HGS Bulletin
Houston Geological Society
Volume 62, Number 3
November 2019

# Annual Sheriff Lecture
# The Sedimentary Record of Antarctica's Contribution to Sea-Level Changes

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## In Every Issue





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## Technical Meetings



## Other Features



**About the Cover:** An aerial view of the Split Mountain Anticline and Dinosaur National Monument. The photo was supplied by Dr. Marli Miller at University of Oregon.

**Applied Geomechanics: Through the Life Cycle of the Field Conference**

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**FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA**

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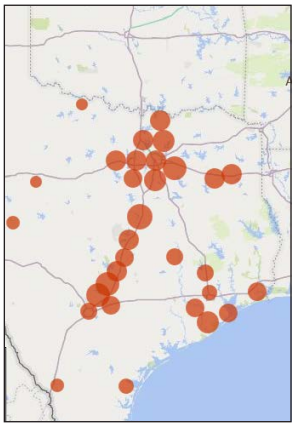
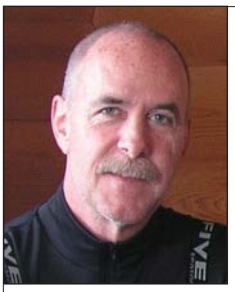


*page 25*



*Jon Blickwede*
*president@hgs.org*

# Petroleum Exploration Then and Now

During mid-October, I attended the Data Science & Analytics event that was organized by HGS NeoGeos and co-sponsored by the Society of Petroleum Engineers. Though much of what was discussed by the panelists was Greek to me (e.g. "microservices in the cloud"—what the heck is that?), I recognize and respect the fact that computer science has revolutionized, and will continue to revolutionize, the ways in which we perform various activities, including exploration for oil & gas. As I look back on my career as an explorationist, I marvel at how streamlined the process of interpreting data has become over the course of a few short decades. The time and tools required to interpret horizons and faults on a seismic dataset have evolved from a matter of days or weeks using colored pencils on a drafting table, to a matter of minutes picking seed points and allowing a software application to autotrack the horizons and faults over a large area. And for me, the process of seismic interpretation is a whole lot more fun than ever, especially with the advent of 3D visualization technology. In any case, the modern-day petroleum explorer spends most of his/her career sitting in front of a computer in an air-conditioned, hermetically sealed building. And with the new set of data science/analytics tools coming to the fore, this indoor working environment is unlikely to change. It wasn't always that way, of course.

During the first half of the 20th century it was common for petroleum exploration geologists to spend a significant portion of each year in the field, carrying out surface mapping, measuring/describing/sampling sections, and searching for oil seeps. There are still a lucky few of us, typically in government geological surveys and academia, that perform actual geological field work. But I think that most of us became interested in geology because of our love of the outdoors, and perhaps even imagined ourselves doing fieldwork on a regular basis throughout the course of our careers – so most of us treasure the chance to get out to the field, albeit a field seminar for a single week per year. I say a "lucky few" still perform field work—but of course the field has its hazards, especially in the early days, before the emphasis on safety. The following are some excerpts from *The First Big Oil Hunt*, Venezuela 1911 – 1916, by R. Arnold et al. (1960, Vantage Press, 353 pp.), and are taken from a journal kept by a then early-career geologist named W.L. Taylor, about geologic reconnaissance undertaken during 1912 in an area southwest of Lake Maracaibo, Venezuela. The story is a good reminder of the relative lack of risks, but also the lack of adventure, that characterizes the typical job of today's explorationist.

"Arriving in Maracaibo, they (American geologists) called at once upon the American Consul, Mr. John A. Ray. When informed of their business and destination, he replied that his advice would be to take the next boat back to the States."

"It had been the intention of the (geologic field) party to strike directly west into the jungle from El Guayabo… Here were great areas of mud flats and cane-breaks swarming with flies and mosquitoes. The mud and slime were from five to fifteen feet deep, so it was decided to move up the river about three miles to a plantation known as El Manguito…Having spent several days trying to reach high ground beyond the swamp, Taylor tried to obtain a view over the surrounding swamp by climbing a tall tree by means of the network of vines growing on its trunk and thus had his first experience with termite ants. In jumping for a vine slightly above his reach, his hand closed tightly through the bark, which was all that remained of the vine, and he fell a distance of about forty-five feet. Fortunately, he struck in soft ground, and the most serious effect…was the dislocation of two bones in the right ankle…He was carried out to El Manguito in a hammock tied to a pole and forced to remain there several days…Higher ground was found some six miles to the north and camp was moved to this new site, which was on a high bank overlooking a creek. The first night in camp was somewhat unusual. Shortly after dark, a terrific tropical storm broke out and the little creek, normally about twenty feet wide, became a raging torrent over a hundred yards wide within three hours. About 10 pm a large jaguar swam across the creek, landed in the midst of camp, but left with a bloodcurdling scream."

"Taylor now experienced his only illness—a three-day siege of malaria. It was his first attack and during moments when not delirious he felt sure he was about to join the celestial choir."

"He (Taylor) soon saw a large outcrop of unusual interest, and on rounding it, his attention was drawn to the movements of a dying monkey. About a dozen others already dead were lying beside it. Just beyond were a number of bows and arrows which had been dropped by five naked Indians who were drinking from a pool. They were immediately recognized as… Motilones. As they had seen Taylor almost instantly, he decided his best move would be to advance in a friendly, bold manner, which he did. The Motilones at once grabbed their bows and began to shoot arrows at him."

You might consider remembering Taylor's story from 1912 when you've had a bad day at the office. **Never stop exploring!** ■

From the Editor

*Fang Lin*
*editor@hgs.org*

# Innovation

Fellow HGS members: In the past October, fifteen distinguished scientists were awarded the Nobel Prizes in Physics, Chemistry, Physiology or Medicine, Literature and Economic Sciences in 2019. I must admit that I normally do not go beyond the news announcements, as details of what those extraordinary scientists have achieved are often way beyond what I can comprehend. This year, however, the story about the Chemistry laureates intrigued me to dig a little deeper, partially because one of the Nobel Prize laureates is from our home state Texas.

For those of you who have not had a chance to follow the news, the 2019 Nobel Prize in Chemistry was awarded to three scientists equally: Prof. M. Stanley Whittingham from Binghamton University in State University of New York, Prof. John B. Goodenough from The University of Texas at Austin, and Prof. Akira Yoshino from Meijo University, Nagoya, Japan. They were awarded for their contribution in development of lithium-ion battery, a product that is widely used in mobile phones, laptop computers and electrical cars nowadays.

At the beginning, I was fascinated by the career of Prof. Goodenough. He is the oldest winner in the history of Nobel Prize. He won the prize at age 97 and remains an active faculty member at UT Austin. In fact, he came to the university at age 64, when most people would have retired or start thinking about retiring, but Prof. Goodenough essentially made a second career after he came to Texas. As I read more about this gentleman, I learned that he did not have a straight path toward Chemistry early on. He studied Mathematics in college and obtained his PhD in Physics. Before he became the head of the Inorganic Chemistry Laboratory at the University of Oxford in 1976, he had only taken two classes in Chemistry in his educational background. When he started his graduate study at University of Chicago at age 24, he was doubted about how much he could achieve in Physics because most big-name physicists of that time had already made their significant discoveries at his age. Despite all these "late" events, he has made remarkable contribution in a wide range of scientific disciplines, from random access magnetic memory (RAM) to lithium-ion battery, and has become one of the most accomplished scientists in the world. Although most of us probably will not be able to achieve as much as what Prof. Goodenough has done, we can never excuse ourselves from too-old-to-try.

If Prof. Goodenough's story mainly provided mental inspiration, the story about how lithium-ion battery was developed by the three Nobel Prize laureates really made me to re-think about innovation. The world's first functional rechargeable battery was invented by Prof. Stanley Whittingham when he worked as a research scientist in Exxon in early 1970's. Yes, you heard it correctly, Exxon, the big oil company. Apparently, the oil crisis in the US in early 1970's prompted research organizations in government institutes as well as private sectors to search for energy forms that could reduce the country's dependency on fossil fuel. Shortly after Whittingham joined Exxon, he discovered titanium bisulfide, a material with sheet-like structure, could be used as cathode in batteries for lithium ions released from metallic lithium anode to go in and out of the cathode freely, which makes the battery rechargeable. Unfortunately, batteries made based on this mechanism could not last long and explosion tended to occur over time. Exxon had to abandon the project due to safety concerns. Prof. Goodenough, who was also studying energy storage devices in Lincoln Laboratory at Massachusetts Institute of Technology around the same time, was intrigued by Prof. Whittingham's discovery and the problem encountered. In 1980's when working at the University of Oxford, he demonstrated that cobalt oxide could be used to replace titanium disulfide as cathode in rechargeable batteries to provide higher voltage and greater stability. By then, it was still difficult to commercialize the product due to the use of expensive and highly reactive metallic lithium as anode. Eventually, Japan's Akira Yoshino working in Asahi Kasei Corporation at the time incorporated Prof. Goodenough's findings into his research. By replacing metallic lithium anode with carbon-rich material (petroleum coke), cost and safety of lithium-ion battery was further improved, which led to the first commercially viable lithium battery in 1985 and commercial production in 1991.

The development of lithium-ion battery is a classic example of step-by-step improvement and innovation. What made this innovation a huge scientific and economic success? I think several components are noteworthy. First, all three scientists had solid training in foundational sciences. Goodenough was trained as a solid-state physicist, Whittingham as a chemist. Yoshino, although trained as an engineer, had attended courses taught by one of the best chemists in the world (Kenichi Fukui, the first Asian Nobel

Prize laureates in Chemistry) in college. The training has prepared them for solving real-life issues with deep scientific understandings and the capability to expand their expertise through continued learning. Second, the problem that they were trying to solve was well-defined and had clear application, i.e., to develop a high-density energy storage device that does not rely on fossil fuel for a marketable cost. Focused study by all three scientists led them to have overcome the technical challenges one by one. Third, the power of integration. One report that I read mentioned that it was hard to define Prof. Goodenough as a physicist, a chemist, or a material scientist. I think it is indeed the cross-functional research and collaboration that has enabled the realization of lithium-ion battery. Of course, there are other merits of these scientists that have contributed to the success of invention, such as passion for science and technology, perseverance and dedication etc.

My personal take from the 2019 Nobel Prize in Chemistry? 1) Age should not be an excuse preventing us from doing things. I thought I was too old to learn machine learning, cloud technique and other things related to "digital innovation", maybe I should at least give it a try. 2) Focus on solving problems. It is easy to get distracted and frustrated during problem solving, but never forget what we are trying to resolve. 3) Integrate cross disciplines and seek collaboration. "Be open to surprises", and to "not have preconceived ideas or close your mind from listening to what might work", as Prof. Goodenough once said.

Did you learn something from the Nobel Prize story as well? If so, I encourage you to write to me at editor@hgs.org.

Thank you for reading this relatively long letter. Have another safe and productive month. ■

**References:**

https://www.nobelprize.org/prizes/chemistry/2019/press-release/

https://cen.acs.org/people/profiles/Podcast-97-lithium-ion-battery/97/i35

https://chemistryworld.com/features/goodenough-rules/8099.article

https://news.uchicago.edu/story/john-b-goodenough-shares-nobel-prize-invention-lithium-ion-battery

# Applied Geoscience Conference

**November 6-7, 2019**

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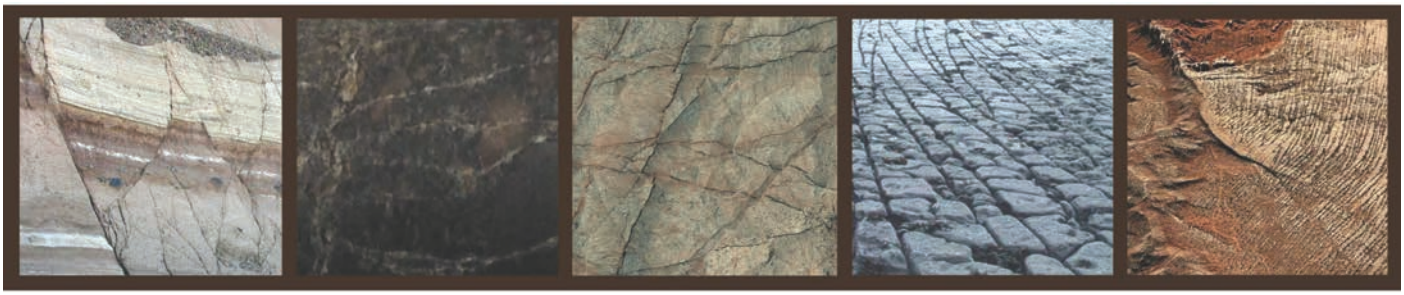

## Applied Geomechanics: Through the Life Cycle of the Field

| | |
|---|---|
| Day 1 AM Session 1 | Accessing Targets Faster with Safer Wellbores |
| **Lunch Keynote** | **Robert W. Zimmerman**, *Imperial College, London* |
| Day 1 PM Session 2 | Optimizing Completion Footprint and Stimulation Designs |
| Day 2 AM Session 3 | Post-stimulation Diagnostics and Monitoring |
| **Lunch Keynote** | **Tony Settari**, *CGG Services (Canada) Inc.* |
| Day 2 PM Session 4 | Extending the Life of the Field: Production, Refracturing, and EOR |

*University Poster Session represented by:* Georgia Tech, Oklahoma State University, Purdue University, The University of Oklahoma, The University of Texas, University of Calgary, University of Houston, Utah State University

**This Fourth Applied Geoscience Geomechanics Conference (since 2013) by an industry expert committee provides the highest value through invited subject matter experts represented by:**

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*General registration: July 1 – November 5, 2019*

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# Applied Geoscience Conference

**November 6-7, 2019**

## Oral Presentations – Wednesday, November 6, 2019

| | | |
|---|---|---|
| **7:00** | **Registration and Coffee** | |
| **8:00 - 8:10** | **Welcome and Opening Remarks:** Jon Blickwede, *HGS President*; Umesh Prasad, *Baker Hughes;* SWN representative | |
| | **Session 1: Accessing Target Faster with Safer Wellbores**<br>**Chairs:** Lauren Cassel, *Completion Imaging Analysis*; Mark Herkommer, *Excellence Logging* | |
| **8:10 - 8:45** | Advanced Seismic Inversion for Geomechanics Applications in Unconventional Reservoirs | **Colin Sayers**, *Schlumberger* |
| **8:45 - 9:20** | Lost-in-hole Diagnostics and Mitigation | **Agus Tjengdrawira**, Julie Kowan, and Namsu Park, *Baker Hughes* |
| **9:20 - 9:40** | **Coffee, Posters, Exhibits** | |
| **9:40 - 10:15** | Laboratory Modelling of Salt Deformation and its Correlation with Drilling Mechanics of Record Hybrid Drill Bit Runs in the GOM | **Ashabikash Roy Chowdhury**, Umesh Prasad and Ryckman Callais, *Baker Hughes* |
| **10:15 - 10:50** | Novel Pore Pressure Prediction Technique for Unconventional Reservoirs | **Vivek Swami**, Robert Raney, Adriana Perez, *CGG*; David P. Yale *Geomechanics Consulting* |
| **10:55 - 11:55** | **Open Floor Discussion & Posters** | |
| **11:55 - 1:00** | **Lunch, Posters, Exhibits** | |
| **12:15 - 1:00** | **Chair:** Deepak Gokaraju, *Metarock Laboratories*<br>**Keynote:** Failure of Anisotropic Rocks such as Shales, and Implications for Borehole Stability | **Robert W. Zimmerman** and Widad Al-Wardy, *Dept. of Earth Science and Engineering, Imperial College of Science, Technology and Medicine, London, UK.* |
| | **Session 2: Optimizing Completion Footprint and Stimulation Designs**<br>**Chairs:** Ashwani Zutshi, *Schlumberger*; Mark Morford, *FracGeo* | |
| **1:05 - 1:40** | Digital Rock Simulation: A Novel Approach for Accurate Characterization of Perforation Tunnel Damage | **Rajani Satti**, *Baker Hughes* |
| **1:40 - 2:15** | Digital Twins for Drilling Fluid and How Digitalization Could Help to Reduce the Cost and Increase the Wellbore Stability | **Mehrdad G Shirangi,** Reza Ettehadi, and Charles A Thompson Jr, *Baker Hughes* |
| **2:15 - 2:35** | **Coffee, Posters, Exhibits** | |
| **2:35 - 3:10** | Stress Sensitivity of Sonic Wave Velocity and the Reliability of Sonic Tools in Unconventional Tight Gas Sand Reservoirs | Dr. Christophe Germay and **Tanguy Lhomme**, *EPSLOG* |
| **3:10 - 3:45** | Characterizing Off-Normal Occurrence and Leakage Risk at Underground Natural Gas Storage Facilities | **Richard A. Schultz**, *Orion Geomechanics* |
| **3:45 - 4:45** | **Open Floor Discussion & Posters** | |

# Applied Geoscience Conference

**November 6-7, 2019**

## Oral Presentations – Thursday, November 7, 2019

| | | |
|---|---|---|
| **7:00** | **Registration and Coffee** | |
| **8:00 - 8:10** | **Welcome and Opening Remarks:** Umesh Prasad, *Baker Hughes* | |
| | **Session 3: Post-stimulation Diagnostics and Monitoring**<br>**Chairs:** David Katz, *Baker Hughes*; Jing Zhang, *The University of Oklahoma PhD Student* | |
| **8:10 - 8:45** | Geomechanics of Unconventional Hydraulic Fracturing: Clusters, Complexity, "Frac-Hits" and All That | **Ahmad Ghassemi**, *The University of Oklahoma* |
| **8:45 - 9:20** | Estimation of Propped Fracture Geometry Using Electromagnetic Geophysics | **Terry Palisch** and **Souvik Mukherjee**, *CARBO Ceramics* |
| **9:20 - 9:40** | **Coffee, Posters, Exhibits** | |
| **9:40 - 10:15** | Near and Far Field DAS Diagnostics for Unconventional Reservoir Monitoring | **Andres Chavarria**, *Optasense* |
| **10:15 - 10:50** | Early Warning Systems – Using PTA Analysis of DFITs to Understand Complex Hydraulic Fractures and Optimize Treatment Designs | **Bob Bachman**, *CGG* |
| **10:55 - 11:55** | **Open Floor Discussion & Posters** | |
| **11:55 - 1:00** | **Lunch, Posters, Exhibits** | |
| **12:15 - 1:00** | **Chair:** Deepak Gokaraju, *MetaRock Laboratories*<br>**Keynote:** Integrating Geology and Geophysics into Engineering Workflows to Enhance Unconventional Production<br>**Poster Winner Awards** | **Tony Settari**, *CGG Services (Canada) Inc.* |
| | **Session 4: Extending the Life of the Field: Production, Refracturing, and EOR**<br>**Chairs:** Barbara Hill, *Schlumberger*; Chi Vinh Ly, *CGG* | |
| **1:05 - 1:40** | Role of Multiple Fracturing of Vertical And Horizontal Wells in Maximizing Production and Extending Life of the Field | **Mohamed Soliman**, *University of Houston* |
| **1:40 - 2:15** | Limits on the Accuracy of Pore Pressure Estimates by Analysis of Random Measurement Error and Means for Improvement | **Mark Herkommer**, *Qube Tech LLC* |
| **2:15 - 2:35** | **Coffee, Posters, Exhibits** | |
| **2:35 - 3:10** | Extending the Life of Enhanced Permeability Zones Created During Hydraulic Fracturing | Ron Dusterhoft, **Zeno Philips** and U. Inyang, *Halliburton* |
| **3:10 - 3:45** | Predrill Pore Pressure Estimation in Wildcat Prospectivity | **Saad T. Saleh**, *GEOMECH, USA* |
| **3:45 - 4:45** | **Open Floor Discussion & Posters** | |
| | **Closing Comments** | |

## Poster Session

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

# Applied Geoscience Conference

**November 6-7, 2019**

## Posters – November 6-7, 2019

**Poster Session Chair: Mike Effler, James Kessler**

| University | Student Name | Poster Topic |
|---|---|---|
| Georgia Institute of Technology | **Ming Lui** | Poroelastic Indentation – Feasibility of a New Testing Method for Tight Rocks |
| Oklahoma State University | **Jingyao Meng** | Geomechanical Characteristics of the Prospective $CO_2$ Sinks and Seals, Eastern Gulf of Mexico |
| Purdue University | **Wenging Wang** | Heterogeneous Stress State in the Crystalline Crust Beneath the Western Canadian Sedimentary Basin: Observations from Borehole Image Logs to 2.4 km |
| The University of Oklahoma | **Zhi Ye** | The Role of Pre-Existing Fractures in Shale Reservoir Stimulation |
| The University of Oklahoma | **Juan Acosta** | Study of Creep Behavior in Barnett Shale Using Nano-Indentation |
| The University of Texas | **Mehdi Teymouri** | Coupled Hydro-Mechanical Analyses and Modeling for Reliable Characterization of Fracture Propagation in Anisotropic and Spatially Heterogeneous Formations |
| The University of Texas | **Shivam Agrawal** | Effect of Rock Heterogeneity at Different Length Scales on Fracture Geometry |
| University of Calgary | **Marco Venieri** | Predicting Reservoir Potential of Unconventional Shale Plays from Wireline Logs: A Correlation Between Compositional and Geomechanical Properties of the Devonian Duvernay Formation, Alberta, Canada |
| University of Houston | **Abdullah Bilal** | Predicting Static Data, Using Dynamic Properties and Quantitative Sample Characterization |
| University of Houston | **Suresh Dande** | Elastic Properties of Propped and Unpropped Eagle Ford Shale and 3D-printed Fractured Rock Models |
| University of Houston | **Rongrong Lin** | A Damped Dynamic Finite Difference Approach for Modeling Static Stress-Strain Fields |
| University of Houston | **Sabyasachi Prakash** | Analysis of Unconsolidated Sands' Yielding Behavior Under Unloading Conditions |

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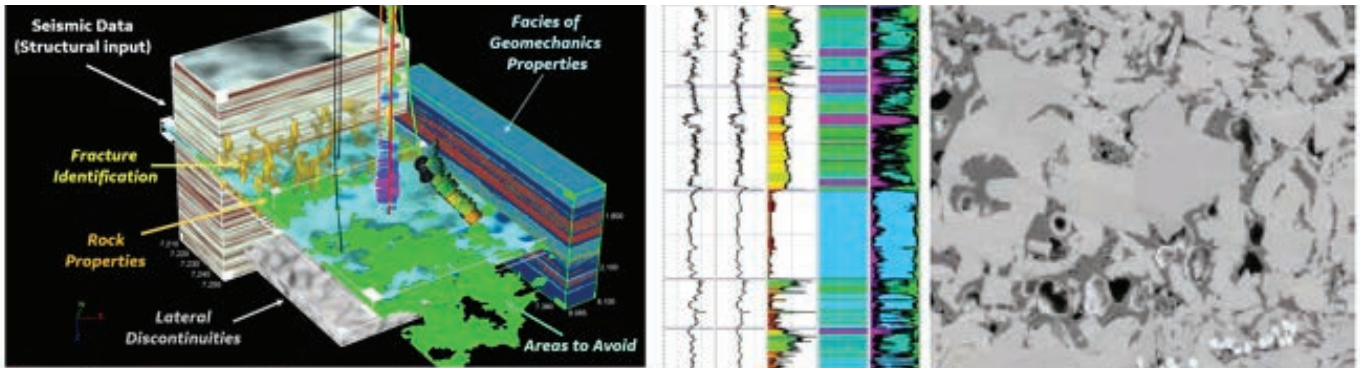


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EUROPEAN ASSOCIATION OF GEOSCIENTISTS & ENGINEERS

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# FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA

## South American Petroleum Plays for Future Decades of the Third Millennium

**19-20 NOVEMBER 2019 • NORRIS CENTER, HOUSTON TX, UNITED STATES**

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# FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA

## 19-20 NOVEMBER 2019

## Oral Presentations – Tuesday, November 19, 2019

| | | |
|---|---|---|
| **7:00** | **Registration and Coffee** | |
| **8:00 - 8:05** | **Introduction** Session Chairs: Jon Blickwede, Steve Getz | |
| | **Business Side of Exploration** Session Chair: Steve Getz | |
| **8:05 - 8:40** | Diversity of Opportunity Drives Exploration Activity and Value | **Alana Tischuk**, *Wood Mackenzie* |
| | **Regional Plays and Source Rock** Session Chairs: Luis Carlos Carvajal-Arenas, Lucia Torrado | |
| **8:40 - 9:15** | Greater Caribbean Petroleum Systems | **Craig Schiefelbein**, *Geochemical Solutions International (GSI)* and **William Dickson**, *DIGs* |
| **9:15 - 9:50** | The Lone Ranger or a Posse of Prospects? A Deepwater Playground from Guyana to Cape Town | **William Dickson**, *DIGs;* **Craig Schiefelbein**, *Geochemical Solutions International (GSI)* and David Rajmon, *Geosophix* |
| **9:50 - 10:05** | Break | |
| | **Exploration Plays: Uruguay – Argentina** Session Chairs: Kristin Frederick Boyd, Mariela Araujo Fresky | |
| **10:05 - 10:40** | New deepwater Clastic Upper Springhill Play in Malvinas Basin, Offshore Argentina | **Swati Ghoshal**, Michael Vinson, Gabriel Ritter, Tomieka Searcy and Ross Benthien, *BP America* |
| **10:40 - 11:15** | Offshore Northern Argentina – A New Frontier | **Steve DeVito**, *TGS* |
| **11:15 - 11:50** | Solving the Passive Margin Play Map Paradox Offshore Uruguay – The Value Density Proposition | **Katya Casey**, *Actus Veritas Geoscience LLC* |
| **11:55 - 1:20** | **Lunch: Keynote Address** Introduction: Kristin Frederick Boyd | |
| | Shell Upstream Argentina: Creating Value through Technical and Operational Excellence in a Global Super Basin | **Ed Kruijs**, *Shell* |
| **1:20 - 1:55** | Remote Sensing 2.0: Innovative Multispectral Satellite Data Analytics | **James Reardon**, Dmitry Vilbaum and Alexandre Agaian, *Terra Energy and Resource Technogies* and Scott C. Sechrist, *Acoustic Geoscience Consulting* |
| | **Exploration Plays: Brazil** Session Chairs: Ceri Davies, Lucia Torrado | |
| **1:55 - 2:30** | Deep Learning Assisted Seismic Interpretation Technology Applied to Evaporite Sequences: Case Study Offshore Santos Basin | **Ana Krueger**, Paul Endressen, Bode Omoboya and Benjamin Lartigue, *BlueWare Inc* |
| **2:30 - 2:45** | Break | |
| **2:45 - 3:20** | Deepwater Santos Basin: Huge Undrilled Pre-Salt Potential | **Cian O'Reilly** and James Keay, *TGS* |
| **3:20 - 3:55** | Cretaceous Plays of Deep-Water Foz do Amazonas Basin and Amazon Cone Area, North Brazil: Analog Petroleum Systems of the Equatorial Atlantic Passive Margins | **Lucia Torrado**, *University of Houston. Now at AGI Exploration, LLC* |
| | **Exploration Plays: Venezuela – Guyana** Session Chairs: Bob Fryklund, Seva Egorov | |
| **3:55 - 4:30** | Guyana-Suriname Deep Water Hydrocarbon System, Three Rivers and Two Source Rocks | **Ken Nibbelink**, Dick Boyce, Mosab Nasser and John Boyce, *JHI Associates, Inc (BVI)* |
| **4:30 - 5:05** | Sand Characterization and Provenance of the Guyanese Rivers – Implications for Offshore Sediment Development | **Ross Taylor**, *CGG* |

# FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA

## 19-20 NOVEMBER 2019

## Oral Presentations – Wednesday, November 20, 2019

| | | |
|---|---|---|
| **7:00** | **Registration and Coffee** | |
| **8:00 - 8:05** | **Introduction** Session Chair: Pete Emmet | |
| | **Business Side of Exploration** Session Chair: Pete Emmet | |
| **8:05 - 8:40** | Common Pitfalls in Seismic Imaging in Overthrust Geology and How to Address Them – a Collection of Case Studies from South America | **Thomas Fieseler**, *TEECsolutions GmbH* |
| | **Exploration Plays: Venezuela – Guyana** Session Chairs: Bob Fryklund, Seva Egorov | |
| **8:40 - 9:15** | The Cretaceous Source Rocks from East Venezuela, Trinidad, Guyana/ Suriname Basins, NE South America | **Francia Galea Alvarez**, *Actus Veritas Geoscience, LLC* |
| **9:15 - 9:50** | Insights into the Geological Framework of Northeastern South America | **Marel Sanchez**, *Actus Veritas Geoscience, LLC* |
| **9:50 - 10:05** | Break | |
| | **Regional Plays of the Caribbean** Session Chairs: Bob Weiner, Carolina Mejia | |
| **10:05 - 10:40** | The Case for Paleogene Convergent Tectonism Along Northern South America BEFORE Diachronous Oblique Caribbean Collision | **Jim Pindell** and Diego Villagomez, *Tectonic Analysis Ltd* |
| **10:40 - 11:15** | An Emerging Play in the Caribbean: Tertiary Carbonate Buildups | **Peter Lanzarone**, Carlos Louzada, Stefan Punnette, Hui Jin, Michael Vinson, Jesse Koch and Scott Lepley, *BP America* |
| **11:15 - 11:50** | Character of the Caribbean Crust Revealed: Observations of New and Reprocessed Seismic Data | **Kyle Reuber**, Jim Pindell, Antara Goswami, Mattie Friday, Chuck Campbell, Andy Bliss and Brian Horn; *ION E&P Advisors* and *Tectonic Analysis Ltd* |
| **11:55 - 1:20** | **Lunch: Keynote Address** Introduction: Steve Getz | |
| | Energy Opportunities in Latin America: Investing Through the Political Cycles | **Richard Chuchla**, *Energy and Earth Resources Graduate Program, Jackson School, UT Austin* |
| | **Western Caribbean** Session Chairs: Steve Getz, Carolina Mejia | |
| **1:20 - 1:55** | Petroleum Potential of the Colombia Basin: Insights from New Rock Evaluation Analyses for Regional Seismic Observations | **Luis Carlos Carvajal-Arenas** and Lucia Torrado, *University of Houston. Now at AGI Exploration, LLC*, and Paul Mann, *Earth and Atmospheric Sciences, The University of Houston* |
| **1:55 - 2:30** | Structural Evolution and Hydrocarbon Prospectivity in Offshore Panama in the Caribbean | **Antara Goswami**, Jim Pindell, Robert Erlich, Kyle Reuber, Tim Matava and Andy Bliss, *ION E&P Advisors, Tectonic Analysis Ltd* and *Cayo Energy LP* |
| **2:30 - 2:45** | Break | |
| **2:45 - 3:20** | Exploration Potential of the Northern Offshore Region of Jamaica | **Gregg H. Blake**, *Blake Geological Services, LLC*, and Raymond Thompson, Herona Thompson and Brian Richardson, *Dept of Oil and Gas, PCJ* |
| | **Central America** Session Chairs: Pete Emmet, Hector San-Martin | |
| **3:20 - 3:55** | Late Cretaceous–Cenozoic Paleogeographic Evolution of the Nicaraguan Platform, Western Caribbean Sea: Implications for Hydrocarbon Potential | **Lucia Torrado** and Luis Carlos Carvajal-Arenas, *University of Houston. Now at AGI Exploration, LLC* |
| **3:55 - 4:30** | The Petroleum Geology of Offshore Honduras | **Christopher Matchette-Downes**, *CaribX (UK) Limited* |
| **4:30 - 5:05** | Petroleum Geology and Potential of Guatemala | **Mark R. Bitter**, *Marbit Geoconsulting, LLC* |

# FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA

## 19-20 NOVEMBER 2019

## Posters – 19-20 November 2019

**Poster Session Chair: Mike Effler**

| Affliation | Name | Poster Topic |
|---|---|---|
| The University of Texas | **Abdulah Eljalafi** | Stratigraphic Architecture of Isolated Cretaceous Carbonate Platforms: A Case Study from the El Doctor Platform, Central Mexico |
| University of Houston | **Weston Charles** | Regional Flexure of the Caribbean Intraplate Area as a Result of its Subduction Beneath the Northern South America Margin |
| University of Houston | **Lila M Bishop** | Tectonic and Stratigraphic Stages and Hydrocarbon Prospectivity of the Sandino Forearc Basin of Nicaragua and Costa Rica Inferred from Seismic Mapping, Seismic Facies Analysis, and 2D Basin Modeling |
| University of Houston | **Christian Montes** | Determining the Amount of Left-lateral Displacement along the Santa Marta-Bucaramanga Fault, Colombia |
| University of Houston | **Bryan Moore** | Mapping the Continent-ocean Boundary Along the Gulf of Mexico and Circum-Atlantic Conjugate Margins Using Marine Satellite Gravity Data |
| University of Houston | **Sean Romito** | Caribbean Basement Terranes; Boundaries, Sedimentary Thickness, Subsidence Histories, and Regional Controls on Hydrocarbon Source Rocks, Oil Seeps, and Shows |
| University of Houston | **Lei Sun** | Tectonic Geomorphology and Gravity Modeling Reveal the Crustal Structure of Hispaniola and Impact on its Prospectivity |
| University of Houston/ Northeast Petroleum University | **Anqi Shen** | Flow Driven by Capillary Pressure in Shale Nanopores and Applications |
| University of Utah | **Dhrupada Beti** | Application of a New Resource Assessment Workflow to Offshore Suriname: Correction for Mineral Matrix Effect and Reclassification of Organofacies |
| University of Utah | **Sudeep Kanungo** | South Atlantic Deep-water Source Rock Systems from Offshore Suriname to the Falkland Plateau |
| Canopy E&P Services LLC | **Rogers Hardy** | The Quest from Shallow Shelf to Deepwater in Latin America: How We Got Where We Are, Where are We Going |
| Fugro | **Stephanie Ingle** | De-risking Frontier Offshore Exploration in Latin America with Seep Hunting and Geochemical Campaigns |
| ION Geophysycal Corporation | **Felix Diaz** | New Insights on the Petroleum System in the Salaverry Basin-Offshore Peru |

# EXHIBITING OPPORTUNITIES

Main reason for exhibiting:

- Meet existing and acquire new customers
- Introduce new products and services
- Demonstrate your technology and equipment
- Monitor the competition!
- Expand your network

## Exhibitors benefits

When booking a stand for HGS/EAGE 2019 exhibitors will benefit from the following

- 2 exhibitors passes good for admittance to the exhibit hall only
- Exposure on the EAGE and HGS website
- Free access to the receptions
- Free lunches

To secure booth space, please complete the contract at the end of this guide and send it to us by email (office@hgs.org). Please note that all incoming contracts will be handled on first come first served basis.

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With an array of unique promotional opportunities, we can help you design the perfect program to enhance your company's experience at HGS/EAGE2019.

## Why become a sponsor

When you are a corporate sponsor you get high visibility in a qualitative and uncluttered environment that makes your message stand out. HGS and EAGE events are synonymous with quality, with proven track records in the past. The HGS/EAGE 2019 program offers a diverse menu that will for sure help you reach your target audience.

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# FIRST HGS/EAGE CONFERENCE ON LATIN AMERICA

19-20 November 2019

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**Contact the HGS office for booth selection 713-463-9476** Booth # _____

Do you require Internet access at your booth? ☐ Yes ☐ No Do you require electricity at your booth? ☐ Yes ☐ No
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| ☐ | $5,000 | $2,500 | Technical Session Day 1 | |
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| ☐ | $5,000 | $2,500 | Breakfast Day One | |
| ☐ | $5,000 | $2,500 | Breakfast Day Two | |
| ☐ | $5,000 | $2,500 | AV Equipment and Services | |
| ☐ | $5,000 | $2,500 | AM & PM Break Food & Beverage Day One | |
| ☐ | $5,000 | $2,500 | AM & PM Break Food & Beverage Day Two | |
| ☐ | $5,000 | NA | Lanyards | |
| ☐ | $2,500 | $1,250 | Poster Gallery | |
| ☐ | $5,000 | NA | Delegate Bags | |
| ☐ | $1,000 | $500 | Speaker Gifts | |
| ☐ | $2,000 | NA | WIFI | |
| ☐ | $1,000 | $500 | Conference Signage | |
| ☐ | $1,200 | $600 | Printing Proceedings Catalogue | |
| ☐ | $500 | $250 | Note Pads, Pens | |
| ☐ | $ | $ | General Fund – You fill in the amount | |

# Seismic Workshop | Equatorial and South Atlantic Conjugate Margin Workshop

## Monday, November 18th | Norris Conference Center | Houston CityCentre

Join us for a workshop examining the evolution of the Conjugate Margins from the Equatorial Atlantic to Austral Magma-rich segment. Evaluate both margins as a single basin to understand similarities and differences between the proven and prospective petroleum systems of South America and West Africa. The workshop will focus on interpretation styles and 'hands on' data interpretation exercises to provide attendees with new ideas and insights in to exploration potential in the South Atlantic.

**AGENDA**

| | |
|---|---|
| **8:30-9:00 am** | **Registration & Coffee** |
| 9:00-9:30 am | Introduction and objectives \| *(Brian Horn)* |
| 9:30-10:00 am | Introduction to Magma rich margins – South of the Walvis ridge \| *(Kyle Reuber)* |
| **10:00-10:15 am** | **Break** |
| 10:15-11:15 am | **Exercise:** Namibia & Uruguay Conjugates |
| 11:15-12:00 pm | The South Atlantic Salt basin \| *(Jim Pindell)* |
| **12:00-1:30 pm** | **Break for Lunch** |
| 1:30-2:30 pm | **Exercise:** Salt Basin Conjugate Sections (SaoPaulo – Namibe, Campos-Kwanza, Sergipe-S Gabon) |
| 2:30-3:00 pm | Salt Basin Wrap up |
| 3:00-3:30 pm | The Equatorial Atlantic Transform Margin \| *(Neil Hurst)* |
| 3:30-4:30 pm | **Exercise:** Equatorial Transform Margin (Ghana to N Brazil) |
| 4:30 pm | Wrap Up - Happu hour |

## COURSE INSTRUCTORS

### Kyle Reuber, PhD.

Kyle Reuber, PhD. is a geologist for ION's E&P Advisors Team based in Houston. His primary area of focus is Latin America and the Caribbean. His current role is multi-faceted and broad in scope. Kyle has designed SPAN programs in locations such as Panama, Argentina, and West Africa. His interpretation projects integrate the regional 2D -SPAN and available reprocessed vintage datasets.

Kyle's project management background also assists in his roles as the lead interpreter for multiple basin modeling studies along the Atlantic margins using the ION data.

Kyle's more recent works includes a tectonic analysis of the conjugate margins of the volcanic passive margins of Uruguay and Namibia. This project characterized the along-strike variability of seaward dipping reflector distribution and rifted basement architecture using the SPAN data.

He regularly presents his findings at industry conferences and was most recently recognized for his role as a co-author with the 2017 AAPG Jules Braunstein – Best Paper Award of 2017.

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# Seismic Workshop | Equatorial and South Atlantic Conjugate Margin Workshop

## COURSE INSTRUCTORS

### Dr. James (Jim) Pindell

Dr. James (Jim) Pindell has been Director of Tectonic Analysis Inc. (USA) and Ltd. (UK) since 1986 and 1998, respectively. Jim has also maintained a strong foothold in academia, with positions in the role of research scientist over various times at Lamont Earth Observatory, Dartmouth College, Rice University, the University of Houston, and Cardiff University (Wales).

Pindell has a PhD in geology from the University of Durham, England (1985, supervisors John F. Dewey and Walter C. Pitman); a Master's Degree in geology from SUNY Albany (1981), and a BA in geology from Colgate University (1979). Jim serves as a teacher and as a consultant to the oil industry, and in his academic role has published a broad range of some 75 papers on the Gulf of Mexico, Latin America, and the Atlantic margins.

Pindell synthesizes regional onshore and offshore, geological and geophysical, structural and sedimentological data to derive detailed tectonic and basin histories, and to establish petroleum systems within sedimentary basins and continental margins. He specialises in defining the relationship between tectonic history/processes and stratigraphic response, and in palinspastic reconstruction of paleogeographic evolution. The syntheses provide the foundations for larger team programs, providing the backdrop for assessing a range of exploration elements such as models of source and reservoir rock deposition, causes and timing of hydrocarbon generation, identification of paleo-migration pathways, thermal basin modelling, and play generation. Since 2011, Jim has assessed the deeper levels of regional seismic data sets for ION Geophysical (ION Consulting) to unravel processes of rifting and passive margin development. One result of this work was to receive the 2015 Best Paper award (for 2014) in Basin Research from the EAGE (Europe).

### Lisa Fullarton

Lisa Fullarton has 20 years industry experience gained predominantly in International oil companies including Hess, Shell and Texaco, working on mega-regional to prospect scale exploration projects across 5 continents. She has a PhD in Structural Geology from Royal Holloway and Bedford New College, University of London, a MSc in Petroleum Geology from the University of Aberdeen and a BSc in Geology from Imperial College, University of London. Since 2013 Lisa has been working as an Independent Consultant. She has been consulting with Ion Geohysical since 2017 on projects in Libya, Nigeria and West Africa.

### Neil Hurst

Neil is an exploration geoscientist in the E&P Advisors team at ION. Neil has 13 years oil and gas industry experience working at Statoil, BG Group and ION. Neil has a broad knowledge of multiple basins globally with experience working in specialist structural geology, global new ventures and asset teams within oil and gas operators.

Neil is skilled in seismic interpretation, structural restoration, regional and prospect scale evaluations, gravity modelling, basin analysis and fault seal analysis. Neil was previously subject matter expert (SME) for structural restoration in BG Group. Neil has a PhD and MESci from Liverpool University in Geophysics and Geology.

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# 2020 HGS-PESGB Africa Conference

## September 15-16, 2020

Norris Conference Centers | Houston, TX

Call for Abstracts January 2020
Abstract Deadline April 2020

Submit abstracts - Africa2020@hgs.org

**Monday, November 11, 2019**

# HGS General and North American Dinner Meeting

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

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

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

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

***Dr. Julia Wellner***
*University of Houston*

## The Robert E. Sheriff Lecture Series

### Sponsored by the Department of Earth and Atmospheric Sciences at University of Houston and the U.H. Geoscience Alumni Association

In addition to the presentation by the guest speaker, Dr. Hua-wei Zhou, Chair of the Department of Earth and Atmospheric Sciences, will present an update of activities at U.H. as well as the departmental Outstanding Alumni Award. There will be a poster session on current thesis and dissertation research of U.H. students.

***Come and meet the next generation of geoscientists from the University of Houston!***

**The Robert E. Sheriff Lecture Series** was initiated in 1999 by the University of Houston Geoscience Alumni Association to honor Dr. Sheriff as an educator, scholar, and proponent for the geosciences. The series has recently been co-sponsored by the Houston Geological Society.

**The Sheriff Lecture mission is to**

**bring some of the best known geologists and geophysicists in the world to the Houston community to share ideas relevant to exploration geology and geophysics, and to showcase geoscience activity at the University of Houston.**

A full list of the Student Posters will be available on the HGS Website.

# *R.E. Sheriff Lecture:*
# The Sedimentary Record of Antarctica's Contribution to Sea-Level Changes

Today, Antarctica is covered by an ice sheet that, if it were to melt, has the capacity to contribute on the order of nearly 60 meters to global sea-level rise. Most of that ice is stable and is expected to be so long into the future, but parts of the West Antarctic Ice Sheet, particularly Thwaites and Pine Island glaciers, are susceptible to sudden retreat, or even "collapse." In the past, the ice was significantly expanded, reaching the continental shelf break around most of the margin. As the ice sheet retreated to its modern extent, the shrinking ice left behind a sedimentary signature of deglacial history. Over repeated cycles of glacial advance and retreat, in some places at least since the latest Eocene, sedimentary deposits of alternating glacial and interglacial periods have built up on the continental shelf and slope. Because the stability of the Antarctic Ice Sheet is strongly influenced by the ocean, the sedimentary deposits from the ice-ocean margin are the ideal place to study the controls on stability or instability of the ice.

**HGS Joint General and North American Dinner** *continued on page 23*

# 2019 Inaugural

# GSH FALL FORUM

# The Business of UNCONVENTIONALS and the Role for Geophysics

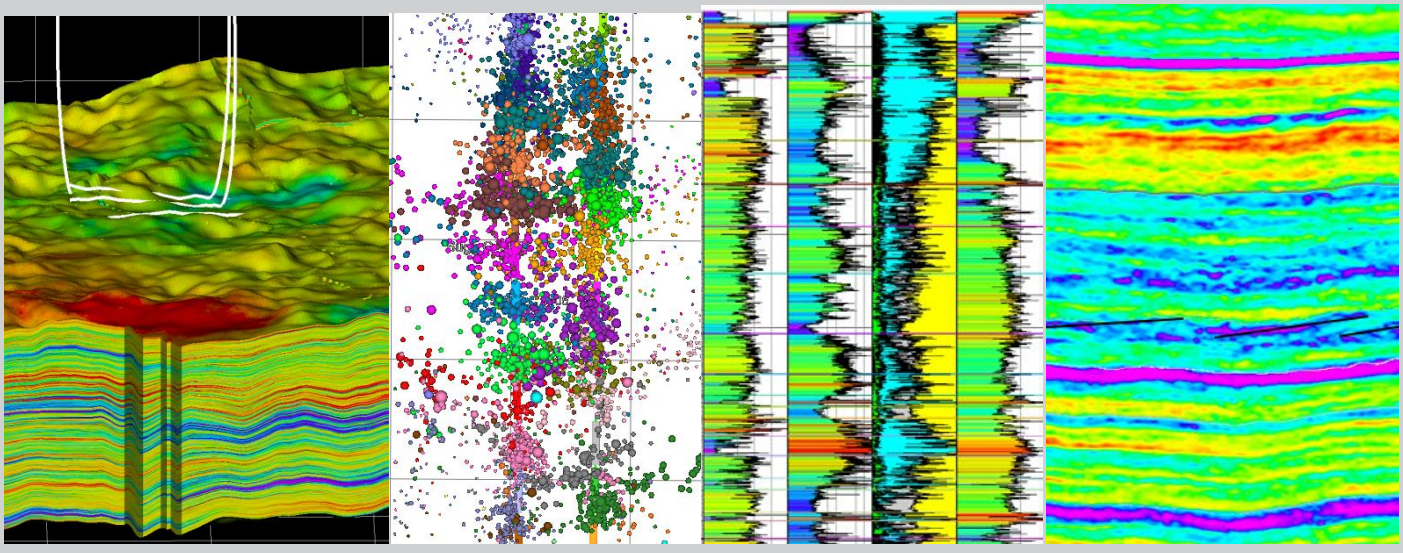
November 1, 2019

Norris Conference Center, Houston, TX

## Exploring How Geophysics Is Used In Unconventional Resource Plays

- The business of unconventionals (how to survive/be successful/competitive)
- How is investor pressure for free cash flow affecting the market?
- How do we demonstrate the value of geophysics in unconventional plays?
- What Earth Science technical disciplines are relevant in unconventionals?
- How should universities and YPs prepare for the future in this field?

Includes a panel discussion by some of the leaders in the industry



For Registration, Sponsorship & Booth info, call the GSH @ 281-741-1624 or visit gshtx.org

## HGS Joint General and North American Dinner

*continued from page 21*

*Drill rig on RV/IB* Nathaniel B. Palmer*, while surrounded by sea ice.*

This talk will focus on using the sedimentary record from the West Antarctic margin, by combining geophysical survey data, including 3.5 kHz profiles, seismic data, and multibeam swath bathymetry, with both gravity and drill cores, to map the past extent of the ice, determine the chronology of glacial cycles, and estimate the controls on glacial stability. Data will be presented from three different time periods. First, we will review data from deep-water sites, beyond the glacial limit and thus not susceptible to erosion, where drill cores have recovered continuous records of glacial cyclicity since the Neogene, allowing correlation to global sea-level records. Next, we will examine records of retreat since the last glacial maximum, at the end of the Pleistocene, where the difference in timing of retreat in individual drainage basins can be determined. Finally, we will look at the sedimentary records from where Thwaites Glacier has retreated over just recent decades, allowing an examination the factors influencing the ice today and how they differ from past periods. ■

### Biographical Sketch

**Julia Wellner** is a marine geologist who works primarily offshore Antarctica on questions related to the sedimentary record of glacial variability, climate history, and sea-level change. Wellner has completed over a dozen ocean-going cruises collecting geophysical data, surface samples, and drill cores, including ten seasons in Antarctica. Most recently, she served as the Co-Chief of International Ocean Discovery Program (IODP) Expedition 379, Amundsen Sea West Antarctic Ice Sheet History. Next season she will be back in Antarctica as part of the International Thwaites Glacier Collaboration.

She and her students also work in the Gulf of Mexico, examining details of recent stratigraphic units as analogs for petroleum reservoirs and on coastal response to sea-level rise. They use donated data as well as collect new data in shallow water using their own boat, the R/V *Mishipeshu*.

Julia completed a tour as an American Association of Petroleum Geologists (AAPG) Distinguished Lecturer in 2016 and now serves on several AAPG committees. She volunteers to lead coastal field trips for many local meetings, including the upcoming 2020 AAPG meeting.

She earned her PhD in 2001 in geology & geophysics from Rice University, where she also completed a post-doctoral fellowship. She has been at the University of Houston since 2006 where she teaches stratigraphy, sequence stratigraphy, marine geology, oceanography and field courses in facies interpretation. She received the Outstanding Faculty Award from the UH Alumni Association in 2015 and served as a UH Energy Fellow in 2016-2017.

# 2019 GSH Tennis Tournament

## Friday November 8, 2019

12-1pm: Registration & Lunch

1-5pm: Tennis Tournament

## Copperfield Racquet and Health Club

Chair: rjones@seitel.com

GSH: kathys@gshtx.org

**Wednesday, November 13, 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**

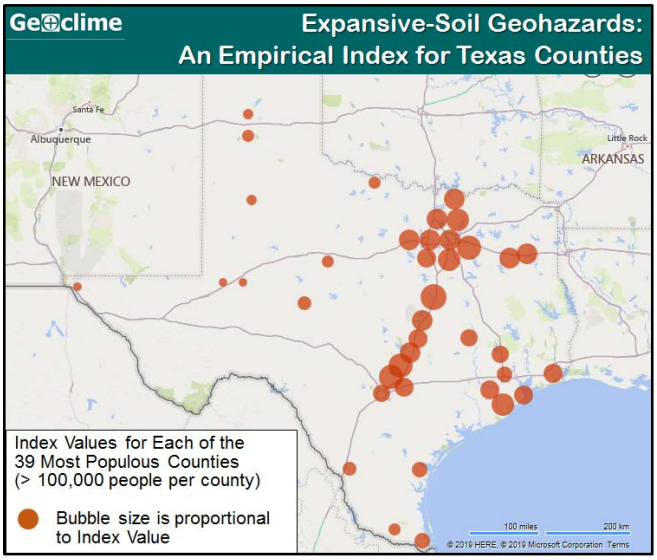
**To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.**
**Pre-registration without payment will not be accepted.**
**Walk-ups may pay at the door if extra seats are available.**

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

***Jim Gooding***
*Geoclime*

# Expansive-Soil Geohazards: An Empirical Index for Texas Counties

A simple index for the relative likelihood of expansive-soil damage, including effects of soil plasticity and drought-flood cycles, is formulated for Texas counties from publicly-available, online data for soil engineering properties and rainfall time-series. A dimensionless scale on which index values rise from zero toward or beyond one (1.0) indicates the counties most likely to experience expansive-soil effects. For the 39 most populous Texas counties, the range of index values is 0.02-1.40 although 18 counties cluster within the range of 0.80-1.20. The index is proposed as a quick screening tool to inform decisions about whether more detailed field or laboratory studies are advisable for expansive-soil geohazards. ■




## Biographical Sketch

**James L. Gooding** is the founder and Managing Director of Geoclime, LLC, providing quality and risk management consulting for energy, water, science and engineering projects with geotechnical elements. During multiple careers in government and industry, Jim worked as a supervisory research scientist (NASA), industry risk analyst and operations director (Enron; ImpactWeather – now StormGeo), director of commercial services in electric-power and natural gas businesses (Duke Energy) and management consultant for midstream energy businesses (Black & Veatch). His work in industry has included many engagements serving underground natural gas storage operators, leveraging his combined knowledge and experience in applied geoscience, commercial valuation and regulatory compliance. He is a licensed Professional Geoscientist (PG) and is credentialed by the American Society for Quality as a Certified Manager of Quality/Organizational Excellence (CMQ/OE). He earned a PhD with Distinction from the University of New Mexico in Earth & Planetary Science (Geology). Details of his background and experience are available at https://www.linkedin.com/in/james-gooding-phd/

**Monday, November 18, 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.**
**Pre-registration without payment will not be accepted.**
**Walk-ups may pay at the door if extra seats are available.**

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



**Rog Hardy, Grant Fergeson, Jim Peck**
*Canopy E&P Services LLC*

# The Quest from Shallow Shelf to Deepwater in Latin America: How We Got Where We Are, Where We Are Going

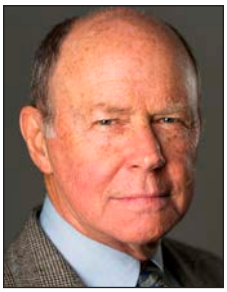
Industry's first exploration foray into open ocean was shortly after World War II on Louisiana's shallow shelf as an extension of prolific onshore and transition zone discoveries, enabled by a booming U.S. post-World War II economy and a wealth of former military ocean engineering talent. As geotechnical and engineering innovations progressed in the 1950's and early 1960's, Mexico's nearly adjacent shallow shelf Tampico and Salina Basins, plus Trinidad's Gulf of Paria and Atlantic Columbus Basin were soon beneficiaries, also as extensions of geologically contiguous major onshore producing areas.

This initial trendology, focused mainly by limited early seismic and seabed gravity data, continued to garner success and gradually gave way in the 1960's to utilizing large digital multiclient geophysical surveys to expand beyond the basins immediately adjacent onshore production. As the 60's to the 80's progressed, however, production technology limited exploration to the shelf where failure or marginal success was achieved in basins such as Brazil's Santos, Peru's Talara, Argentina's Malvinas, and Guyana-Suriname Basins.

In the 90's and 2000's production technology advanced in the U.S. GOM beyond the fixed-leg platform enabled exploration in deeper waters, focused by more data sets, integration of DSDP and ODP drilling data, seismic stratigraphy, AVO, and plate tectonics (especially in the South Atlantic linking up Africa's productive basins with South American target areas). Major deepwater success followed in Brazil's Campos-Santos, and more recently Mexico's Perdido Foldbelt plus Guyana. Not all deepwater expansion has been roses, however, with in failures including Cuba, Barbados, Suriname with French Guyana, northeast Brazil, and Uruguay, plus relatively marginal or gas-only success in Colombia, Venezuela, Trinidad, French Guyana, north central Brazil and the Malvinas – Falklands regions.

We informally categorize the shelf and deepwater success of the last sixty years into "closed" and "open" productive systems. "Closed" systems are highly structured with super seals and/or readily definable traps and boundaries on seismic data – Mexico's Salina-Sureste Basin and Brazil's Campos-Santos, plus a lesser extent the US-Mexico Perdido Foldbelt and Brazil's Sergipe Alagoas. "Closed" systems are very rich and have major reserves to be found primarily by drilling in-between existing discoveries in Brazil, plus some step-outs in Mexico. Their heyday has decades to come, but they will probably see a production decline before humankind moves to a post-carbon world. "Open" systems, conversely, are subtly structured (with local exceptions) or purely stratigraphic with undefinable boundaries on seismic – best characterized by Guyana. Vast regions possibly harboring major accumulations in "open" systems remain undrilled or barely touched by the bit, from deepwater Barbados to Argentina on the Atlantic side, and higher risk Mexico to Chile on the Pacific side. A major effort is underway to identify more Guyanas that will result in establishing new producing provinces, but at the present industry pace some large productive complexes may go undiscovered before we move to that post-carbon world. ■

## Biographical Sketches



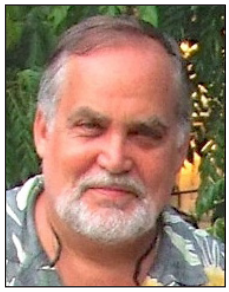
**Rog Hardy** has over four decades of diverse business and technical experience – in international and domestic, in operations and new ventures, with host governments, majors, independents, start-ups, contractors and as an independent consultant.

Most recently, Rog's equity position in a Latin America-focused E&P start-up, Cruz del Sur LLC, and extensive consulting in North American shale growth strategy plus

international new ventures and operations position him to be well versed in current issues and trends in the global industry.

Previously, Rog held technical and leadership positions of increasing scope and responsibility in Amoco, Chevron, Natomas/IIAPCO (Maxus) and Unocal, culminating in six years as Vice President Unocal Indonesia leading and participating in a major business unit's oil, gas, and geothermal exploration, production (including LNG export) of over 200,000 MMBOE, and new venture strategy. Global experience elsewhere includes in-depth new ventures and operations in the Sub-Andean Countries of South America, Southeast Asia, Sub-Saharan Africa, the Caribbean and North America.

Rog is past chair of the AAPG History of Petroleum Geology Committee and a Visiting Petroleum Geoscientist. He has a bachelor's in geology from the University of Minnesota, and a master's from San Diego State. He is a registered geophysicist by the state of California. See more at www.linkedin.com/in/roghardy



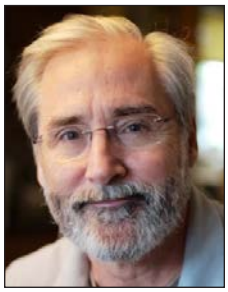
**Jim Peck** has proven repeatedly over the last four decades to be an effective explorationist and oil finder with extensive geological and geophysical interpretation worldwide with emphasis on sequence stratigraphy and geophysical attribute analyses. He has shown exceptional and holistic ability to quickly synthesize regional tectonics, basinal analyses, depositional systems and burial histories into petroleum system models, and then utilize those elements toward comprehensive prospect evaluation and field development projects.

Jim's new ventures and operational experience essentially extends globally with emphases on North Africa and the Mediterranean, the Middle East, West Africa, South America, the Caribbean, Southeast Asia and the Gulf of Mexico.

Most recently, Jim has consulted to a broad range of clients internationally and domestically, and founded the Pelagic Exploration Company with two partners, conducting successful ventures in the Eastern Mediterranean.

Previously, Jim was Vice President of Geology for Reading and Bates Development Company, Senior Team Leader with Total in Singapore and Jakarta, and Chief Geologist for the Syrian-American Petroleum Company.

Jim has a Bachelor's degree in geology from the University of Houston. His primary interpretational platforms are IHS 3D-2D Kingdom Geophysics and Geology. See more at https://www.linkedin.com/in/james-peck-05a94123/



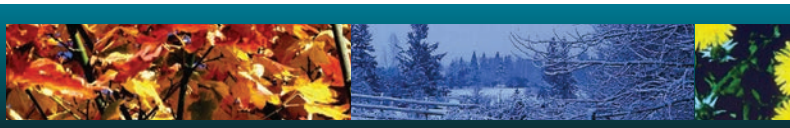
**Grant Fergeson** has a strong track record finding commercial accumulations of oil and gas in both conventional and unconventional Paleozoic through Tertiary exploration plays, principally in North America's onshore and offshore Gulf Coast, East Texas, Williston and Michigan Basins, plus generating and evaluating prospects in the Caribbean and other basins worldwide.

Grant specializes in integration of basin research with subsurface and seismic data to create a complete picture of working petroleum trap styles and prospective regions. This enables generation of high quality risk appropriate prospects which has resulted in numerous successful discoveries over the decades of his career. He is also adept at driving multi-player technical teams toward the rapid conclusion of technical evaluations of prospects, and subsequent funding and testing by drill bit in order to realize economic potentials.

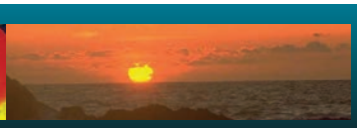
Recently Grant was Executive Vice President E&P for Mertz Energy, and earlier was affiliated with Devon Energy, EOG Resources, and Vastar Resources. He was also owner of Fergeson Petroleum Company and Chief Geologist at Venus Oil Company in San Antonio.

Grant has a BS from The University of Texas at Austin, is a Texas Certified Professional Geoscientist, an AAPG DPA Certified Geologist, and has an extensive record of professional service including past-President of the South Texas Geological Society plus Technical Session Chairman for GCAGS and AAPG Conventions. See more at https://www.linkedin.com/in/grant-fergeson-19515213/

# November 2019



| Sunday | Monday | Tuesday | Wednesday |
|---|---|---|---|
| | **Members Pre-registered Prices:**<br>Dinner Meetings members..... $40<br>Emeritus/Honorary members..... $40<br>Student members ..... $10<br>Nonmembers & walk-ups ..... $45<br>Except - Env. & Eng. ..... $30<br>Nonmembers & walk-ups ..... $35<br>Emeritus/Honorary members..... $15 | **Reservations:**<br>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.** | |
| 3 | 4 | 5<br>**NeoGeo Trivia Night**<br>*7-9 pm*<br>*Liberty Station*<br>*2101 Washington Ave*<br>**HGS Board Meeting**<br>*6 p.m.* | 6<br>**Applied Geoscience Conference Applied Geomechanics: Through the Life Cycle of the Field**<br>*Southwestern Energy, 100 Energy Drive, Spring, TX 77389*<br>*Page 6* |
| 10 | 11<br>**HGS Joint General and North American Dinner Meeting Annual Sheriff Lecture**<br>*"The Sedimentary Record of Antarctica's Contribution to Sea-Level Changes," Dr. Julia Wellner,*<br>*Page 21* | 12 | 13<br>**HGS Environmental & Engineeering Dinner Meeting**<br>*"Expansive-Soil Geohazards: An Empirical Index for Texas Counties," Jim Gooding,*<br>*Page 25* |
| 17 | 18<br>**HGS International Dinner Meeting**<br>*"The Quest from Shallow Shelf to Deepwater in Latin America: How We Got Where We Are, Where We Are Going," Rog Hardy, Grant Fergeson, Jim Peck*<br>*Page 26* | 19<br>**First HGS/EAGE Conference on Latin America**<br>*South American Petroleum Plays for Future Decades of the Third Millenium*<br>*Norris Center, Houston, TX*<br>*Page 12-17* | 20 |
| 24 | 25 | 26 | 27<br>**HGS Office Closed for Thanksgiving** |

# GeoEvents

Thursday Friday Saturday

| | | |
|---|---|---|
| | 1 Don't wait, make your reservations online at hgs.org | 2 |
| 7 | 8 | 9 |
| 14 | 15 | 16 |
| 21 | 22 | 23 |
| 28 | 29 | 30 |

**November 6-7, 2019**
HGS Applied Geoscience Conference
*Applied Geomechanics: Through the Life Cycle of the Field, Spring, Texas, USA, Pages 6-11*

**November 19-20, 2019**
First HGS/EAGE Conference on Latin America
*South American Petroleum Plays for Future Decades of the Third Millennium, Houston, Texas, USA Pages 12-17*

**February 11 – 13, 2020**
AAPG Global Super Basins Leadership Conference
*Sugar Land, Texas, USA*

**March 9 – 13, 2020**
CERAWeek
*Houston, Texas, USA*

**May 4 – 7, 2020**
Offshore Technology Conference
*Houston, Texas, USA*

**June 7 – 10, 2020**
AAPG 2020 Annual Convention & Exhibition
*Houston, Texas, USA*

**June 8 – 11, 2020**
EAGE Annual Conference & Exhibition
*Amsterdam, The Netherlands*

# The NeoGeos Committee

The NeoGeos Committee was formed for the purpose of building a community of geoscientists that are starting their careers in geoscience and providing career resources to help them navigate their first few years in the professional world. Casey Langdon took over as chair in September 2018 and leads a committee of volunteers that coordinate, plan, and execute events focused on the success of young professionals. These volunteers include Tiffani Kennedy, David Hamilton, Jordan Dickinson, Jake Shultz, Katie Fry, and Josh Krnavek.

Initially focused on facilitating happy hours, this year the NeoGeos committee has expanded to hosting a professional development series, larger industry sponsored happy hours, and fun events that go beyond the typical networking happy hours. The goal of the professional development series was to introduce attendees to specific career paths not normally explored by students and young professionals. The inaugural event in March focused on Investment Banking, providing an opportunity for professionals from this niche industry an opportunity to mentor students, young professionals, and other attendees. The second, and more recent Career Development Series event was co-hosted with SPE and focused on Data Science and Analytics. Over 100 people attended this panel discussion and subsequent networking hosted at Karbach Brewery. Also new to the NeoGeos in 2019 was Geology Trivia Night. The three trivia nights hosted so far this year have drawn crowds in excess of 65 attendees. The most recent Trivia Night was hosted in conjunction with the AAPG Student Expo to emphasize the importance of networking for students and young professionals.

Lastly, the NeoGeos put together the short course, Effective Networking for Professional Development, for the AAPG Student Expo including $500 in travel grants to student attendees. This short course had an attendance of 40+ students and focused on networking in the professional world. The 'speed dating/ networking' exercise was very successful as it allowed attendees to prepare with industry professionals for the "face-to-face" networking on the expo floor later that day. ■



# HGS Welcomes New Members



**New Members Effective October 2019**

**ACTIVE MEMBERS**

Graeme Bailey
Craig Beasley
John Chapman
Joni Clark
Mark George
Matthew Hutcheson
Esperanca Rosa
Jean-Marc Ugolini
Jameson West

**STUDENT MEMBERS**

Matthew Barley
Elizabeth Davis
Barbara Kemeh
McKensie Kilgore
Cassie Mohkami
Eniola Omiyale
Aisha Stephens
Conrad Suen

**EMERITUS MEMBERS**

Bruce DeBartolo

*Welcome New Members*

# Serving the Houston Geoscience Geomechanics Community Since 2013

The Houston Geological Society's Applied Geoscience Geomechanics Workshop has evolved significantly since its inception in 2013, alternating with the HGS Mudrocks conference that occurs in even-numbered years. The conference is organized by a committee of industry experts, and provides high value by presenting the insights of invited subject matter experts from a variety of operating and service companies. A portion of the success of these conferences is due to Houston being a hub for many oil & gas companies, with a large number of companies having their headquarters located in the region. The invited subject matter experts, scientists, and researchers are frequently able to attend the workshop without making travel and lodging arrangements. However, at least 10 university students travel from distant universities (including Canadian universities) to present their latest work in poster sessions, and they are reimbursed up to $500 for their expenses.

The title of this year's conference and those of the three prior conferences are presented below.

- 1st HGS AGC 2013 – Interdisciplinary Micro to Macroscale Geomechanics
- 2nd HGS AGC 2015 – Geomechanics in Unconventionals
- 3rd HGS AGC 2017 – Reservoir Characterization, Engineering Applications, Surveillance, Diagnostics, and Case studies
- 4th HGS AGC 2019 – Applied Geomechanics: Through the Life Cycle of the Field

These conferences have covered several core subjects in which geomechanics is one of the keys for successful exploration drilling, reservoir modeling for both stresses and hydrocarbon rock properties, completion by massive hydraulic fracturing, improved production, and abandoning the well by complying with applicable regulations.

The topics of this year's conference cover wide aspects of geomechanics which ultimately lower the risks of drilling, completions, and production, and minimizes uncertainties inherent in these operations. Altogether, four sessions, sixteen oral presentations, and thirteen poster sessions are scheduled. Additionally, four alternate speakers have been reserved in case of presenter cancellations, who are available to present at any 'lunch and learn' activities planned by HGS. The two keynote speakers, Robert Zimmermann (Imperial College London) and Tony Settari (CGG Canada), need no introduction for professionals in the geoscience and geomechanics communities. The November 6 – 7 conference venue is Southwestern Energy's Conference Center in Spring, Texas.

A large number of committee members have assisted in organizing this conference, led by former HGS President John Adamick, HGS Event Director Andrea Peoples, General Chair Umesh Prasad, eight Session Chairs, and ten other committee members. Conference attendees will receive a transactions volume which includes extended abstracts and speaker biographies for all of the talks. The transactions are also available for purchase through the HGS office. All oral program speakers will receive HGS speaker awards through the efforts of the HGS Speaker Award Committee Chair Mike Deming.

The invited university student poster presenters will received up to $500 toward their travel expenses, and complimentary registrations for the event. This was made possible through the poster session sponsorship provided by the Baker Hughes Company. ■

# Remembrance

## DWIGHT McCLINTOCK "CLINT" MOORE

**Dwight "Clint" Moore** passed away suddenly on Tuesday, October 1, 2019. Clint, as he preferred to be called, will be sorely missed by his many friends and the many people he touched, which includes, but not limited to many in the Oil and Gas Industry. Clint was a tireless, quick thinking doer, who served a breathtaking number of communities. He was a multifaceted person who excelled in everything he set his mind to do and that was a lot.

His great passions included geology, government, helping other people including via involvement in the Susan G. Komen organization, and diving. Clint managed to often combine his passions in much of what he achieved. He was a grass roots activist in both professional and political organizations. In his core, he strongly believed that individuals, not autocracies, could govern themselves and be the driving force behind human progress. He did not just give lip service to his belief of a bottom up driven source of governance. He was a tireless volunteer, and more often than not, a leader who showed his fellow colleagues and citizens how to be involved and make things happen.

Clint's passion for geology started at an early age as he learned geology from his father, who was an independent Petroleum Geologist. His professional career started with his first job in 1978 at Diamond Shamrock as a Junior Geologist, subsequently rising to District Geologist and Senior Business Analyst by the time he left in 1987. He then joined Anadarko Petroleum Corporation for around a 15-year tenure as a Senior Geologist, rising to Exploration Supervisor. He interrupted his career as a geologist in 2003 to make an unsuccessful run to represent the Texas 2nd Congressional District in the U.S. House of Representatives, coming in 3rd out of 5 primary candidates. From 2004 until 2006 he hung out his shingle as an Exploration-Business Analysis Consultant, which was followed by a couple of yearlong tenures at Murphy Oil as Manager of Business Development during 2007 and as the President of DiamondStar Drilling from 2007 to 2008. Those situations were followed by more than 5 years from 2008 to 2013 as the Vice President for Corporate Development at ION Geophysical Corporation. He left ION during 2013 to co-found GulfSlope Energy, Inc. He initially served as Vice President and Corporate Secretary, while simultaneously serving as Officer of the Corporation, as well as Chief Administrative Executive and became Vice President – Geophysics, Geology, & Exploration in 2018.

Clint was a widely respected geoscientist in the Gulf Coast who was an active leader in the geoscience community at the local level with Houston Geological Society (HGS), as well as the regional level through the Gulf Coast Association Geological Society (GCAGS) and at the national level as an Active Member of the American Association of Petroleum Geologists (AAPG). He was a Licensed Professional Geoscientist in the State of Texas, a member of AAPG's Division of Professional Affairs (DPA) and has held scientific and management positions with several petroleum exploration companies during his 40-plus-year professional career. For over the last 20+ years, Clint presented and published many talks, lectures, and speeches, to his many professional organizations.

Clint's leadership and commitment in the geologic community was extensive. His service to the Houston Geological Society included Vice President (1992-1993), President-Elect (1993-1994), and being the youngest president of the HGS (1994-95), after which he also served on the HGS Nominations Committee. His impact and active participation in HGS were recognized by his colleagues. He received HGS's highest awards, including the President's Award (1993), Distinguished Service Award (1996) and Honorary Life Membership (1999).

In addition, Clint was a leader for more than 30 years at the regional level for the Gulf Coast Association of Geological Societies. His work bringing high quality technical presentations to the GCAGS annual conventions was recognized by his nomination to receive the GCAGS Distinguished Service award, which he will posthumously receive at the 2019 GeoGulf Convention. Previously he served on the GCAGS Board of Directors (1994-1995), the AAPG Advisory Council Representative for GCAGS, and often as a GCAGS Convention Session Chair (2019, 2015, 2014, 2012).

Clint's participation on the national-global level included representing GCAGS and HGS as a Delegate in the AAPG House of Delegates (HoD). He was a member of the HoD's Constitution and Bylaws, Credentials, Future Directives and Nominations and Election committees. He was awarded both the Distinguished Service Award and the HoD's highest award of Honorary Membership.

**Remembrance** *continued on page 34*

His service to American Association of Petroleum Geologists (AAPG) included membership on the AAPG Executive Committee as AAPG Treasurer (2004-2006); AAPG Investment Committee Chairman (2009-2013) and Vice Chairman (2007-2010), Audit Review (2004-2006) and Career Services Committee Vice-Chairman (2009-2013) and Chairman (2006-2009 and 2013-2015), Budget Review Committee (2004-2006), All Member Survey Committee (2003-2006), Constitution & Bylaws Committee Chairman (1999-2000), and finally, AAPG Foundation Military Veterans Scholarship Program Committee (2013-present)

Clint's AAPG colleagues and peers recognized his efforts when he received six Certificates of Merit (2016, 2013, 2006, 2004, 1999, 1997), DPA Distinguished Service (2010), DPA Distinguished Service (2001) and John W. Shelton Search and Discovery award (2011), House of Delegates Long Service Award (2012), and AAPG Honorary Member of the House of Delegates Awardee (2018).

Clint was also a mover and shaker in Republican politics both in Texas and on a National level. Clint combined his diving, government, geology and the petroleum industry passions when, in October 2005, NOAA's National Marine Sanctuary Program Management appointed Clint as the "Oil & Gas Production Representative" to the Sanctuary Advisory Council (SAC) of the Flower Gardens Bank National Marine Sanctuary, and was he reappointed in January 2008 to the term limit of a four-year term that ran through May 2012. In March 2014, he was reappointed to a new three-year term through March 2017 and reappointed in May 2017 to a new three-year term through December 2020. He was elected in May 2015 to a two-year term as Chairman of the Sanctuary Advisory Council (SAC) and re-elected again as SAC Chairman to an additional two-year term limit that ended May 2019. While serving on this citizen Council, Clint was elected by the Council to serve as Chairman of the 1st Boundary Expansion Working Group, as well as the Charter Revision Subcommittee, and as Co-Chairman of the current Boundary Expansion Working Group.

In the government arena, in June 2006, Texas Governor Rick Perry appointed Clint as a Committee member from Texas of the Interstate Oil & Gas Compact Commission (IOGCC), where he served the State of Texas on the IOGCC's Energy Resources, Research, and Technology Committee. He was elected by the Texas State Republican Convention six times in a row from 1996 through 2016 to serve as a Republican National Convention Delegate.

On a State level, he served as the Texas Senate District 7 Representative on State Republican Convention Rules Committee 13 times from 1994-2018, as well as the State Republican Executive Committeeman - Senate District 7 from 2004-2012 and the State Party Assistant Parliamentarian from September 2019 to his death. He served as a former Republican Senate District Chairman for Senate District 7 and 15. He was honored in 2012-13 as State Party Volunteer of the Year – Senate District # 7, and in 1994-95 as State Party Volunteer of the Year – Senate District # 15. From 1989 to present he was served as the Executive Committee Member, and Precinct # 520 and # 110 Chairman. Clint was quite a lobbyist for all the causes he believed in. He once commented that he felt the best thing he had done in his life was to help shepherd through the 2019 Texas law requiring Texas insurers to cover diagnostic breast cancer screenings at no additional cost to patients. He also lobbied on behalf of establishing and reauthorizing the Texas Geoscience Act, which established the Texas Board of Professional Geoscientists (TBPG) and therefore licensing in Texas of Geoscientists who are engaged in work that protects public health, safety, welfare and the state's natural resources. In the most recent Sunset episode, Clint was solely responsible for pushing the reauthorization through the governor's office against significant resistance.

In Harris County Clint was the Assistant to the Harris County Republican Party Chairman 2004-2008 and 2012-2014. He was a member of the Conservative Coalition of Harris County and a Member of Board of Directors and Candidate Review Committee. Clint's service did not stop with professional societies and government. He served as Director of the North Harris County Regional Water Authority from 2000-2002 where he is credited with negotiating favorable water rates with the City of Houston. He also served as the Director of the Spring Lakes Homeowners Association 2003-2007 (President 2006-2007) and was the Director Harris County Municipal Utility District # 249 (2004-2007).

He was an avid diver with over 450 dives and 100 to Gulf of Mexico Banks and Platforms. He belonged to the Texas Gulf Coast Council of Diving Clubs where he was awarded the Lifetime Achievement Award – 2018, and held multiple PADI Certifications for Open Water, Advanced Open Water, Enriched Air (NITROX), Manta Ray Awareness (YAP), Maldivian Manta Ray Conservation. From 1997-2001 he served as the Production Advisor on IMAX Film "Ocean Oasis" a journey into the Baja California desert and Sea of Cortes.

For his extended family, he was the President from 1997-Present of the Rodeham Moore Descendants Association.

Clint graduated from Cranbrook College Preparatory School in Michigan. He served as the 1999 and 2004 Reunion Committee Co-Chairman. He went on to study at Southern Methodist University (SMU) in 1974 and he graduated in 1978 with a dual degree in geology and business administration, and with a minor in economics. He was the Vice President and President of the SMU Alumni Association – Houston Chapter from 1982-1986.

Clint is survived by his wife, Diana Moore. To honor Clint, and in lieu of flowers, Diana asks that people make donations to the AAPG Foundation's Military Veterans Scholarship Program. Clint was particularly proud that he was able to help setup that program. To do this, please go to https://donate.aapg.org/Core/eDonation.aspx/ and from the "Designate Fund" select "Military Veterans Scholarship Program" and please dedicate your donation in memory of Clint Moore.

A Celebration of Clint's Life was held at 10:00 am on Saturday, October 26 at St. John Divine Episcopal Church, 2450 River Oaks Boulevard. A reception followed at Ouisie's Table. ■

## 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 |
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| 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)

## Website Advertising Opportunities

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

| Placement | Rate | Specifications/Description |
|---|---|---|
| HGS Website Home Page Banner Ad | $800 – Monthly<br>$1800 – 3 Months<br>$2800 – 6 Months<br>$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<br>$1500 – 3 Months<br>$2400 – 6 Months<br>$3600 – 12 Months | 200 x 400 pixels; home page right column ad |
| HGS Website Event Page Ad | $600 – Monthly<br>$1200 – 3 Months<br>$1600 – 6 Months<br>$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<br>$100 – 30 days<br>$300 – 3 Months<br>$600 – 6 Months<br>$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<br>*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.<br>• 20% off website ads when combined with print ads in 5 HGS *Bulletin* issues.<br>• 10% off website ads when combined with print ads in 3 *Bulletin* issues. | |

# Application to Become a Member of the Houston Geological Society

***Qualifications for Active Membership***

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

***Qualifications for Associate Membership (including students)***

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

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

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

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

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

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