salt deposition in relation to basement tectonics, and some pertinent aspects of Cretaceous and Tertiary depositional history. For the Caribbean story along the southern and southeastern Gulf of Mexico, we document first arrival of flysch deposition into the Gulf margins, the timing of arc–continent collisions, and the opening of the Yucatan Basin which played an important role in the collision of the Cuban Arc with the Bahamas. We summarise what we can be confident about, what we shouldn't be confident about (but sometimes are), what is widely believed but is demonstrably wrong, and what remains unexplained. This talk is an appraisal of where we stand today and where we could continue to investigate. ■

Biographical Sketch

Jim Pindell has directed Tectonic Analysis Ltd. since 1986, which integrates plate tectonic data with geology to create regional evolutionary syntheses and to constrain aspects of petroleum systems. Concurrently, Jim has held academic research positions at Lamont Earth Observatory, Dartmouth College, Rice University, and Cardiff University (Wales). Jim has a PhD in geology from the University of Durham, England (1985), a MS from SUNY Albany (1982), and a BA from Colgate University (1979). Jim teaches, consults and directs industrially-funded research programs, with past efforts in Colombia, Venezuela, Trinidad, Barbados, the Andes, the Atlantic and its margins, the Caribbean islands, Mexico, and the Gulf of Mexico. Jim has published about 80 papers and articles on these regions, and has been studying passive margin development with ION Geophysical in Houston since 2010.

Searching for Past HGS Publications

We are trying to compile a complete listing of HGS publications over the years, and include those we have not yet captured into the Datapages online database. For those not familiar with Datapages, it is an online database of images of worldwide geoscience publications, operated by the AAPG. Currently all the legacy HGS Bulletins are included, as well as the special publications listed below. The HGS benefits significantly from sales of these online publications.

So, we are looking for both references to, and copies of, any HGS publications we have not yet located. The floods of recent years have destroyed many of our stored publications we would have otherwise available.

If you are sorting out your library, or have digital copies of any recent HGS publications, please send this information to: editor.hgs@hgs.org. Many thanks.

HGS Special Publications Available on Datapages Archive Online Database (as of April 2, 2018)

Disappointing Seismic Anomalies: Dry Hole Symposium #2, 2003

Deepwater Gulf of Mexico Dry Hole Seminar, 2000

Countdown to the 21st Century Houston Geological Society Technical Symposium, March 31, 1998

Environmental Geology and Genetic Sequence Analysis of the Trinity River Valley-Delta Region, Chambers and Liberty Counties, Texas, 1990

The Downdip Yegua: State of the Trend, 1989

Typical Oil and Gas Fields of Southeast Texas - Vol. 2, 1987

Field Seminar of the Big Bend, Trans-Pecos Region, Texas, 1986

Finding Deep Sands in the Gulf Coast Tertiary, 1984

Houston Area Environmental Geology: Surface Faulting, Ground Subsidence, Hazard Liability, 1981

Claiborne Sediments of the Brazos Valley, Southeast Texas, 1979

Lignite Resources in East-Central Texas, 1979

Oil Fields and Their Relation to Subsidence and Active Surface Faulting in the Houston Area, 1979

Stratigraphic Cross Sections of Southeast Texas, 1979

Damon Mound: Field Trip Guidebook, 1978

The Chenier Plain and Modern Coastal Environments, Southwestern Louisiana and Geomorphology of the Pleistocene Beaumont Trinity River Delta Plain, 1978

Geology of Alternate Energy Resources in the South-Central United States, 1977

Deltas: Models for Exploration, 1975

Structure, Stratigraphy and Petroleum Potential of the Northern Gulf of Mexico, 1974

Abnormal Subsurface Pressure: A Study Group Report, 1969-1971, 1971

Deltas of the World, Modern and Ancient: Bibliography, 1971

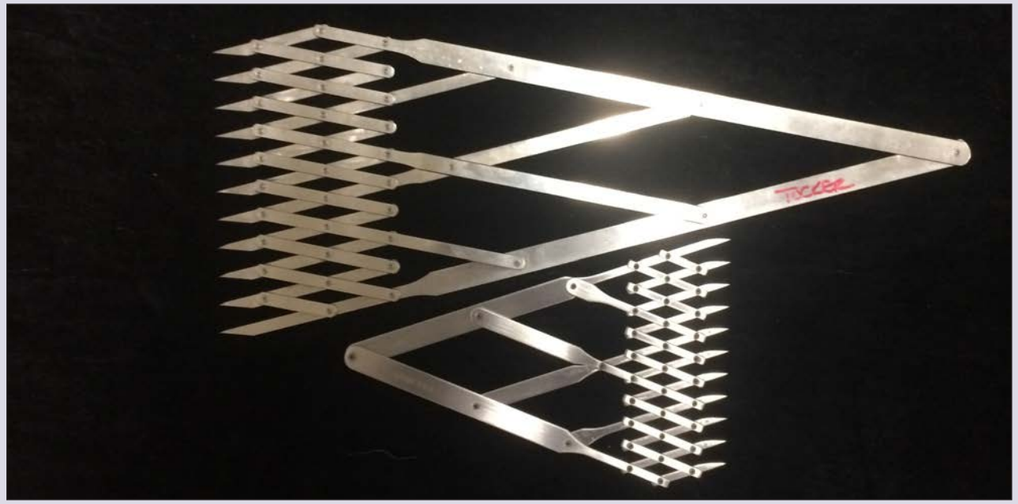
Holocene Geology of the Galveston Bay Area, 1969

Environments of Deposition, Wilcox Group: Field Trip Guidebook, Texas Gulf Coast, 1968

Deltas in Their Geologic Framework, 1966

Guidebook to the Geology of El Rancho Cima, Hays and Comal Counties, Texas: A Guidebook for Boy Scouts, 1963

Early Career Quiz



This is a recollection of useful tools no longer in common use.
It is encouraged to ask a colleague to talk about this.

The winner of a HGS meeting registration is the first respondent to editor.hgs@hgs.org that:

1. Correctly names the items in the picture,
2. Explains their use, and
3. Has worked the fewest number of years and months as a professional geoscientist.

Send your answers to: editor.hgs@hgs.org. Have fun.

The December quiz brought the following comments from an Associate Member, who described himself as a "landman from the Precambrian Era".

The items pictured in the December HGS *Bulletin* were/are known as Allen Engineering Scales and Allen Miscellaneous Scales. Your photo wisely obscured the top "title" scale from view.

No doubt you found them while cleaning out the desk/office of a departed senior colleague. You probably also found a lot of dirty pipe cleaners and stale tobacco, yellowed, crumbling paper log prints and eraser dust in there too.

The scales in question were copyrighted and sold for many years by Mr. Kibbee R. Allen, of Houston. I'm not sure where they could be purchased today, (and I have no need to find out, because I literally bought a stash of spares about 15 years ago).

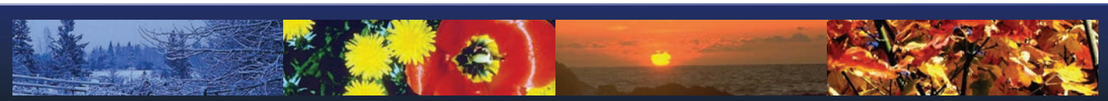
I cannot really remember Mr. Allen, or even what his primary occupation was, but he sold a heck of a lot of these scales and they were very useful. They were pretty much "standard issue", so to speak, for young petroleum landmen such as I was.

The potential uses for the scales were limited only by your imagination. What made them unique was that the complete set included almost every possible variation of scale, coupled with almost every unit of measure known to the Western world. Ever heard of an arpent? Or a perch, a vara or a pole? Kibbee had them all in there.

On top of that, they came in an attractive "leather" (vinyl) carrying case.

(Mine were actually in a dusty box—Ed.)

January 2019 GeoEvents



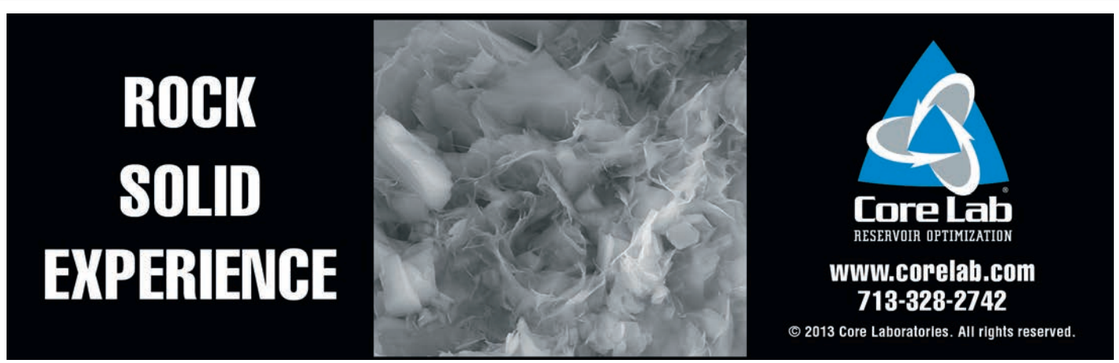
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Members Pre-registered Prices: Dinner Meetings members..... $40 Emeritus/Honorary members..... $40 Student members ..... $10 Nonmembers & walk-ups ..... $45 Except - Env. & Eng. ..... $30 Nonmembers & walk-ups ..... $35 Emeritus/Honorary members..... $15	1	2 3		4 **Don't wait, make your reservations online at hgs.org**	5
6	7	8 **HGS Board Meeting** *6 p.m.*	9 **HGS Environmental & Engineering Dinner Meeting** *"Drones – A New Tool for the Environmental and Engineering Geology Professionals," Mike Allison, Page 19*	10	11	12
13	14 **HGS General Dinner Meeting** *"Haynesville Shale Gas Play: A U.S. Renaissance Driven by Technical Innovation," William D. DeMis, Page 21*	15 **HGS Northsiders Luncheon Meeting** *"Haynesville Shale Gas Play: Identifying Geological Deformation Using High-Resolution Borehole Images in the Northern Gulf of Mexico Basin: Shale and Deformation Band Characterization," Weixin "Wayne" Xu and Anish Kumar, Page 23*	16	17	18	19
20	21 **Two Day Continiung Education Course Groundwater Hydrogeology** *WorleyParson Houston Page 8*	22	23 **HGS General Luncheon Meeting** *"How the Giant Pikka Field and World Class Nanushuk Play Lay Hidden Within the North Slope Basin of Alaska" Matt Furin, Page 25*	24	25	26
27	28 **HGS North American Dinner Meeting** *"The Greater Gulf of Mexico: What We Know, and What We Don't," James Pindell, Page 27*	29	30	31	**Reservations:** The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail office@hgs.org, or call the office at 713-463-9476. **Reservations for HGS meetings must be made or cancelled by the date shown on the HGS Website calendar, normally that is 24 hours before hand or on the last business day before the event**. If you make your reservation on the Website or by email, an email confirmation will be sent to you. If you do not receive a confirmation, check with the Webmaster@hgs.org. Once the meals are ordered and name tags and lists are prepared, no more reservations can be added even if they are sent. **No-shows will be billed.**	

March 5 – 6, 2019
HGS Applied Geoscience Conference
Subsurface intelligence and Analytics, Page 9

March 23 – 31, 2019
Explore the Solitario Flatirons with HGS Fieldtrip
Big Bend Ranch State Park, Page 18

May 19 – 22, 2019
AAPG 2019 Annual Convention & Exhibition
San Antonio, Texas, USA

July 22 – 24, 2019
Unconventional Resources Technology Conference (URTeC 2019)
Denver, Colorado



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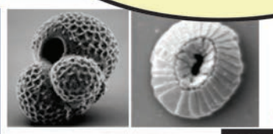

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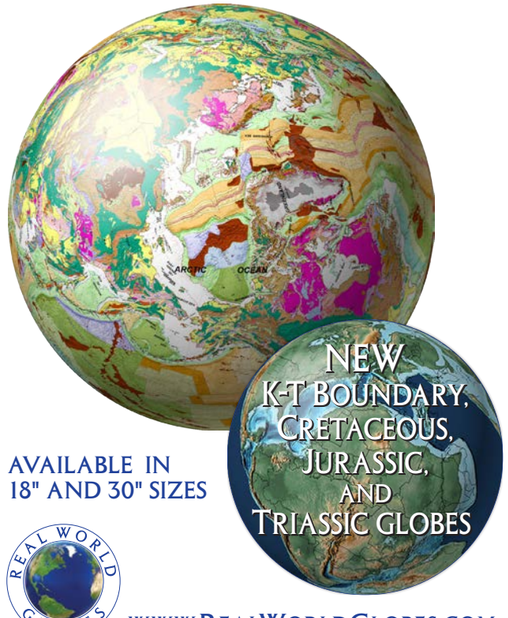

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Fluvial Tapestries: GeoArt of Hurricane Harvey

By Katharine Kendall, Artist; Jerome Kendall, University of New Mexico

Geologists have a unique perspective as the science of geology considers events that occur well beyond the lifespan of humans. Their training hones the skills to read features in the physical world and consider what created those details and when they were formed in scales of millions and billions of years. The details they interpret become visual representations of the time they were formed, so when looking at the landscape geologists see beyond the evidence of humans and life as we know it into the deeper, longer time that creates the infrastructure of the earth itself. We call this "earth time". Earth time chronicles the long-term effects of earth's natural processes and the physical features produced over time scales well beyond what has or will happen in a month, year, decade or century. This awareness and recognition of a deeper earth time combined with human-built landscapes enriches a geologist's assessment of the values and needs of our present human moment.

Today the human time scale dominates our social and political values and choices. We make decisions based on the scale of a human lifetime even as there is an awareness of human history, dating from a few thousand years. In the context of describing the natural world there are terms like 100-year flood and 500-year flood; however, even these terms are too abstract for most people to recognize their value in relation to their own lives. Our contemporary time is seems faster with new technology pushing us well beyond physical processes of horsepower and steam power into digital speed through internet cables (when asked 'how fast does Google search' Google returned 4,230,000,000 results in 0.64 seconds as displayed just under the search bar where the search was enacted). This kind of speed and time is what we expect in the contemporary world. It's what the general population can relate to. However, geologists have the ability to describe something

Fluvial Tapestries: GeoArt of Hurricane Harvey *continued on page 34*

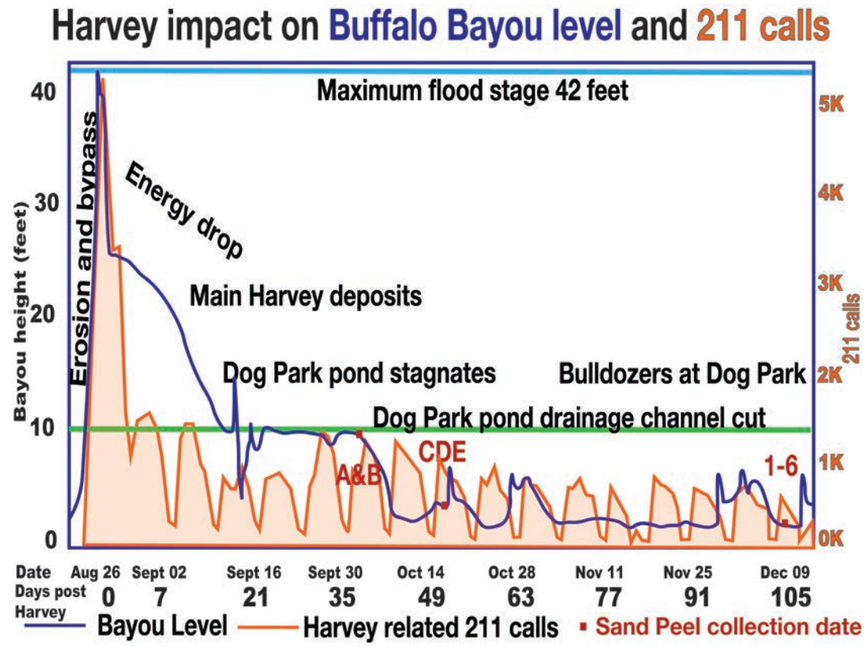

Figure 1. Hurricane Harvey Buffalo Bayou water level and 2-1-1 Calls. *The chart plots Buffalo Bayou water level at the Shepard bridge (USGS, 2017) (solid dark blue line in feet elevation scale, on left, location shown as black dot on* ***Figure 2****) and United Way 2-1-1 Harvey related telephone call volume (HCDC, 2017) (orange line above light orange color fill with scale in thousands of calls per day on the right; location shown as red dot on Figure 2) over time. The small red squares indicate the dates of sand peel collection. During the first 30 days, calls reached over 5000 per day as the water level peaked, then dropped to below 1000 per day. These calls were dominantly for food and shelter assistance. During this period, at its peak level of 42 feet elevation (dashed horizontal blue line), the bayou eroded older deposits, then deposited most of the sand bars as the water level dropped to 10 feet from its maximum. Approximately 30-40 days post-Harvey, the volume of calls nearly doubled and changed to FEMA registration, housing, and utility assistance. The bayou drops below 10 feet (horizontal green line) and starts to adjust during this period. One adjustment is the cutting of a channel through a new sand bar facilitating the drainage of a pond formed in the dog park. At the 100-day mark, the telephone call level dropped to hundreds per day with more of a focus on financial assistance, while the sand peels record the continued drainage of the dog park and reworking of the deposits by bulldozers during the recovery effort.*

Fluvial Tapestries: GeoArt of Hurricane Harvey continued from page 33

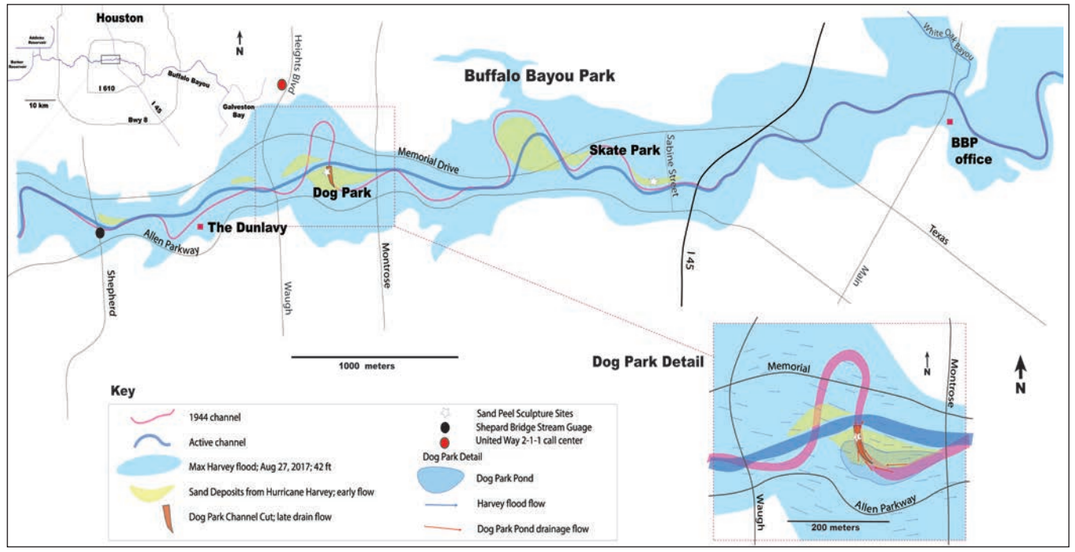

Figure 2. Map of the Hurricane Harvey flood waters in Buffalo Bayou Park. *The upper left is a location map showing Buffalo Bayou and major highways. The dark blue line is the current active channel, the red line is the 1944 channel and the blue polygon is the maximum extent of flooding (Harris County Flood Control District, 2017). The light green areas mark the extent of ~3-13 feet (1-4 m) sand bar deposits. Note the correlation between sand bar deposits and the places where the bayou has been artificially straightened. Over 600 million pounds of sand, enough to fill NRG stadium 11 feet deep, were removed during the recovery efforts (BBP, 2017). The detail of the dog park area in the lower right shows a sand bar that is later cut by a channel (orange polygon) draining a pond that formed in the dog park. The blue arrows show the net flow direction of the bayou during flood while the red arrows represent the net flow as the bayou adjusted when the water level dropped below ~10 feet (~3 m), draining the dog park.*

different that is vital to humans' relationships to the natural world around them, especially as that world changes in its own time scale with melting glaciers and rising oceans. We need a way to consider both human time and earth time to understand and adapt to our rapidly changing world.

In August 2017 Hurricane Harvey made landfall on the gulf coast of Texas. Many areas received more than 40 inches (~1,000 mm) of rain as the system slowly meandered over eastern Texas and adjacent waters, causing unprecedented flooding over a four-day period. Harvey was the wettest tropical cyclone on record in the United States (Roth, 2018), with peak accumulation of 60.58 in (1,539 mm), in Nederland, Texas,. Record water levels occurred at every bridge crossing along Buffalo Bayou (**Figure 1**). The Harris County Flood Control District recorded one out of every ten buildings in Harris County flooded during Hurricane Harvey (Lindner and Fitzgerald, 2017). Floodwaters carried sediment as it swept downstream towards the Gulf, utilizing the bayou system to channel and move floodwaters out to the Gulf of Mexico. In Buffalo Bayou alone the storm deposited over 600 million pounds of sand, enough sand to fill NRG stadium 11 feet deep according to Buffalo Bayou Partnership (BBP, 2017). These deposits created a prime opportunity for local geologist Jerry Kendall and his daughter and artist Kate Kendall to create sand peels in their own backyard with the intention of combining their skills to create both science and art objects that would tell a distinctive story of Hurricane Harvey and its effects on Houston, TX.

From October 2017 to June 2018 a team of artists and geologists led by Kate Kendall and Jerry Kendall, working in communication with the Buffalo Bayou Partnership (BBP) and the University of Houston Department of Earth and Atmospheric Sciences, collected 12 sand peels from sediment deposits left by Hurricane Harvey in Buffalo Bayou Park (**Figure 2**). Taken from two locations near the Johnny Steele Dog Park and the Lee and Joe Jamail Skatepark, the sand peels capture and preserve the sedimentary structures and layers deposited during the flood. These layers are interpreted to indicate the directions of water/sediment flow, the time of maximum flow and floodwaters, the time(s) of adjustment, and the recovery efforts on the part of the Buffalo Bayou Partnership stabilization crew (**Figures 3, 4,** and **5**). The sedimentary structures are the result of the evolving energy levels and sediment load carried by Buffalo Bayou as rainfall was unleashed by Hurricane Harvey. These can be dated in approximate time when compared to the stream gauge at the Shepherd bridge (**Figure 1**).

Fluvial Tapestries: GeoArt of Hurricane Harvey *continued on page 36*

Figure 3. *Sand peel sculpture of the waning flood*

Figure 3a. Interpreted sand peel sculpture of the waning flood. *Flood: The sand on clay contact near the base of the sand peel records erosion at the peak of Harvey flooding early on the morning of August 27th (blue line). The approximately 24-inch-thick broadly layered fine sand above the erosional base records the initial deposits from waning flow of Buffalo Bayou during the next ~20 days. In the upper right corner of the sculpture, above an erosional surface, are shorter wavelength bed forms and ripple marks interpreted to result from reduced flow rates. This phase deposited a sand bar up to ~12 feet (3.5m) thick. The flow direction of the bayou is towards the viewer.*
All the sand peel sculptures are shown as mirror images so the orientations are as they appeared in the outcrops. The red arrows indicate the net flow direction. Up arrow is for flow away from the viewer and a down arrow is toward the viewer.

Fluvial Tapestries: GeoArt of Hurricane Harvey *continued from page 35*

Figure 4. *Sand peel sculpture of the flood and adjustment phase*

Technical Article

Fluvial Tapestries: GeoArt of Hurricane Harvey *continued from page 37*

Figure 5. *Sand peel sculpture of the flood, adjustment and recovery phase*

Technical Article

Fluvial Tapestries: GeoArt of Hurricane Harvey continued from page 39

A special feature of these sand peels is existing in both earth time and human time. It is rare in the geologic community that a rock or a sediment deposit can be pinpointed to a specific and exact time of creation on any human time scale. The sediments deposited during Hurricane Harvey can be correlated to specific points in earth and human times using data from the Shepherd bridge stream gauge. The main sand peel extraction site at the dog park is the United Way 211 Call Center where human events are being recorded, a few hundred meters downstream from the Shepherd bridge stream gauge. Figure 1 shows the Buffalo Bayou water level at the Shepherd bridge (USGS, 2017) and the United Way 2-1-1 Harvey related telephone call volume to Houston Community Data Connections (HCDC, 2017) for approximately 100 days following Hurricane Harvey. The sand peels (white stars on **Figure 2**), stream gauge (black dot on Figure 2) and 2-1-1 call center (red dot on **Figure 2**) capture the bayou's geologic record, water level, and human impact of Hurricane Harvey at essentially the same location. The records of 2-1-1 calls closely correlate with the flood gauge water levels, with the highest volume of calls during the peak flood water levels and a corresponding drop in calls when water levels receded. 2-1-1 also tracks the needs of each caller: Harvey calls related first to instant needs of food and shelter and transitioned after 30 days to basic immediate needs of living expenses with a spike when rent was due. After 90 days, most calls were related to recovery needs of employment assistance and home repair. The data sets from the stream gauge, the 2-1-1 calls and the sand peels are used to create a timeline that contains both human and geologic time elements and supports the interpretations.

Along with geologic interpretations, these sand peels are designed as art objects with specific features that highlight aspects of their creation and potential poetic analyses of the natural and human processes that created them. The process of collecting the peels is both artistic and scientific and the sand peel sculptures present not only their geology but also their production process, which is painterly and specific and relies both on technique and chance. Each peel is unique in both its geology (structure, location and time) and also in its process of extraction as each location had specific moisture and permeability variations, each time of extraction had specific weather conditions and each pass with the brush to apply the liquid polymer had a unique stroke and penetration, all of which give each sand peel its own shape, texture and relief. After using a fixative to strengthen their integrity, each of the 12 resulting sand peels taken from Buffalo Bayou was cut to a unique shape to highlight the stratification and/or the shape of the original peel as it was pulled from its site. These shapes were then traced and cut to create custom mounting boards for each peel. This technique leaves little to no edge to frame the peels and allows them to float frameless as a finished pieces of art. Any holes in the original peels were also cut out of the mounting boards, preserving the gaps where the polymer did not impregnate the sediment and evidence of the variability in the collection process. Custom brackets made of

Figure 4a. Interpreted sand peel sculpture of the flood and adjustment phase
Flood: *The irregular sand on clay contact near the base of the sand peel records erosion at the peak of Harvey flooding early on the morning of August 27th (blue line). The approximately 6-inch-thick layer of finely structured sand records the waning flow of Buffalo Bayou during the next 20 or so days. This flood phase deposited thick a sand bar but only a thin remnant remains (blue to green line). The flow direction is away from the viewer.*
Adjustment: *Approximately 45 days after Harvey, Buffalo Bayou dropped 10 feet (~3m), receding back to its channel, and water began to drain from a pond formed at the dog park. After ~ October 5th, the rapidly draining pond partially eroded the sand bar, then deposited the sand in the upper 4/5ths of the sculpture (above green line). This peel also captures an additional event from a thunderstorm in November that refilled the dog park pond and deposited a new layer of mud (dashed green line). This later drainage of the pond again deposited additional sand and debris in the upper 1/5th of the tapestry. For the adjustment period, (above green line) the flow direction is from right to left.*

Figure 5a. Interpreted sand peel sculpture of the flood, adjustment and recovery phase
Flood: *The irregular sand on clay contact near the base of the sand peel records erosion at the peak of Harvey flooding early on the morning of August 27th (blue line). The approximately 10-inch-thick layer of finely structured sand records the waning flow of Buffalo Bayou during the next 20 or so days. This flood phase deposited a thick sand bar but only thin remnant remains (blue to green line). The flow direction is away from the viewer.*
Adjustment: *Approximately 45 days after Harvey, Buffalo Bayou dropped 10 feet (~3m), receding back to its channel and water began to drain from a pond formed at the dog park. The episodic draining pond partially eroded the sand bar then deposited the sand in the middle 1/3 of the sculpture (between green and red lines). The base of this segment is rich in organics. Flow was from right to left. The contorted and vertical beds are interpreted to record collapse of the channel cut wall as the channel cut and filled the bar.*
Recovery: *The unstructured sands above the red line were pushed into the channel cut by bulldozers grading the sands during the sand removal process. Over 600 million pounds of sand were removed during the recovery efforts (BBP, 2017).*

reclaimed oak panels from Harvey debris were secured to the back of each mounting board to hang the finished peels on a wall with approximately an inch of space between the wall and the back of the mounting board. The backs of the boards are painted in either a blue or green glossy paint. This paint reflects a hue of blue or green on the wall behind the peel which shifts in saturation and brightness as the viewer moves around the finished, hanging sand peel sculpture. This subtle color glow also complements and magnifies the natural yellows and oranges in the captured sediment. These visual cues of color, outline and texture can be read and interpreted as the stratification but in an aesthetic context. They tell the story of the sand peel creation process: the variables of the location and timing of collection, the context of flooding water and the hands of the makers, all of which recognize the specificity of each object.

Though the concept of a sand peel comes from a traditional scientific and educational geology background (Moiola, 1969), the mounting and presentation of these sand peels as art objects allows for the coexistence of scientific and artistic interpretation both of the objects and of the context of their creation including their relationships to geologic and human time scales. Science and art share many traits especially in relation to the scientific process and the art making process, where we have a human drive to collect, analyze, and represent the world around us. Both are tools to understand and pass on information about the current, past and future world. Being able to utilize information from the different logics and perspectives of science and aesthetics allows for different points of access to understand the event and the time it represents. The sand peels offer a unique opportunity for both perspectives of the storm as opposed to the more traditional human only narratives of these kinds of events.

To mark the anniversary of the storm Fotofest International presented a show of images from Hurricane Harvey (Fotofest, 2018). Titled SEEING HARVEY: Personal Stories, Public Responses, the exhibition focused "on the widespread and sustained influence this monumental event had on the region's landscape, infrastructure, and communities, and on the resilience and fortitude of those affected" and displayed images from professional photojournalists and artists and from members of the public. Images came from Houston Chronicle photojournalists, Houston area artists, and the general public in response to an open call for submissions through social media and the web. Overwhelming amounts of water, people in their flooded homes, high water in various areas of the affected region, rescue efforts and recovery efforts dominated the representations of the storm. They depicted the human story by people witnessing their human world affected by Harvey in a human time scale with the image captions noting the time and place each image was taken. These images and this sense of time resonate in a human world, but what is their relationship with the natural world and its representation and understanding?

Fluvial Tapestries: GeoArt of Hurricane Harvey *continued on page 42*

Fluvial Tapestries: GeoArt of Hurricane Harvey continued from page 41

Figure 6. Image looking down Dog Park channel cut
*View looking north out of the Dog Park drainage channel at Buffalo Bayou. The sand peel sculpture site of **Figure 3** is on the left and that of **Figure 4** is on the right. The sand peel sculpture shown in **Figure 4** is ~ 2 feet wide and 4 feet high (0.6 x 1.2m). On the left are primarily sand bar deposits. The blue lines mark the basal erosional surface. On the right are remnants of the sand bar (between the blue and green line). This is overlain by the Dog Park channel cut deposits (between green and red lines). Above this are sands reworked by bulldozers. Across Buffalo Bayou a bridge spans a small tributary that lies in the old (1944) channel. To the right of the bridge at water level are outcrops of Pleistocene red mudstone coastal plain deposits of the Beaumont Formation (USGS 2017).*
The sequence of events interpreted is:
1. Pleistocene (2.5-0.0117ma) fluvial deposits were formed on a coastal plain when the coastline was on the order of ~ 60 miles (~100km) south of where it is today (Paine et al., 2012). Paine (2012) estimates shore line retreat rates have been 10 to 40 feet per year (3 to 12m) over the last 16,000 years.
2. In 1944, the viewed segment of natural Buffalo Bayou channel flowed toward the viewer under the present-day bridge and through what is now the Dog Park drainage channel until the bayou was straightened in the 1970s.
3. During the waning flow, Harvey floodwater dropped from 42 feet to ~10 feet and flowed from left to right depositing the thick sand bar and filling the dog park channel.
4. When the bayou dropped below ~ 10 feet (3m) approximately 30 days after Harvey, the pond that formed in the dog park started draining, cutting through the sand bar. The flow was away from the viewer. This channel continued to cut and fill for approximately 60 days.
5. Around 70 days after Harvey bulldozers and trucks began reworking and removing sand from the area.

The sand peel sculptures offer a more complex narrative for the Harvey and its impact on Houston. The sand strata imagery provides both a direct natural narrative and a more abstract view than images of people and their constructed spaces. The abstraction and the consideration of the natural world enable thinking in earth time, the kind of time that is relevant to understand these kinds of events in relation to the past and the future of the city of Houston. A storm like Harvey is not the first and it will not be the last major storm to hit the gulf coast of Texas. These flood events will happen again; it is recorded in the geology of the Gulf. **Figure 6** shows Pleistocene fluvial deposits along Buffalo Bayou where the sand peels were collected. These deposits were formed on a costal plain when the coastline was approximately 60 miles (100 km) south of where it is today (Paine et al., 2012). Paine estimates shoreline retreat rates have been 10 to 40 ft/year (3 to 12 m/year) over the last 16,000 years. With this understanding of the region, the Houston geologic community has a responsibility to educate other Houston and Gulf Coast communities to understand these two kinds of time and the reality of storms and flooding for the infrastructure and people of the Houston and the greater Gulf Coast region.

Buffalo Bayou is an ever-evolving fundamental feature of Houston. It always will change and adapt to its surroundings. The bayou responds to both natural and artificial changes imposed on it, eroding in one place and depositing sediment somewhere else, working simultaneously in both human and earth time. Hurricane Harvey is not unique; it was one of thousands of such events that Buffalo Bayou has experienced, and will happen again. The natural record in Buffalo Bayou preserved in the sand peel sculptures documents the Hurricane Harvey flood and recovery and reminds us that we need to be prepared to coexist with an ever-changing coastline. The human time scale is not dominant; it coincides with a natural one, an earth time. Together, considering our cohabitation of the Gulf Coast, we can work to embrace this complexity, make changes and be ready for the next major storm event.

The GeoArt Collaborative, an effort of artists and geologists to raise the appreciation of coastal inhabitants for the dynamic nature of where they live, is building on the sand peel effort. The sand peel sculptures are planned for exhibition and featured in a field trip at the GCAGS fall 2019 meeting in Houston. These sand peel sculptures are an artistic and scientific collaboration between artist and daughter Kate Kendall, geologist and father Jerry Kendall, and their communities with support from the Buffalo Bayou Partnership and funded in part by the City of Houston through the Houston Arts Alliance. For past exhibitions, information and images of the artwork and future GeoArt events visit https://www.katekendall.info. ■

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Biographical Sketches

Kate Kendall (b. 1985) looks to the natural world as a less determined space than the human world to soften boundaries and complicate, challenge and enrich the viewer's perspective on reality. As a conceptual artist, she uses many different media ranging from sculpture and installation to video, sound and text to help communicate ideas and create experiences. Her goal is to promote new narratives and languages that enable mobility and find ways for us to live with complexity and difference together. Her work mines focused research and personal experiences/history with geology and landscape to consider narrative knots, aiming to expose their construction, stress their complexity and enrich the viewer's perception of their own cultural and political context.

Kate Kendall received her MFA from California Institute of the Arts and her BA from the University of Southern California. She has exhibited in Los Angeles, New Mexico, South Africa and various spaces in Houston including DiverseWorks Art Space, Lawndale and Box13 ArtSpace. She has also worked fabricating and installing public art all around the city of Houston while working for public artist Dixie Friend Gay and completed her own mosaic, the Forget-Me-Not Panel of Smither Park in 2013 for the Orange Show Center for Visionary Art Campus.

Jerry Kendall is a global expert on the processes of mountain building. He began his geology career in the Arctic doing field exploration and research in Greenland and Svalbard. He has 40 years of experience in outdoor geology instruction in remote areas to varied groups, including Boy Scouts, students and professional geologists. He has worked in academia and industry expanding the limits of knowledge on how multiple earth processes interact to produce mountains and hydrocarbon accumulations. He has a deep passion for understanding the integration of earth systems, how it impacts us, and sharing that understanding with others.

Jerry Kendall has been a resident of Houston Texas for 20 years. He currently advises students at the University of Houston Earth and Atmospheric Science department and is adjunct faculty at the University of New Mexico. He lives directly on Buffalo Bayou and has watched it flow, surge and evolve over the last 20 years. He is interested in how the natural processes of the bayous have integrated with the anthropogenic efforts to coexist with it.

2018 HGS K-12 Public Outreach
The Houston Gem and Mineral Show

The HGS K12 group once again participated in the Houston Gem and Mineral Society Show at the Humble Civic Center on the second weekend in November. The annual HGMS show sponsors school field trips on Friday and Scouts for geology badges on the weekend and the HGS booth is a designated stop for the field trips and for the Scouts. Attendance at the 2018 HGMS show was 3444 plus 1000 students and 350 adults for the Friday field trips. On Saturday 81 Scouts went through the Geology Merit Badge program.

The HGS had multiple volunteers to staff the booth for all 3 days, plus geology student volunteers from UH Downtown and UH Main Campus. A list of all the volunteers includes: **Alan Foley, Andrew Hind, Budihardjo Santoso, Dawne Jordan, Eric Beam, Georgina Garcia, Gregg Zelewski, Huw James, Janet Combes, Janie Schuelke, Jim Schuelke, John Jordan, Juan Manzanares, Ken Green, Ken Williams, Kennedy Dade, Kenneth Shipper, Micah Craft, Mikaela Grass, Mollie Kish, Olivia Wren, Sam Leone, Sandy Nemeth, Sarah Heinlein, Shawn Wright, Stefania Laronga, Terri Bannister,** and **Weston Charles**.

The HGS booth used its posters explaining what a geologist does and there were 3D maps with 3D glasses for viewing. Sample rocks of various types were available to see, along with hand lenses to look at the details. United Salt Corporation's Hockley Salt Mine provided multiple sacks of salt to use as giveaways to attendees.

Other Outreach Activities During 2018

The HGS Outreach group has participated in multiple events this year. The HGS was active in the Sally Ride-Reach for the Stars STEM Festival at Rice University on 21 April. In spite of some late, weather-related scrambling, volunteers Sharon Choens, Laurie Green, Stefania Laronga, Michelle Pittenger, Nancy Slater, and Jim Tucker talked about earth science to the young aspiring women scientists. The rock salt handout samples were a hit, as usual. At the Boy Scout Fair on 28 April, the HGS also had a booth (pictures to the right).

An HGS volunteer gave a presentation at the Houston Arboretum summer camp, and several provided activities at Girl Scout twilight camp for a geology badge. More volunteers gave talks at Maud Marks library on their summer theme "Geology Rocks". Samples of salt donated by the Hockley Salt Mine were given out at all these events; salt samples were also given to teachers from across the US at a learning session sponsored by the AGI and to local teachers participating in the Houston Museum of Natural Science's I Explore school tours sponsored by Saudi Aramco. Multiple HGS volunteers participated in all these events that do not fall under a specific committee title. ■

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.*

At the Texas Sunset Advisory Commission's (TSAC's) decision meeting in November 2018 the TSAC repeatedly expressed concern about a "North Carolina problem". They didn't explain what the problem was, but we have found out what it was about.

The North Carolina Board of Dental Examiners is the state entity that oversees licensure and discipline of dentistry and dental hygienists. State law in North Carolina, similar to the practice in other states, requires six of the eight members of the Board to be licensed, practicing dentists. When the Board began issuing cease-and-desist orders to non-dentists offering tooth whitening services, asserting that only licensed dentists could whiten teeth under state law, the Federal Trade Commission brought an administrative complaint against the Board for anticompetitive practices. The FTC eventually held that the Board's actions are not entitled to immunity from federal antitrust law, as state action typically is, because its operations were not actively supervised by the state of North Carolina. The Board appealed the FTC's decision, eventually pushing the question to the US Supreme Court.

In an opinion by Justice Anthony Kennedy, the Court upheld the FTC's decision. Especially important to the Court's analysis was the fact that dentists, who derive some of their income from teeth whitening services, largely controlled the Board of Dental Examiners. Justice Kennedy stressed this point, finding the need for antitrust law particularly great "in light of the risks licensing boards dominated by market participants may pose to the free market." The Court declined to exactly fix a line for what constitutes excessive control of a licensing board, saying only that the determination is context-dependent. The Court also agreed with the FTC's position regarding the lack of state oversight of the Board, reaffirming the requirements of active state supervision: (1) supervision is substantive, not merely procedural; (2) the supervisor may veto or modify decisions of the Board; (3) the mere potential for review is not a substitute for actual supervision; and (4) the supervisor may not itself be a market participant. Since the Board of Dental Examiners was not subject to any state oversight at all and was largely dominated by market participants, it clearly did not meet these requirements.

While the full implications of the case are not yet clear, litigation has begun to proceed under the new precedent and several states have taken steps to shore up their review of state licensing boards in light of the decision.

In Texas, a judge allowed a suit against the Texas Medical Board to proceed after finding that neither the sunset review process nor the administrative review process in §2001.174 of the government code met the requirements of the North Carolina Case. See Teladoc, Inc. v. Texas Med. Bd., No. 1:15-CV-343-RP, 2016 WL 4362208, at *4 (W.D. Tex. Aug. 15, 2016). And though its decision was based on other law, the Texas Supreme Court cited the logic of the North Carolina case favorably in Patel v. Texas Dep't of Licensing & Regulation, 469 S.W.3d 69, 108 (Tex. 2015), explaining that that the law "no longer insulates regulators regulating to anticompetitive effect. Licensing boards comprised of private competitors will face Sherman Act liability if they flex power to smother aspiring entrepreneurs."

The TSAC is discussing an omnibus bill that covers every licensing Board to comply with the ruling – meaning adding additional members to Boards to ensure "licensing boards are not dominated by market participants."

The Texas Legislature will be meeting beginning in January 2019 and bills began to be filed in November 2018. The Wise Report, accessible on the HGS website, is tracking a number of bills that are of interest to Texas geologists.

AGI Geoscience Policy Monthly Review (October 2018)

Senate hearing addresses the EPA proposed transparency rule

A subcommittee of the Senate Committee on Environment and Public Works held a hearing on October 3, 2018 to gauge expert opinion on the Environmental Protection Agency's (EPA) "Strengthening Transparency in Regulatory Science" proposed rule. The proposed rule, issued by former EPA Administrator Scott Pruitt on April 24, 2018 directs the EPA to use "peer-reviewed information, standardized test methods, consistent data evaluation procedures, and good laboratory practices to ensure transparent, understandable, and reproducible scientific assessments." The proposed rule has faced controversy since its release, with critics arguing that the requirement for reproducibility and for studies to publish their data and models would prohibit the EPA from using peer-reviewed studies that are non-replicable or contain confidential health information in regulatory decisions.

Senators at the Subcommittee on Superfund, Waste Management, and Regulatory Oversight hearing considered testimony from three witnesses: Dr. Edward Calabrese from the University of Massachusetts at Amherst School of Public Health and Health Sciences, Dr. Robert Hahn from the Oxford University Smith School of Enterprise and the Environment, and Dr. Rush Holt, chief executive officer at the American Association for the Advancement of Science. **Government Update** *continued on page 46*

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Dr. Calabrese and Dr. Hahn testified in favor of the proposed rule, while Dr. Holt testified against. In his statement, Dr. Calabrese labeled the rule a timely way of ensuring scientific and administrative accountability. "EPA's transparency proposal is excellent as far as it goes, but it needs to be expanded," Dr. Calabrese said.

Dr. Hahn echoed Dr. Calabrese's sentiments, saying the rule is a common-sense next step for the EPA. Dr. Hahn also asserted that Congress should consider a similar policy for other government agencies, which could be accomplished with something like the Honest and Open New EPA Science Treatment (HONEST) Act (H.R.1430/S.1794). The language of the EPA's proposed rule closely parallels the HONEST Act, which was introduced in both chambers of Congress last year by Representative Lamar Smith (R-TX-21) and Senator Mike Rounds (R-SD). The HONEST Act would prohibit the EPA from "proposing, finalizing, or disseminating a covered action unless all scientific and technical information relied on to support such action is the best available science, specifically identified, and publicly available in a manner sufficient for independent analysis and substantial reproduction of research results." The House passed H.R. 1430 on March 29, 2018 but the bill has not yet been considered in the Senate.

Responding to some criticism of the proposed rule at the hearing, Dr. Hahn argued that the rule would not nullify existing environmental regulations, disregard existing research, violate confidentiality protections, jeopardize privacy, or undermine the peer-review process.

Dr. Holt clashed with the other witnesses in his testimony, calling the proposed transparency rule an "insidious dodge" that is about reducing regulations, not about promoting transparent or sound science. "Contrary to the stated purpose of the rule, the rule would result in the exclusion of valid and important scientific findings from the regulatory process," Dr. Holt said.

Subcommittee members at the hearing appeared split along party lines in their statements and lines of questioning. Senator Rounds, chairman of the subcommittee, said that he has been concerned in the past that the broad discretion and lack of transparency at the EPA has led the agency to seek out science that determines a predetermined policy outcome. He expressed confidence in the proposed rule's ability to steer the EPA toward its intended mission of protecting human health and thanked the EPA for issuing the proposed rule.

Subcommittee Ranking Member Cory Booker (D-NJ) clashed with Chairman Rounds, saying the EPA's proposed rule mimics the same rhetoric employed by the tobacco industry to discredit studies that would lead to regulation on secondhand smoke, calling it "déjà vu, all over again."

The EPA earlier this year held a twelve-hour public hearing on the proposed rule on July 17, 2018. The public comment period on the proposed rule closed on August 16, 2018 and it currently awaits further action by Acting EPA Administrator Andrew Wheeler. The Trump administration's fall 2018 regulatory agenda, released October 16, 2018 listed the proposed rule under "long-term actions" with an expected completion date of January 2020, implying that the rule is not a top agency priority at the EPA.

Senate committee approves Land and Water Conservation Fund reauthorization

On October 2, 2018 the Senate Committee on Energy and Natural Resources held a hearing and reported favorably on legislation (S. 569) that would permanently reauthorize the Land and Water Conservation Fund (LWCF). Created in 1965, the LWCF directs federal royalties from offshore oil and gas drilling to conservation and public recreation efforts. Although Congress was unable to pass a reauthorization bill before funding for the LCWF expired on September 30, 2018 the authority to carry out the program does not expire. Oil and gas revenue from offshore drilling will be diverted into the general Treasury instead of the LCWF until lawmakers reinstate it.

This action came three weeks after the House Committee on Natural Resources passed their version of the bill (H.R. 502) on September 13, 2018. Both the House and Senate versions have bipartisan support and aim to permanently reauthorize the LWCF. However, the two bills have some key differences, setting up hurdles to their final passage.

The Senate bill, introduced by Energy and Natural Resources Committee Ranking Member Maria Cantwell (D-WA), would ensure full funding for the LWCF at its annual authorized level of $900 million. The program has been appropriated at about half of this authorized amount in recent years. However, Chairman Rob Bishop (R-UT-1) said that mandatory funding for the LWCF, as featured in the Senate version of the bill, could destroy its chance of passage in the House because of long-term budgetary concerns. The House version, introduced by Natural Resources Committee Ranking Member Raul Grijalva (D-AZ-3), does not dedicate annual funding to the LWCF, meaning Congress would have to continue to appropriate funds for the program each year through their annual budgeting process.

Neither chamber took further action on the bill before entering a month-long recess on October 12, 2018. Chairman Bishop has said he expects passage before the end of the year. He also hopes to pass it as part of a "broader legislative lands package" that would include the Restore Our Parks and Public Lands Act (H.R. 6510) to address the backlog of infrastructure projects in national parks.

USGS briefing and report highlight expanded rollout of earthquake early warning system

The United States Geological Survey (USGS) held a briefing on October 2, 2018 to discuss the ongoing rollout of the ShakeAlert Earthquake Early Warning System. The briefing was held in conjunction with the release of a new USGS report titled, "Revised technical implementation plan for the ShakeAlert System—An earthquake early warning system for the West Coast of the U.S."

Shake Alert uses networks of ground-motion sensors and sophisticated computer algorithms to detect earthquakes moments after they begin, calculate their locations and magnitudes, and estimate the resulting intensity of shaking. Alerts can then be sent to people and systems that may experience damaging shaking, allowing them to prepare appropriately before the shaking begins. Effective implementation of such a system can reduce the impact of earthquakes, save lives, and protect property in earthquake-prone areas.

The briefing was led by Dr. Bill Leith, the Senior Advisor for Earthquake and Geologic Hazards at the USGS. It also featured professors and researchers from four different West Coast universities: Dr. Thomas Heaton from the California Institute of Technology, Dr. Richard Allen from the University of California, Berkeley, Dr. Leland O'Driscoll from the University of Oregon, and Dr. Harold Tobin from the University of Washington.

The ShakeAlert system has been in testing since the early 2010s and, as of October 2018, is being rolled out more widely to public and private organizations in California, Oregon, and Washington. Broader public alerting has not yet begun because existing mass-alert technologies are not currently able to deliver earthquake alerts sufficiently rapidly and widely to be effective.

This long-term implementation plan calls for a total of 1,675 seismic monitoring stations. About 865 seismic stations are currently contributing data to ShakeAlert and 250 more have funding and are currently being built, according to the revised USGS report. The planned U.S. system has similarities to existing systems in Mexico and Japan. However, the U.S. faces a particular geological challenge in implementing earthquake early warning. In Mexico and Japan, the biggest earthquake-generating faults are largely located offshore, far from major population centers, allowing for more warning time before the arrival of an earthquake. In California, major cities sit directly on or near major faults, requiring much more rapid detection of earthquakes and distribution of alerts to provide any warning at all.

On October 10, 2018 Department of the Interior Secretary Ryan Zinke tweeted that he directed the National Park Service, the Bureau of Land Management, and the Fish and Wildlife Service to streamline regulatory processes and prioritize the deployment of USGS earthquake sensors. The tweet linked to a Wall Street Journal article published online earlier that same day, which indicated that the Journal had obtained a memo from Secretary Zinke ordering federal agencies to identify and help remove regulatory impediments to deploying the equipment in national parks and Bureau of Land Management properties near major population centers from San Diego, California, to Anchorage, Alaska. According to the article, the secretarial order also applies to volcanic-activity monitoring equipment in Hawaii.

Lawmakers reauthorize NOAA Marine Debris Program

President Donald Trump signed the Save Our Seas Act of 2018 (S. 3508) into law on October 11, 2018. The Save Our Seas Act reauthorizes the National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program through fiscal year 2022. It also strengthens certain Coast Guard requirements to promote safety in the maritime industry and establishes a Coast Guard Blue Technology center of expertise to promote awareness and implementation of marine technology within the Coast Guard.

The act has three titles: Marine Debris, Maritime Safety, and Center of Expertise. Title I reauthorizes the NOAA Marine Debris Program and appropriates $10 million per year to the program. The NOAA Marine Debris Program investigates and prevents the adverse impacts of ocean pollution. It was originally authorized in 2006 as the Marine Debris Research, Prevention, and Reduction Act and amended in 2012 to provide a new funding mechanism to respond to clean-up efforts from severe marine debris events such as floods, storms, and tsunamis. The act directs the President to work with foreign countries to reduce marine debris, including forming new international agreements that create infrastructure to reduce waste discharges.

Senator Dan Sullivan (R-AK) introduced the bill on September 26 with bipartisan cosponsors Senators Sheldon Whitehouse (D-RI), James Inhofe (R-OK), and Bill Nelson (D-FL). The bill had strong bipartisan support, passing the Senate by unanimous consent on the same day and passing without objection in the House on the following day.

President Trump signed the bill alongside Secretary of Commerce Wilbur Ross and Acting NOAA Administrator Admiral Tim Gallaudet.

In a speech before signing the bill, President Trump said the 8 million tons of garbage dumped into our oceans globally are harmful to not only marine life, but also fishermen and communities that rely on the ocean's resources along America's coastline.

"The United States has some of the most beautiful beaches and oceans in the world, and the coastlines are incredible," President Trump said. "As President, I will continue to do everything I can to stop other nations from making our oceans into their landfills. That's why I'm pleased — very pleased, I must say — to put my signature on this important legislation."

President Trump signs America's Water Infrastructure Act of 2018 into law

President Donald Trump signed America's Water Infrastructure Act of 2018 (S. 3021), which includes the Water Resources Development Act (WRDA) of 2018, into law on October 23, 2018.

S. 3021 outlines updates to the biannual WRDA legislation, drinking water infrastructure development, and hydropower regulations.

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As part of the 2018 WRDA update, S. 3021 authorizes investments in water infrastructure such as ports, channels, locks, and dams, including the reauthorization of the Levee Safety Initiative and the National Dam Safety Program through 2023.

The other titles contain language to advance drinking water infrastructure by authorizing more than $4.4 billion for the state drinking water revolving loan fund program, authorizing $100 million for areas affected by natural disasters to obtain or repair drinking water systems, and streamlining the regulatory approval process for hydropower projects.

The president's signature put Congress back on track to pass the biannual WRDA on schedule for the third time since 2014. Prior to 2014, Congress had not passed WRDA in seven years.

House Transportation and Infrastructure Committee Chairman Bill Shuster (R-PA-9) originally introduced WRDA as H.R. 8 in May before the text was incorporated into S. 3021. The final bill serves as a follow-up to the Water Resources Development Act of 2016 (S. 2848).

"WRDA, as included in the America's Water Infrastructure Act of 2018, will ensure that we stay economically competitive with other countries," Shuster said before the bill's final passage in the Senate. "I am proud that we have been able to work together for the good of our infrastructure and now have an opportunity to send the third WRDA during my chairmanship to the president." ■

HGS Welcomes New Members

New Members Effective December 2018

ACTIVE MEMBERS
William Babcock
Stephanie Bell
Mark McCollum

STUDENT MEMBERS
Trey Anglin
Sarah Austin
Elizabeth Bell
Anne Billingsley
Hannah Blaylock
Allison Bohanon
Benny Bonet
Maria Bonilla
Amy Bottge
Kala Brown
Jonathan Camelo
Cade Campbell
William Cherdomia
Alice Colville
Marjean Cone
Nicole Cordoba
Jennifer Davis
Dana Drinkall
Edward Duarte
Brooke Dykstra
Emily Finger
Ashley Fox
Gabrielle Garcia
Kacey Garger
Kaitlyn Gauvey
Lindsay Gutierrez
Robert Hensley
Elisandra Hernandez
Mauel Jaramillo
Nicole Jewell
Katherine Jones
Leslie Jordan
Konstantinos Kasamias
Ashton Killen
Sarah Kittross
Kristin Kopera
Julien Kuhn de Chizelle
Asmara Lehrmann
Mauel Lopez
Jamin Lopez
Erin Lynch
Maria Marroguin
Elizabeth Martin III
Marissa Mayfield
Gabrielle Miller
Kimberly Moore
Kara Naegeli
Joseph Nola
Maria Pesek
Sean Price
Amber Quevy
Natalie Robbins
Cesar Rodriguez
Bryan Rodriguez
Kayleigh Rogers
Martina Rogers
Lydia Ryan
Yanira Santiago-Perez
Divya Saxena
Megan Schmidt
Alexandra Shelters
Felipe Silva
Alexandria Stevenson
Kyle Stewart
Caleb Stuber
Anna Threlkeld
Olivia Thurston
Miguel Valencia
Duabchi Vang
Lainnie Velazquez
Wilnelly Ventura-Valentin
Connor Watkins
Avery Welker
Walker Weyland
Emily White
Catherine Wilsbacher
Brianna Wilson
Elizabeth Wuyep
Thomas Zarquera

Welcome New Members

HGS *Bulletin* Instructions to Authors

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

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

Figures, maps, diagrams, etc., should be digital files using Adobe Illustrator or Adobe Photoshop. Files should be saved and submitted in .ai, .eps, .tif or .jpg format. Send them as separate attachments via email or CD if they are larger than 5 MEGs each, accompanied by figure captions that include the file name of the desired image. DO NOT EMBED them into your text document; they must be sent as separate files from the text. DO NOT USE POWERPOINT, CLIP ART or Internet images (72-DPI resolution) as these do not have adequate resolution for the printed page and cannot be accepted. All digital files must have 300-DPI resolution or greater at the approximate size the figure will be printed.

Photographs may be digital or hard copy. Hard copies must be printed on glossy paper with the author's name, photo or figure number and caption on the back. Digital files must be submitted in .tif, .jpg or .eps format with 300-DPI or greater resolution at the printing size and be accompanied by figure captions that are linked by the file name of the image. The images should be submitted as individual email attachments (if less than 5 MB) or on CD or DVD.

HGS *Bulletin* Advertising

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

Random Inside Ad Placement Black & White Prices Shown – Color add 30% to prices below					**Specific Page Color Ad Placement**					
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						
3	$300	$550	$950	$2,000						$1,000
2	$250	$400	$700	$1,500						
1	$150	$250	$450	$1,000	$1,500	$1,400	$1,250	$1,000	$1,250	$850
Professional Directory Section Business Card Ad: 10 Issues – $160 ($30 for each additional name on same card)										

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

Application to Become a Member of the Houston Geological Society

Qualifications for Active Membership

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

Qualifications for Associate Membership (including students)

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

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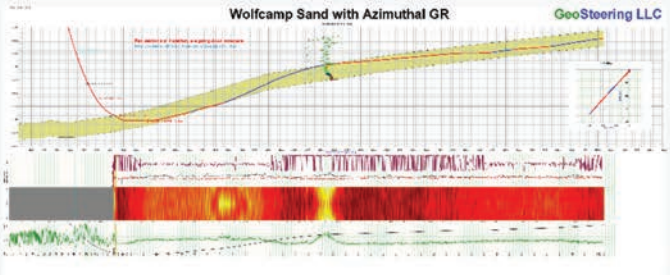

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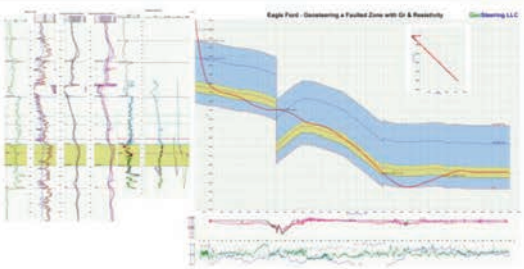

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