

HGS Bulletin

Volume 63, Number 4

Houston Geological Society

December 2020

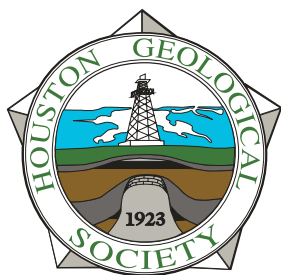
**USING FLUID INCLUSION SALINITY
DATA TO REDUCE UNCERTAINTY IN
PETROPHYSICAL S_w CALCULATION –
NEW APPLICATION OF AN OLD
TECHNIQUE IN UNCONVENTIONAL
RESERVOIRS**

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HGS Executive Office Director	Andrea Peoples	713-463-9476	andrea@hgs.org		
HGS Admin. Assistant/Web Content Manager	Alyssa Cushing	713-463-9476	acushing@hgs.org		



The Bulletin

Houston Geological Society

Volume 63, Number 4

December 2020

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The Houston Geological Society Bulletin (ISSN-018-6686) is published monthly except for July and August by the Houston Geological Society, 14811 St. Mary's Lane, Suite 250, Houston, Texas 77079-2916. Phone: 713-463-9476; fax: 281-679-5504

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

Subscriptions: Subscription to a digital version of this publication is included in the membership dues (\$30.00 annually). The subscription price for non-members is \$160.00. The printed Bulletin for 10 issues for HGS members is \$150.00 or \$15.00 per issue while supplies last. Periodicals postage paid in Houston, Texas.

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

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About the Cover: An upstream look at Kaieteur Falls, Potaro River, Guyana. The cliff forming, Roraima Formation, conglomeratic sandstones are Proterozoic in age (~1.8 billion years old) and are remarkably undeformed. Cenozoic landscape evolution has allowed for peneplanation of the Pakaraima plateau. Modern day fluvial systems are now etched onto relict alluvial plains, with the peneplains separated by beautiful knick points like Kaieteur. Photo supplied by Ross Taylor, CGG.



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Actionable Insights from North America's Greatest Basins

Super Basin applications continue to help drive the future of exploration and development. AAPG will be continuing its initiative to showcase some of the world's greatest super basins during the fourth Global Super Basins Leadership Conference, 25–26 January 2021. This online conference will feature a full two-day program of experts and commercial masters on North American onshore and offshore Super Basins. The geology, exploration, and development of these basins provide great analogs that can re-think other global basins' potential.

Industry leaders operating within the basins will share geologic, technical, and business insights while looking at lessons learned, challenges overcome, and future views from these basins. The program will be valuable to those working in the featured basins and global explorers looking for actionable insights from North American analogs.

Basins covered will include:

Anadarko Basin
Permian Basin: Midland & Delaware
Analog for Global Exploration
Appalachian Super Basin
Gulfcoast Super Basin
Cretaceous Western Interior Seaway
Basin
Western Canadian Super Basin



"Excellent diversity of talks. I really appreciated the consistent approach to communicating the geology – past, present, and future of each basin. Each presenter had a different approach that brought something unique about each basin forward."

– Super Basins 2020 Attendee Survey

**To learn more visit:
SuperBasins.AAPG.org**



Jim Tucker
president@hgs.org

What a Year!

The end of the year is always a time to look back, and 2020 is a year we will be glad to have over. It's hard now to remember the first quarter, although I don't think I slept through it. I'm writing this while visiting our daughter on the coast. Growing up in Corpus Christi, I always appreciate time at the beach and this is the nicest time of year here (the secret is out). Even when breezy and overcast, like today, the beach walking is fine, even if the Gulf is not as inviting.

Jon Blickwede, immediate HGS Past-President is Chair of the Nominations Committee, along with his two predecessors. Please consider standing for candidacy to the Board, or talk to a colleague who you think can contribute to any of the Board functions and operating the Society. And as always, send me any suggestions for members of our committees.

Later this week we will celebrate Thanksgiving, the U.S. one anyway. Clearly the Pilgrims in New England had more effective public relations than the earlier (unsuccessful) colonial efforts in Virginia, and the much earlier Spanish efforts from Mexico to New Mexico and Texas. Most of us spend our time on much older earth history, where the record is also incomplete, which is often what makes it most interesting. More history at the end of this column. But being thankful anytime is good.

You may be reading this after the 1 December National Academy of Sciences webinar (11-2 CST) on Pathways to the Future Just, Equitable, Diverse, and Inclusive (JEDI) Energy Workforce. Outside of the catchy acronym, this sounds like it will focus on the needed future workforce skills, a subset of the STEM (sciences, technology, engineering and math) emphases of the past few years in primary and secondary education. I imagine the discussion will follow the topics in the recent publication Future Directions for the U.S. Geological Survey's Energy Resources Program (free PDF available at <https://www.nap.edu/download/25141>). This society has long had programs for precollege youth on the range of earth sciences, and how they are involved in our lives. Ideas are being collected via discussion at: <https://www.facebook.com/groups/352988679054845>. This is valuable, but does not necessarily encourage enough students to continue in geosciences, so we all need to do what we can to encourage the interest that is already out there.

The current workforce, including many HGS Members, continues to be in a hiring slump, particularly with the merging, consolidation and bankruptcies affecting many of our employers. The HGS is developing an Employment Committee that will focus on connecting Members with jobs, and coaching in the skills for this workforce. Please contact me if you are interested.

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Back to the historical matters, you may remember the successful campaign last year to raise funds to purchase the Lyell notebooks for the University of Edinburgh, so they may be placed for public access. These materials are beginning to come out, and may be viewed at: Through Lyell's Eyes – Library Blog.

Charles Lyell Website <https://www.ed.ac.uk/information-services/library-museum-gallery/crc/the-sir-charles-lyell-collection>.

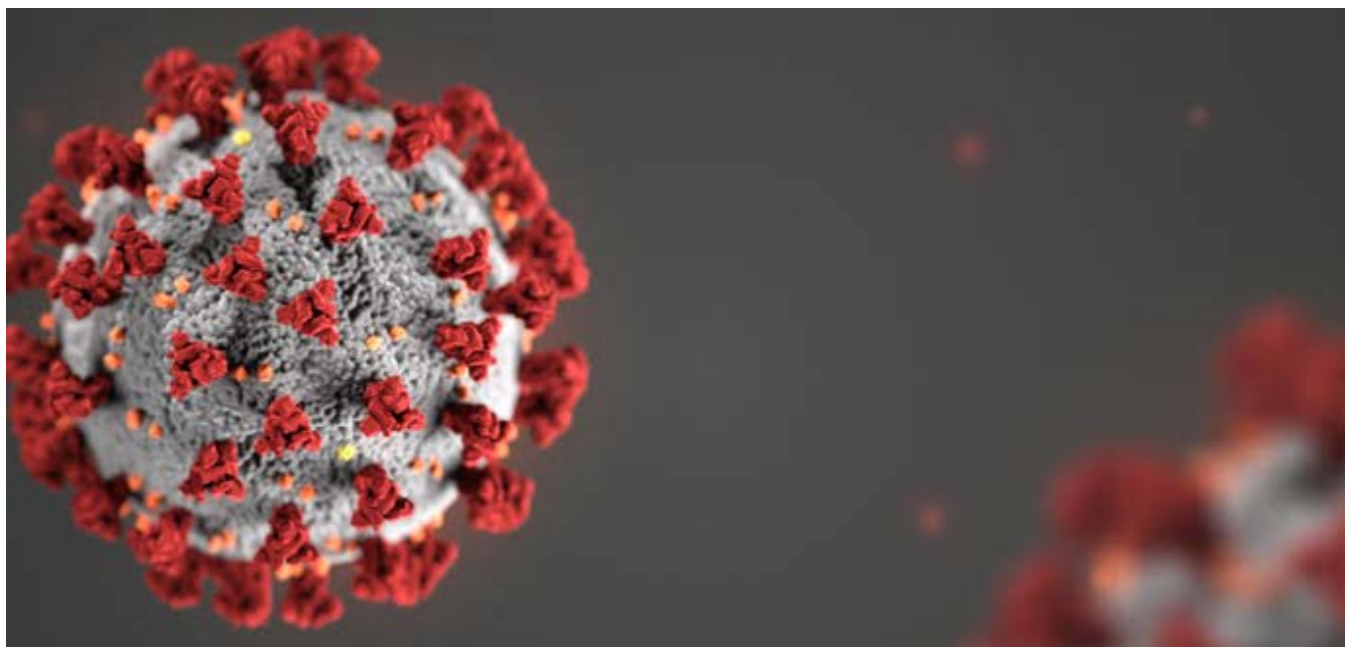


The library plans a series of web presentations during January and February, and we will publicize them on the HGS communications outlets.

And ending on another historical note, 10 January will be the 120th anniversary of the Spindletop discovery near Beaumont, opening up the Gulf Coast for petroleum exploration. We will have an HGS virtual meeting the evening of 11 January with lots of information on this discovery and its history. Sign up via the HGS website. ■

Be safe and volunteer for something this month.

Jim Tucker



Coronavirus (COVID-19) Policy Statement: Updated Friday, November 30, 2020

Because of the ongoing coronavirus (COVID-19) situation, all in-person HGS events through the end of 2020 are cancelled/postponed or will be substituted by online events. Please check the HGS website on a regular basis for all HGS online event opportunities.

The HGS Board will continue to monitor the situation and determine whether to extend the cancellation or postponement of HGS in-person events as we enter the New Year.

Please monitor hgs.org and your email for further communication concerning HGS events.

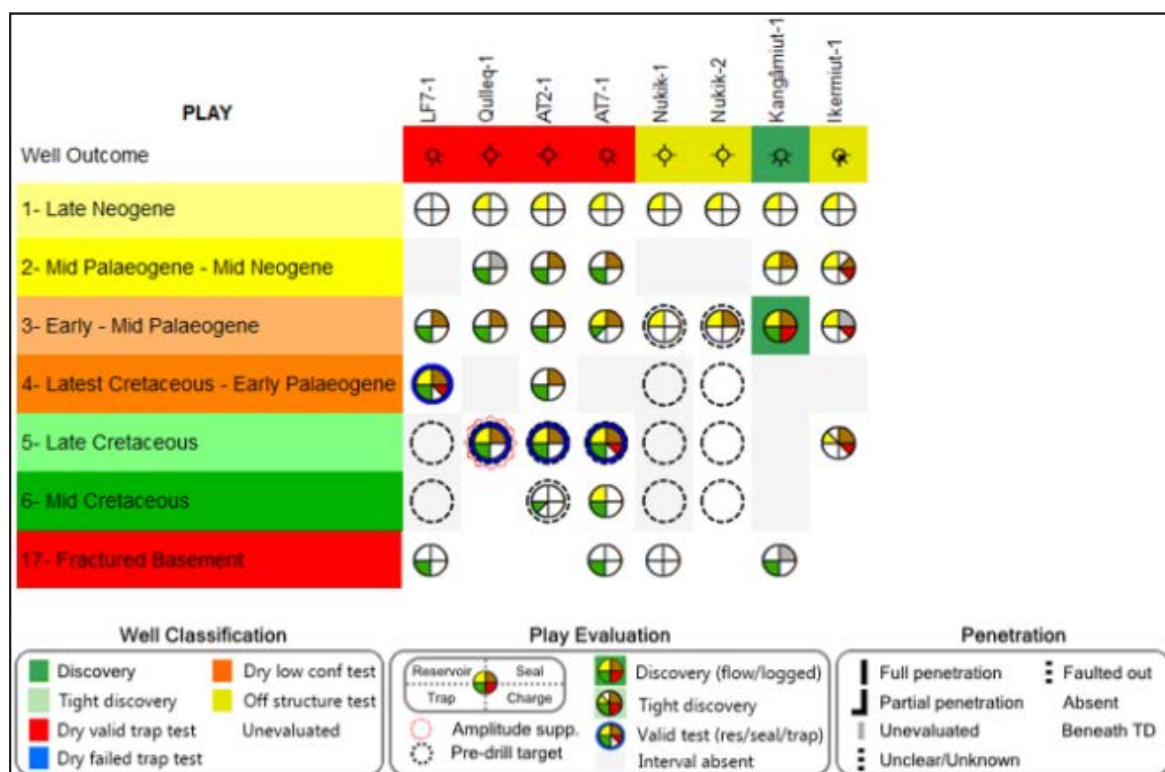
For more information about how you can help to prevent the illness, visit the CDC website: <https://www.cdc.gov/>.

2020-2021 HGS Board



Ceri Davies
editor@hgs.org

Hope Springs Eternal



Post-well analysis of the eight exploration wells in Assessment Unit 1, Davis Strait and Labrador Sea. <https://greenland-resource-assessment.gl/>

Hello friends, In last month's *Bulletin*, I discussed the challenges we're facing as an industry and how we might consider a transition to a new career. Well, what a difference a few weeks can make. This month we're witnessing signs of the industry rejuvenating.

Leading off, the Oil and Gas Department of Greenland's Ministry of Industry, Energy, Research and Labour announced that it is opening up three new offshore areas for exploration. With environment and safety paramount, the authorities are providing the most attractive opportunities for companies willing to drive frontier exploration. Recognizing the challenges and uncertainty associated with the prospectivity of the West Coast, the Oil and Gas Department, in collaboration with Nunaoil and the Geological Survey of Denmark and Greenland have conducted a resource assessment, independently reviewed by the Norwegian Petroleum Directorate. This assessment, along with the data used during the

project, are available to interested oil and gas companies.

Elsewhere, hot on the back of a series of successful wells from the Apache-Total partnership, Staatsolie have announced the Suriname Shallow Offshore (SHO) Bid Round 2020/2021. The 8 blocks on offer are in the western part of the country, directly south of Block 58, home of the recent discoveries. With oil typing tying both the deepwater offshore discoveries and the infamous Tambarejdo field to the Albian, Cenomanian and Turonian source kitchen, these blocks are situated along the migration pathway of this prolific source system. Although the 6 wells drilled to date in the offered areas have been unsuccessful economically, all have encountered hydrocarbons, with the AKT-2 Well delivering hydrocarbon shows across 205m in the Santonian with an additional 87m of shows in the Albian. Virtual data rooms are available now with bids due by 30th April 2021.

From the Editor continued on page14

TECHNICAL PROGRAMME

Oral Presentations Tuesday 1st December

07:30	Virtual Coffee
Session I	
07:45	Introduction EAGE/HGS
07:50	Welcome & Aims by Technical Committee
09:00	Mexican Side of the Deep Waters of the Gulf of Mexico Basin: A Risked Perspective on Yet-to-find Sub-salt Wilcox Plays - Sergio Rodríguez - IHS Markit
08:30	Stratigraphic and structural interpretation of the San Pedro Basin (south-eastern Dominican Republic offshore margin) and its implications in the hydrocarbon potential - Gorosabel-Araus, Jose Miguel (Department of Geodynamics, Stratigraphy and Paleontology, Universidad Complutense of Madrid)
08:50	Potiguar Basin, Brazil – New 3D seismic elevates exploration opportunities from Leads to Prospects - Randall Etherington (TGS)
09:10	Open Panel Discussion
09:30	Virtual coffee Break
09:40	Improving the sub-basalt seismic imaging in Norte basin, onshore Uruguay - Rodriguez, Pablo (ANCAP)
10:00	A Streamlined and Standardized Benthic Mapping Approach for Offshore Site Characterization - Jones, Craig (Integral Consulting Inc)
10:20	The Colombian General Maritime Directorate, develops the first complete deep water seep hunting program - Olarte García, Luis Carlos (DIMAR)
10:40	Open Panel Discussion
11:00	Virtual coffee Break
11:10	Joint inversion of the reflectivity and the background subsurface components - Cabrales Vargas, Alejandro (PEMEX)
11:30	Combining wave paths to improve Brazil's presalt image. Central Santos basin multi azimuth reimaging - Marcela Ortin (Schlumberger)
11:50	Ultra-Frontier of Santos Basin – Positive Perspective for the Discovery of Pre-Salt Giant Fields Beyond the EEZ Pedro Zalan (TGS)
12:00	Open Panel Discussion
12:20	End 1st day



TECHNICAL PROGRAMME

Oral Presentations Wednesday 2nd December

07:30	Virtual Coffee
Session IV	
07:45	Introduction Session IV
07:50	Tectonostratigraphic Framework of Northern South America and Implications for Hydrocarbon Exploration - Raul Ysaccis - Schlumberger
08:20	From nimble node to STRYDE - a brief history of a disruptive nodal technology - Ourabah, Amine (STRYDE)
08:40	Cenozoic tectonic history of the North America–Caribbean–Cocos triple junction in Southern Mexico - Villagomez, Diego (Tectonic Analysis Ltd.)
09:00	Open Panel Discussion
09:20	Virtual coffee Break
09:30	Machine Learning Applications in Oil & Gas Exploration & Production Hari Menon - Movus
09:50	Revisiting gravity inversion for depth-to-basement estimation- Stefano Scandroglio (SCHLUMBERGER)
10:10	Double saloon door tectonics: two examples in South and Central America: the Caribbean and the Bolivian orocline - Martin, Keith (Independent Consultant)
10:30	Open Panel Discussion
10:50	Virtual coffee Break
11:00	Colorado Basin, Argentina – The clarity and aerial extent of New Seismic data helps elevate leads to prospects Randall Etherington (TGS)
11:20	Characterization of a Tertiary Paleo-Valley System – Onshore Guyana Basin Ross Taylor (CGG)
11:40	Open Uruguay Round: Frontier Exploration Opportunities Cecilia Romeu - (ANCAP - Administración Nacional de Combustibles Alcohol y Portland - Uruguay)
12:10	Open Panel Discussion
12:30	End 2nd Day



TECHNICAL PROGRAMME

Oral Presentations Thursday 3rd December	
07:30	Virtual Coffee
Session VII	
07:45	Introduction Session VII
07:50	Keynote Speaker Jose Mogollón - Movus
08:20	Paleocene Tectonic Activity in Offshore Uruguayan Basins and its Hydrocarbon Implications - Conti, Bruno (ANCAP)
08:40	Southern Argentine Basin: Is this the better half? Eric Newman (TGS)
09:00	Open Panel Discussion
09:20	Virtual coffee Break
09:30	The Importance of Geosciences in the Brazilian Pre-Salt Development - Lima Bruhn, Carlos Henrique (Petrobras E&P)
09:50	Considering FTG Acquisition in Areas of High Topographic Relief - Buzan, George (Bell Geospace Inc.)
10:10	High Rate High Ultimate Wells - Meckel, Trey (Pluspetrol)
10:30	Open Panel Discussion
10:50	Virtual coffee Break
11:00	Reducing structural uncertainty in complex geology: a reprocessing case study onshore Colombia- Mattia Speziali (Schlumberger)
11:20	Hydrocarbon Potential of Mixed Turbidite-Contourite Systems in Latin America - Rodriguez, Karyna (Searcher)
11:40	Future Licensing Rounds – Brazilian Hot Areas Ronan Magalhães Ávila (ANP Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - Brazil)
12:10	Open Panel Discussion
12:30	End Conference

Benedek Gál

Zsófia Poros

Edwin Ortega

ConocoPhillips Company

Using Fluid Inclusion Salinity Data to Reduce Uncertainty in Petrophysical S_w Calculation – New Application of an Old Technique in Unconventional Reservoirs

Main objectives of petrophysics in hydrocarbon exploration are assessing lithology and calculating porosity and fluid saturations to identify potential pay zones. Fluid saturations are further used to estimate in-place hydrocarbon volume – the ultimate basis of economic value. Formation water salinity is one of the most important inputs in the calculation of fluid saturations. During early-stage exploration, formation water salinity in the target reservoir is typically unknown, which brings large uncertainty to resulting petrophysical evaluations. In such cases, fluid inclusions can be used as an independent tool to provide guidance on formation water salinity. The influence of salinity on S_w is particularly strong under 80 ppk NaCl equivalent concentrations and in low porosity (PHI<10%) reservoirs.

Fluid inclusions are small volumes of pore fluid (water, oil, gas or a mixture of these phases) that were trapped in minerals formed during the diagenetic history of a reservoir. They may represent multiple episodes in the fluid history of the rock. Fluid inclusion assemblages need to be correlated with diagenetic stages and tectonic episodes throughout the burial history of the reservoir to establish their relative and, if possible, absolute timing. This is typically achieved via careful petrography and basin modelling workflows. Then, estimated formation water salinity, inferred from fluid inclusions, can be integrated with petrophysics to provide robust exploration-stage petrophysical outputs.

We present several case studies spanning source rock plays (Avalon & Wolfcamp Fm, Permian Basin, La Luna Fm, Colombia), and tight carbonates (Yeso Group, New Mexico NW Shelf, Austin Chalk Fm, Gulf Coast). In all these examples, water salinity over geological time, reconstructed from fluid inclusions, converges to the salinity ranges of produced water from the formations under study. Furthermore, we prove the method valid over a wide range of salinities (50-200 ppk NaCl_{eq}) and in cases where inclusion salinities increase (Austin Chalk), decrease (Avalon & Wolfcamp) or appear stable (La Luna) through the burial history.

In the case of La Luna formation, fluid inclusion data from fracture/vug-filling minerals were used to define the “best technical case” during early exploration. Subsequent well tests confirmed formation water salinity estimations from the fluid inclusion study. This validation was one of the key drivers in extending the application of the method to other basin evaluations in South America and the onshore US.

Diagenetic studies, fluid inclusion analysis and the methods to calculate petrophysical fluid saturations are established tools in the exploration toolkit. Our results demonstrate that closer integration of these fields adds significant value to the exploration and appraisal process by reducing uncertainty around fluid saturations, in-place volumes and ultimately acreage valuation. ■

Biographical Sketch



BENEDEK GÁL is senior geologist in the Global New Ventures organization at ConocoPhillips. He received his MSc and PhD from Eötvös Loránd University in Budapest, Hungary while working on ore petrology, geochemistry, and fluid inclusions on the ore deposits of the Duluth Complex in Minnesota. He worked as project geologist on mineral exploration projects in Finnish Lapland, Anatolia (Turkey) and the Atacama region (Chile) before joining ConocoPhillips in 2014. Since then he was involved in research and technology development in geochemistry, basin modeling and exploration for new hydrocarbon plays, conventional and unconventional, across the globe. He is interested in integrated workflows that link data on all scales to produce predictive maps and models to identify undiscovered hydrocarbon resources.

December 2020

Sunday

Monday

Tuesday

Wednesday



	Virtual Pre-registered Prices: Virtual Meetings members \$10/15 Emeritus/Honorary members..... \$10/15 Student members \$5 Nonmembers \$30/35	1 EAGE-HGS Virtual Latin America Conference 2020 Page 6-8	2
6	7	8 HGS Board Meeting 6 p.m.	9 HGS Environmental and Engineering Dinner Virtual Zoom Meeting TBA
13	14 HGS General Dinner Virtual Zoom Meeting <i>"Using Fluid Inclusion Salinity Data to Reduce Uncertainty in Petrophysical Sw Calculation,"</i> Benedek Gál, Page 9	15	16
20	21 HGS Office Closed for Winter Holiday	22	23
27	28 HGS Office Closed for Winter Holiday	29	30

Cheated, Mistreated, Pushed Around?

Have you been cheated, mistreated or somehow deprived of your share of a deal, working interest or royalty? If so, give me a call. I have thirty years experience as a working interest and royalty owner in the oil and gas business to go along with forty years of court room experience. A trusted team of professionals together with the necessary resources is available to work on your case. You do not pay anything unless we win.

Proven Results



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

Robert A. Chaffin

THE CHAFFIN LAW FIRM

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24	25	26
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.		

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January 25-26, 2021
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 An online event
 Actionable Insights from North
 America's Greatest Basins
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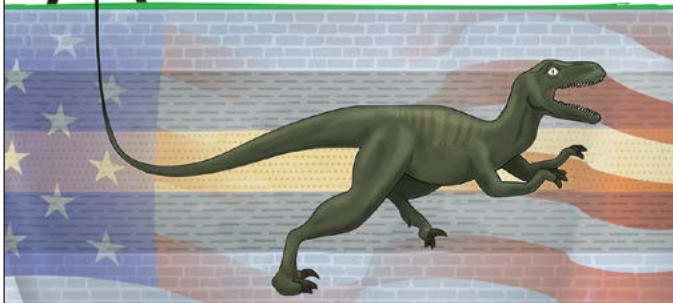


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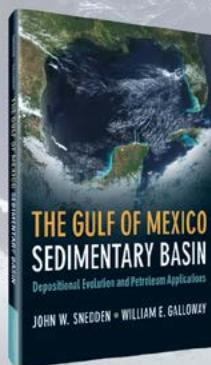
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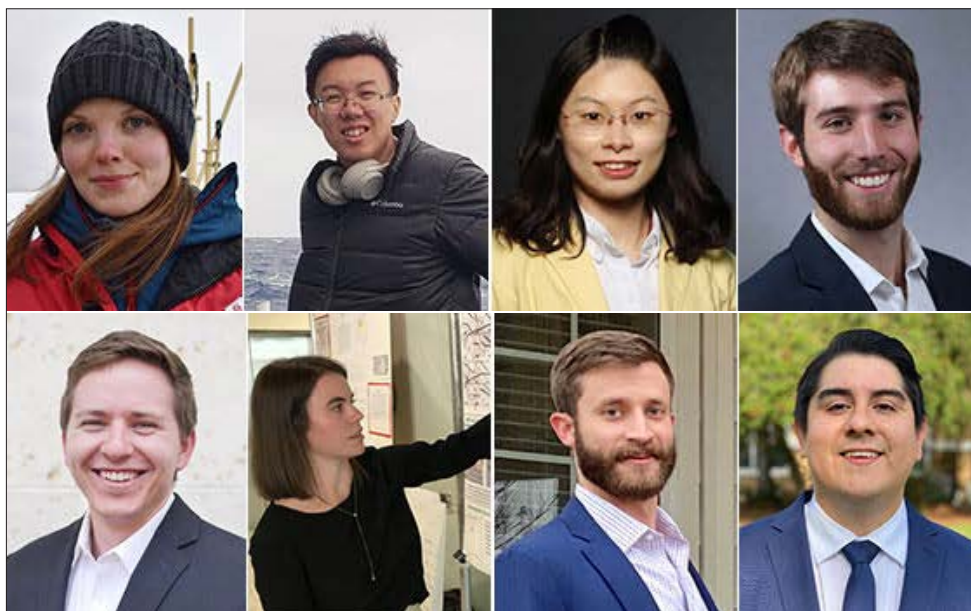


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University of Houston Sheriff Lecture Student Poster Competition



EAS Student Awardees (from left): Rachel Clark (Advanced PhD), Zhehao Li (Advanced PhD), Hualing Zhang (Advanced PhD), Sean Romito (Advanced PhD), Andrew Stearns (2nd-Year MS), Lila M. Bishop (2nd-Year MS), Bryan Moore (1st-Semester MS), and Michael Martinez (1st-Semester MS)

Over 400 individuals were able to view and participate in the 33 poster entries virtually during the day of the Sheriff lecture. The poster session included a pdf of the poster and a supplementary 3-minute recorded presentation, followed by a 1-hour Q & A with individual poster presenters in their own Microsoft Teams channel. The outside feedback on the poster presentations and 1-hour Q&A was very complimentary and a number who attended said it was the best virtual poster session they have attended up to this point.

The University of Houston faculty team included Regina Capuano (chair), Steve Naruk (co-chair), Jiajia Sun, Dan Hauptvogel, and Paul Mann. A special thank you to the University of Houston College of Natural Science and Mathematics IT specialists who helped make the poster session a possibility, Ngozi Onwuama and Andrea Arias-Rodriguez. ■

Advanced PhD Category (19 poster submissions)

First Place tie (Prize: \$450) **Rachel Clarke** – Marine Sedimentary Record of Holocene of Thwaites Glacier's Margins, Amundsen Sea, West Antarctica

First Place tie (Prize: \$450) **Zhehao Li** – Simultaneous Source Separation by Residual Learning of Deep, Convolutional Neural Networks

Third Place (Prize: \$100) **Hualing Zhang** – Crustal Structure of the Sergipe-Alagoas Rifted-passive Margin, Northeastern Brazil, Based on Gravity Modeling

Honorable Mention (Prize: \$50) **Sean Romito** – Understanding the Sub-salt Rifting History of the South Gabon Basin Through Interpretation and Modeling of the Directly Conjugate Camamu and Almada Margins, Offshore Northeastern Brazil

Second Year MS/First Year PhD Category (7 poster submissions)

First Place (Prize: \$450) **Andrew Stearns** – Quantifying Hurricane Harvey Sediment Transport in the Houston-Galveston Region

Second Place (Prize: \$250) **Lila M. Bishop** – Direct Hydrocarbon Indicators Associated with Oligocene-Recent Folds of the Sandino Forearc Basin, Offshore Pacific Margin of Nicaragua

Undergraduate/First Year MS Category (7 poster submissions)

First Place (Prize: \$350) **Bryan Moore** – Along-strike Structure and Zonation of the Barbados Accretionary Prism: Taper Angle vs. Subducting Highs

Second Place (Prize: \$150) **Michael Martinez** – Predicting Areas of Giant Oil and Gas Field Discoveries Along the South America-West Africa Conjugate Margins

U of H Sheriff Lecture Student Poster Competition continued on page 14

University of Houston Sheriff Lecture Student Poster Competition continued from page 13

The organizers and student presenters would like to thank the following volunteer judges of the student poster session for sharing their time and expertise:

From the University of Houston Faculty

Julia Wellner, Emily Beverly, Kurt Rudolf, and Gary Guthrie

From the Houston Area Geoscience Community

Sebabrata Sakar (Schlumberger), Bryan Ott (Hess) John Solum (Shell), Dian He (Shell), Peter Lanzarone (BP), Kochi Onyeagor (Shell), Shawn Wright (Hess), Mark Richardson (Exxon retired), Changrui Gong (Apache), Barbara Hill (Schlumberger), Andrew Pulham (Consultant), Yanet Cuddus (Schlumberger), Di Chen (Schlumberger), Zheng Huang (Consultant), Ella Saudale (Consultant), Carolina Mejia (Landmark), and Courtney Anzalone (Schlumberger)

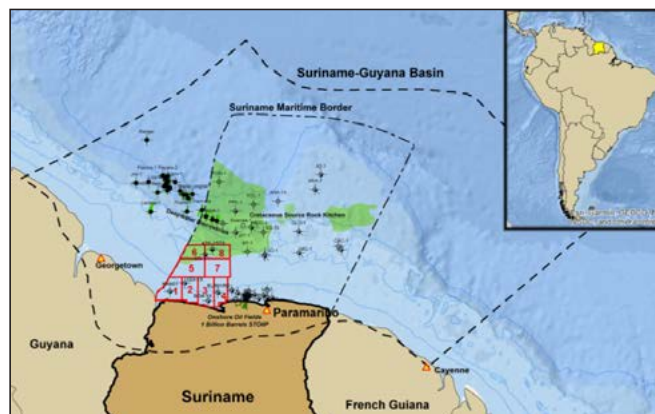
From the Editor continued from page 5

Closer to home, the Gulf of Mexico is home to numerous giant fields and to testing the limits of technology. The GOM has delivered for the US economy for over 70 years. Despite the 50,000+ wells that have been drilled in the GOM, new plays and concepts are still being developed and the various yet-to-find assessments remain healthy. Beginning back in 1954, this month we saw the 131st Gulf of Mexico lease sale. Although GOM exploration will be topical as we enter the New Year, with 105 bids placed from 23 companies, the highest bidders provided a reassuring mix of European Super Majors and local Texas based companies.

Lastly, the oil price. Let's hope the trend continues!

If your time allows, I encourage you to attend the EAGE-HGS Latin America conference, taking place virtually, December 1-3. Next year we hope to hold the event in early October, in person, in Houston. ■

Until next month, have a good Holiday and hopefully see you in person in 2021. Ceri



New Suriname Shallow Offshore (SHO) Bid Round 2020/2021.
<https://www.staatsolie.com/en/suriname-sho-2020-2021-bid-round/>

Company	Total High Bids	Sum of High Bids
1.Shell Offshore Inc.	21	\$27,877,809
2.EnVen Energy Ventures, LLC	13	\$7,699,000
3.BP Exploration & Production Inc.	10	\$17,130,319
4.Chevron U.S.A. Inc.	10	\$17,098,072
5.Repsol E&P USA Inc.	9	\$6,437,891
6.Murphy Exploration & Production Company -	8	\$5,324,248
7.Equinor Gulf of Mexico LLC	7	\$22,158,274
8.Anadarko US Offshore LLC	4	\$6,475,357
9.LLOG Exploration Offshore, L.L.C.	4	\$1,383,312
10.Renaissance Offshore, LLC	4	\$473,000

Top Ten Companies Based on Total Number of High Bids Submitted. 256 GOM Lease Sale.
<https://www.boem.gov/sale-256>



Brent and West Texas Oil Price, Friday November 20th. www.oilprice.com



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.

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

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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		
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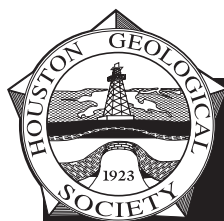
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