Volume 62, Number 5

HGS Bulletin

Houston Geological Society

January 2020

Dr. Jessica Watkins
NASA Astronaut and Geoscientist

HGS Scholarship Night Speaker

February 10, 2020
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Houston Geological Society
Volume 62, Number 5 January 2020

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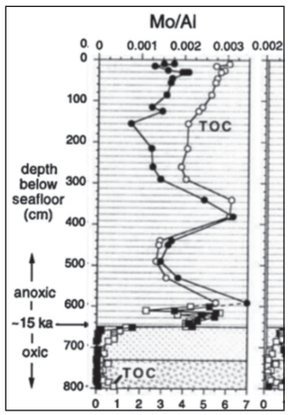

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About the Cover: The background photo shows the Martian rock and mountain. The insert is a portrait of Astronaut Dr. Jessica Watkins, our 2020 Guest Night speaker. The photos were taken by NASA and supplied by Charles Sternbach.

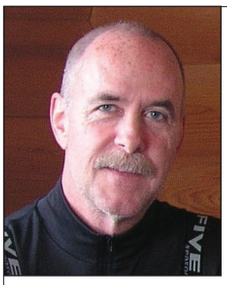
2020 HGS-PESGB Africa Conference

September 15-16, 2020

Norris Conference Centers | Houston, TX

Call for Abstracts January 2020
Abstract Deadline April 2020

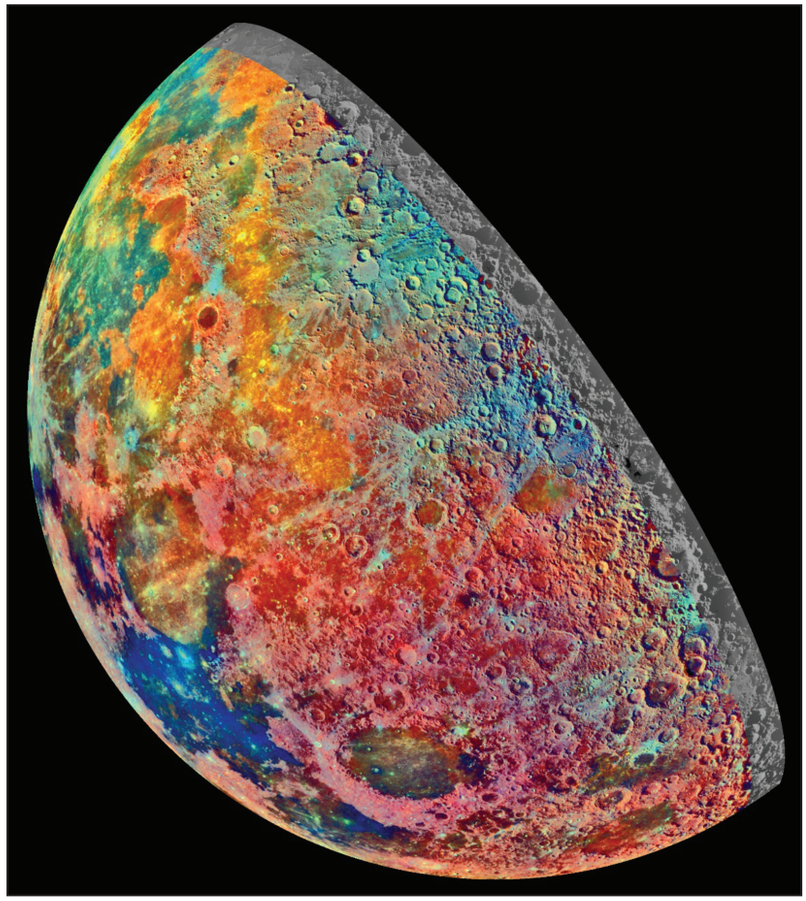
Submit abstracts - Africa2020@hgs.org



Jon Blickwede
president@hgs.org

Exploring Other Worlds…Again

I've been thinking about the geological component of space exploration this past year, for a few reasons. First, because 2019 marked the 50th anniversary of the Apollo 11 Moon landing. Second, one of my other recent activities has been serving as a docent at the Houston Museum of Natural Science, where there has been a wonderful special exhibition on the Moon to commemorate the Apollo 11 anniversary, so I've had a great opportunity to learn more about the ongoing learnings of the "old" Apollo Program, new knowledge of the geomorphology and other characteristics of the Moon from the Lunar Reconnaissance Orbiter, or LRO (https://lunar.gsfc.nasa.gov/about.html), and NASA's plans (unbeknownst to me previously) for returning to the Moon with the first of a series of manned lunar landings by 2024—the Artemis Program (https://www.nasa.gov/specials/artemis/). In addition, for the annual Scholarship Night next month (February 10th at the Norris Center, https://www.hgs.org/civicrm/event/info?id=2120), HGS is honored to have NASA Astronaut Candidate and geologist Dr. Jessica Watkins as the evening's speaker. The event promises to be fascinating and inspirational, and I encourage you all to sign up early.



This false-color mosaic was constructed from a series of images taken through three spectral filters by Galileo's imaging system as the spacecraft flew over the northern regions of the Moon. The part of the Moon visible from Earth is on the left side in this view. The color mosaic shows compositional variations in parts of the Moon's northern hemisphere. Bright pinkish areas are highland materials, such as those surrounding the oval lava-filled Crisium impact basin toward the bottom of the picture. Blue to orange shades indicate volcanic lava flows. To the left of Crisium, the dark blue Mare Tranquillitatis is richer in titanium than the green and orange maria above it. Thin mineral-rich soils associated with relatively recent impacts are represented by light blue colors; the youngest craters have prominent blue rays extending from them. The monochrome band on the right edge shows the unretouched surface of the moon. (*Photo and paraphrased caption courtesy of NASA*)

A few new things (new to me for not having been paying attention in recent years) about the geology and other aspects of the Moon that I've found very interesting:

- In polar, permanently shadowed regions, the LRO found the coldest spots measured (an incredible -415°F in the Hermite Crater of the North Pole) in the entire solar system. Thus, the poles, where none of the Apollo missions landed, are thought to be the most likely sites for water ice that could exist, so the landing sites for the Artemis missions are planned for one of the polar regions (southern).

From the President *continued on page 7*

GeoGulf 2020 Call for Papers

70th GCAGS/GCSSEPM Convention and Exposition
Sept. 30–Oct. 2, 2020 • Lafayette, Louisiana

Hosted by the Lafayette, Baton Rouge, and New Orleans Geological Societies

GeoGulf 2020 Session Themes

- "All Things Salt"—Tectonics, Oil and Gas, Seismic Acq., Proc., and Interp., Mining, etc.
- Machine Learning and Artificial Intelligence Applications
- GCSSEPM Special Session—Topic to be announced
- Gulf of Mexico Temperature and Pressure
- Smackover Session and Core Workshop
- GIS Technology and Applications
- Gulf Coast Environmental
- The Business Side—Legal, Unitization, Finance, Insurance, etc.
- Geoscience Applications of Drone Technology
- Geomechanics—Conventional and Unconventionals
- Carbon Capture / Underground Storage
- Shallow Hazards
- Success from Failure—Learning from our Mistakes
- And more—We are the place for Gulf Coast Geoactivities! We'll fit you in! Got an idea for a theme session, please let us know!

Professionals and Students: We welcome you to submit an abstract for consideration of oral or poster presentation of 250–300 words by February 3, 2020.

Early abstract submissions will be reviewed within a day or two of receipt with acceptance/rejection notification. Submit via email, title, author(s) (with full contact information for each, including company or school, full address with zip code, email, and phone number), and abstract (preferably with 1–2 representative illustrations including reference from text and with captions) to General Chair, James J. Willis, james.willis@gcags.org.

All accepted presenters are expected to submit an initial draft of full paper or extended abstract for publication in the *GeoGulf Transactions* by April 1, 2020, to the *GeoGulf Transactions* Editor, James J. Willis, james.willis@gcags.org. Full information, instructions, size limitations, and helpful hints for abstracts, extended abstracts, and full papers will be posted soon at www.geogulf.org.

If you'd like to publish in the *GCAGS Journal*, the peer-reviewed journal of Gulf Coast geoscience, submit an extended abstract of at least 600 words, including 1–2 representative figures, to the *GCAGS Journal* Editor, Robert Merrill (rmerrill@catheart.com) by December 16, 2019. Once accepted for publication, the deadline for submitting a full manuscript is April 2, 2020. Full instructions for manuscript submissions will be posted online at http://www.gcags.org. Convention presentations of *Journal* submissions are encouraged, but not required.

Fang Lin
editor@hgs.org

Be Truly Open-Minded

Fellow HGS members: Happy New Year! I hope you all have had a great holiday season and are fully recharged for 2020.

At the end of November, I went on vacation in China. First, I want to thank the HGS Editor-Elect Ceri Davies, Design Editor Lisa Krueger, the HGS Office Director Andrea Peoples and former HGS Web Content Manager Jacky Jordan for their help while I was away. Without them, the December issue of the HGS Bulletin could not be published without delay.

For the two weeks in China, I spent one week in Beijing and had the opportunity to visit many "new" architectural masterpieces that were constructed in recent years, such as the "Bird's Nest" and "Water Cube", which are the primary competition venues during the 2008 Beijing Olympics Games. I also visited places more representative of the traditional culture, such as the Nanluogu Ally, which is a pedestrian-only street, built in ancient China style, with all kinds of traditional snacks and refreshments sold along the street. If you like food just like me, a place highly recommended. However, among all the places that I visited during that week, one place that really surprised me and impressed me is a geologic park called Shihuadong, translating into Rock Flower Cave, in suburban Beijing.

It was a cold windy day, not ideal for outdoor activities in winter Beijing. We kind of exhausted ideas of where to go on that day. So, my relatives asked if I had been to the Rock Flower Cave. They thought I might be interested since I am a geologist. In addition, because it's a cave, we won't be exposed in the freezing air. Frankly speaking, my first thought after hearing the proposal was – uh…I am a geologist who have been to quite some places. "Rock Flower Cave", with no disrespect, the name of the place sounds a little rustic. Moreover, for the half dozens of times that I visited Beijing, I never heard of it, not even from my geology friends. So, it must be some tiny mediocre cave that impresses the non-geologists, but not me. The other thing that led me to that conclusion apparently came from my geologic knowledge, proven to be limited later, about China. Through my years of academic study, I know that world-class Karst topography in China mainly exists in southern provinces, pictures of which we often see on post-cards and covers of magazines. Here in the great flat plains of northeastern China, the right place to study Banded Ion Formation or Proterozoic rocks if you are willing to drive to the mountainous areas at the edges of the plain. Karst? Unheard of.

Welcome center of the Shihuadong Scenic Area in Beijing.

Nevertheless, my relatives seemed insisting and really wanted me to go, and we really couldn't think of any other places that we haven't been and would like to visit on that day. Then let's go!

Rock Flower Cave ("Shihuadong Scenic Area" as shown in Google Map) is about 50 kilometers (~31 miles) west of the center of Beijing City. Depending on the traffic, it may take 1-1.5 hours to get there by car during the daytime. As we approached the site, everything looked typical rural area in China, with some mild mountains (i.e., comparing with the lofty ones in western China near the Tibetan Plateau) in the surroundings. After paid for the entrance fee (~10 USD/person), we were ushered into the cave by a tour guide. Then I realized this is not a small cave at all! In front of me are magnificent underground halls that are at least 20-30 meters tall. As we moved forward with the tour guide, we learned that there are seven levels of caves in the mountain, each has their characteristic chemical deposits. At present, only level one, two, three and four are open to the public, with a total walkable path of 2.5 kilometers. The caves were formed 4.5 – 5 million years ago (Ordovician age). Total height of the cave system is more than 150 meters. One can find all kinds of speleothems in the caves, stalactites, stalagmites, cave curtains, columns, gypsum flowers, etc. The colorful lights installed by the site management to shine on the walls of the caves made them even more reverie. I had not been in a cave like this for a long time. It was wonderful to walk around it and even be able to touch part of it! The cave has a near isothermal atmosphere year-round, 11°C – 13°C. So, it was a lot warmer than the outside and was shielded from the wind! I

From the Editor *continued on page 7*

Letter to the Editor

Editor's Words: In the November 2019 issue of the HGS *Bulletin* I wrote an article on innovation, featuring three Nobel Prize Laureates of Chemistry in 2019: Prof. M. Stanley Whittingham from Binghamton University of New York, Prof. John B. Goodenough from The University of Texas at Austin and Prof. Akira Yoshino from Meijo University in Japan. Following the publication of that issue, I received several letters from our readers providing positive feedback. Thanks to all of you who have taken the time writing to me. It means a lot. Among the letters, I found the following one particularly thought-provoking and would like to share it with you with the permission from the author Mr. Charles A. Sternbach.

What I learned was that having a broad background and staying engaged enabled Professor Goodenough to win the Nobel Prizes in Chemistry later in his life. This is good news for geologists too! How?

Bill Fairhurst and I teamed up to teach a short course on exploration creativity for GCAGS 2019. We noted that complex natural sciences, like geoscience and social sciences, typically have the oldest Nobel laureates. Why?

In the case of geoscience, new breakthroughs rely on many sciences, long lived experiences, and familiarity with analogs. Insights into complex systems benefit from examined cumulative experiences. I believe immersion in discovery analogs is fruitful and that exploration has an ideographic language of discovery. "That looks like an Amoruso Field to me!" (a turbidite fan downdip of an incised notch in a shelf) or "That reminds me of the giant Johan Sverdrup Field" (a nearly bald basement high with flanking grabens filled with sediment) are phrases spoken in the explorer's dialect.

In the field of exploration, the AAPG Outstanding Explorer Award is like a Nobel Laureate. Two notable "late bloomer" recipients of that esteemed award come to mind, but there are many more. Mike Johnson discovered the Sanish Field in the Bakken play in the Williston Basin and John Amoruso discovered the giant Amoruso Field in East Texas, both late in life. The lesson?

Geoscientists can and do make profound contributions long after traditional "retirement" ages. Personally, I am counting on it! Celebrating successes resulting from long careers of excellence is the principle behind the HGS Legends programs instituted in my year as HGS President, 1999-2000. Building a heritage of Discovery stories is the principle behind the Discovery Thinking programs that continue to attract attention at AAPG ACE and ICE meetings. Many presentations are online as a resource to explorers. http://www.searchanddiscovery.com/specialcollections/discoverythinking.html

Congratulations to Prof John B. Goodenough!

Biographical Sketch

Charles A. Sternbach served as Staff Geologist for Shell Oil Company, Exploration Manager for Jordan Oil and Gas, and President of First Place Energy. Since 2004 he serves as President of Star Creek Energy. He was appointed University of Houston research professor (2018). Charles earned a PhD (and MS) in geology from Rensselaer Polytechnic Institute and a BA in geology from Columbia University, NY.

Charles was 2017-2018 President of the 30,000-member American Association of Petroleum Geologists. He created and chairs popular AAPG programs on exploration creativity like Discovery Thinking, Playmaker, and Global Super Basin Leadership forums. He speaks widely on energy, geology, and creativity.

When Charles was President of the Houston Geological Society (1999-2000) he created Legends programs. Charles currently serves as Chairman for the HGS Scholarship Night committee. He is an honorary member of HGS, GCAGS, and AAPG.

From the President continued from page 3

- Lunar water ice, if proven to exist via ground-truthing by the Artemis Program, could be used for more than just thirsty astronauts. The contained oxygen and hydrogen could conceivably be converted to breathable air, and the hydrogen could be broken out for use as fuel.

- New (less than 5-year old) impact craters have been found to be widespread across the lunar surface.

- The South Pole-Aitken Crater on the Moon is one of the largest impact craters documented to date in the entire solar system. It's 2500 km in diameter, as compared to the mass extinction culprit Chicxulub in the Gulf of Mexico at 150 km in diameter. South Pole-Aitken Crater is so deep that more than 34 Empire State Buildings could be stacked on top of each other from its bottom to its rim.

- The Moon is *not* geodynamically "dead" as previously thought: recent geomorphic evidence shows that it's been in an overall state of contraction for the past one billion years, although there are also, mysteriously, some small areas where extensional tectonics is taking place, as evidenced by active grabens.

- Outcrops on the Moon, and the associated soil (regolith) are still interpreted as mainly mafic in composition. But LRO analyses have revealed there are some oddball, highly silicic volcanics as well — The DIVINER Lunar Radiometer Experiment (part of the LRO) revealed the presence of lunar soils with compositions more sodium-rich than that of the typical anorthosite crust. DIVINER identified quartz, silica-rich glass, and alkali feldspar at four of these unique, nearside sites.

Hope to see you all at the HGS Scholarship Night Dinner, to recognize HGS's 2019-2020 geoscience student recipients, and to learn more about the next phase in exploration of other worlds. ■

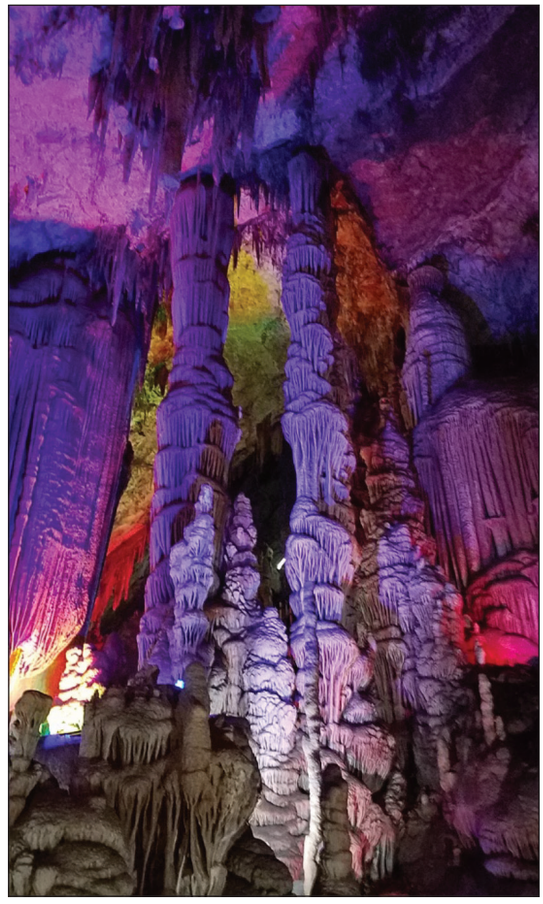
From the Editor continued from page 5

Rock curtains inside the caves.

am very glad that I did not let my first thought to dismiss the opportunity to visit this place. It was certainly worth visiting.

My lessons learned through this experience? Be truly open-minded. Sometimes we get trapped into our presupposed ideas and expert opinions and forgot other possibilities out there. However, what we, the humans, have learned about this 4.6 billion-year old planet is a tiny little fraction of its history. I think the President's Letter on The Cactolith Discovered in the December issue of the HGS *Bulletin* is telling us the same thing. Be truly open-minded is particularly important for exploration geologists. We must remain truly open-minded to discover the unknow, to advance science and technology, and to grow ourselves.

Have a great start of 2020. Until next month. ■



Speleothems inside the caves.

Taking the HGS Scholarship Night to Greater Heights with Astronaut Jessica Watkins!

By Charles A. Sternbach and Jeff W. Lund

The HGS Scholarship Night committee is excited to announce that we will have the pleasure of having Dr. Jessica Watkins, NASA astronaut and geoscientist, as our speaker for the 2020 HGS Scholarship Night planned for Feb 10, 2020! The event will be held at the Norris Conference Center, in City Centre starting at 5:30 PM. We anticipate a full house. Reservations can be made on the HGS.org webpage link. https://www.hgs.org/civicrm/event/info?id=2120

In recent years, our annual Scholarship Night has become a premier event for the HGS. This is a night where we take the time to honor outstanding students with promising futures. This year the HGS Scholarship Night committee asked; who can inform, uplift, and inspire the next generation scholarship winners? Our answer: Jessica Watkins. It is a time-honored tradition of the HGS to recognize astronauts who are also geoscientists and Jessica is among the next generation of astronaut leaders who will one day return to the moon or even walk on Mars.

Jessica Watkins has been selected by NASA to join the 2017 Astronaut Candidate Class. She reported for duty in August 2017. The Colorado native earned a Bachelor's degree in Geological and Environmental Sciences at Stanford University, and a Doctorate in Geology from the University of California, Los Angeles (UCLA). Watkins has worked at NASA's Ames Research Center and NASA's Jet Propulsion Laboratory, and was a collaborator on the Mars Science Laboratory rover, Curiosity.

Watkins was born in Gaithersburg, Maryland, but considers Lafayette, Colorado her hometown. Her parents, Michael and Carolyn Watkins, still live there. In college, she was a member of Stanford Women's Rugby as well as the USA Rugby Women's Sevens National Team. During her postdoc, she served as a volunteer assistant coach for the Caltech Women's Basketball team. She also enjoys soccer, rock climbing, skiing and creative writing. She graduated from Fairview High School in Boulder, Colorado. Earned a Bachelor's degree in Geological and Environmental Sciences from Stanford University in Stanford, California. Earned a Doctorate in Geology from the University of California, Los Angeles.

For her PhD research, Watkins studied the emplacement mechanisms of large landslides on Mars and Earth through orbital data analysis and field work. While at UCLA, she was a teaching assistant for various courses in earth and planetary science. At the time of her selection in June 2017, Watkins was a postdoctoral fellow in the Division of Geological and Planetary Sciences at the California Institute of Technology, where she collaborated on the Mars Science Laboratory rover, Curiosity, participating in daily planning of rover activities and investigating the geologic history of Gale Crater, Mars.

During undergraduate internships at NASA's Ames Research Center, Watkins conducted research supporting the Phoenix Mars Lander mission and prototype Mars drill testing. She also served as chief geologist for NASA Spaceward Bound Crew 86 at the Mars Desert Research Station in 2009. As a graduate student, Watkins participated in several internships at NASA's Jet Propulsion Laboratory (JPL), including analysis of near-earth asteroids discovered by the NEOWISE mission in 2011, tactical and strategic planning for the Curiosity mission in 2013, and system design testing for the upcoming Mars 2020 and Mars Sample Return missions the following year. In addition, she served as a science operations team member for a Desert Research and Technology Studies (Desert RATS) analog mission at NASA's Johnson Space Center in 2011 and participated in the NASA Planetary Science Summer School at JPL in 2016. Watkins reported for duty in August 2017 to begin two years of training as an Astronaut Candidate. Upon completion, she will be assigned technical duties in the Astronaut Office while she awaits a flight assignment.

Jeff Lund, our Calvert Memorial Scholarship Fund Chairman reports that the Warren L. and Florence W. Calvert Memorial Scholarship came from a generous donation from former HGS member Warren Calvert in the late 1970's. Thanks to the generosity of HGS Members and various corporate sponsors we have been able to continue supporting promising future geoscientists in their studies. The Calvert Memorial Fund Scholarships are given to graduate students studying geosciences. The Calvert Memorial Scholarship Fund program consists of a passionate, five-person Board of HGS Members, listed below, dedicated to supporting students and the future of the geoscience field.

In 2019, the Board awarded scholarships to fifteen individual geoscience graduate students, twelve of whom were first time recipients. The awardees included four PhD candidates and eleven M.S. candidates from eight universities. In 2019, we were fortunate enough to not only give more scholarships to students as well as largest monetary amounts in the history of the program. The Calvert Board is very excited to have Astronaut Jessica Watkins as our 2020 Scholarship Night speaker. We believe she is an outstanding member of the geoscience profession and a tremendous role model for all of the students.

Evelyn Medvin, our Foundation Chair, reports that the HGS Foundation Fund will award scholarships to top undergraduate geoscience students from 7 Texas Universities. Because of the generosity of our sponsor companies, we are able to provide $3500 scholarships to 6 of the students and $4500 to our Mabe Scholar, the top scholar of the group. Please come and meet your future employee!

The HGS scholarship Night committee would like to recognize John Tubb for his past chairmanship of this committee. Johns vision built a solid foundation upon which the committee continues to reach for greater heights. ■

HGS Scholarship Night & Dinner Meeting

HGS Foundation Scholarship & Calvert Memorial Fund
February 10, 2020
Speakers: Jessica Watkins, NASA Astronaut Candidate
Location: The Norris Center, City Center, 816 Town and Country Blvd. #210

Elijah Sims - Big Bend Paleontology Fellowship Awardee

SPONSORSHIP FORM

All event profits benefit the HGS Scholarship Funds.

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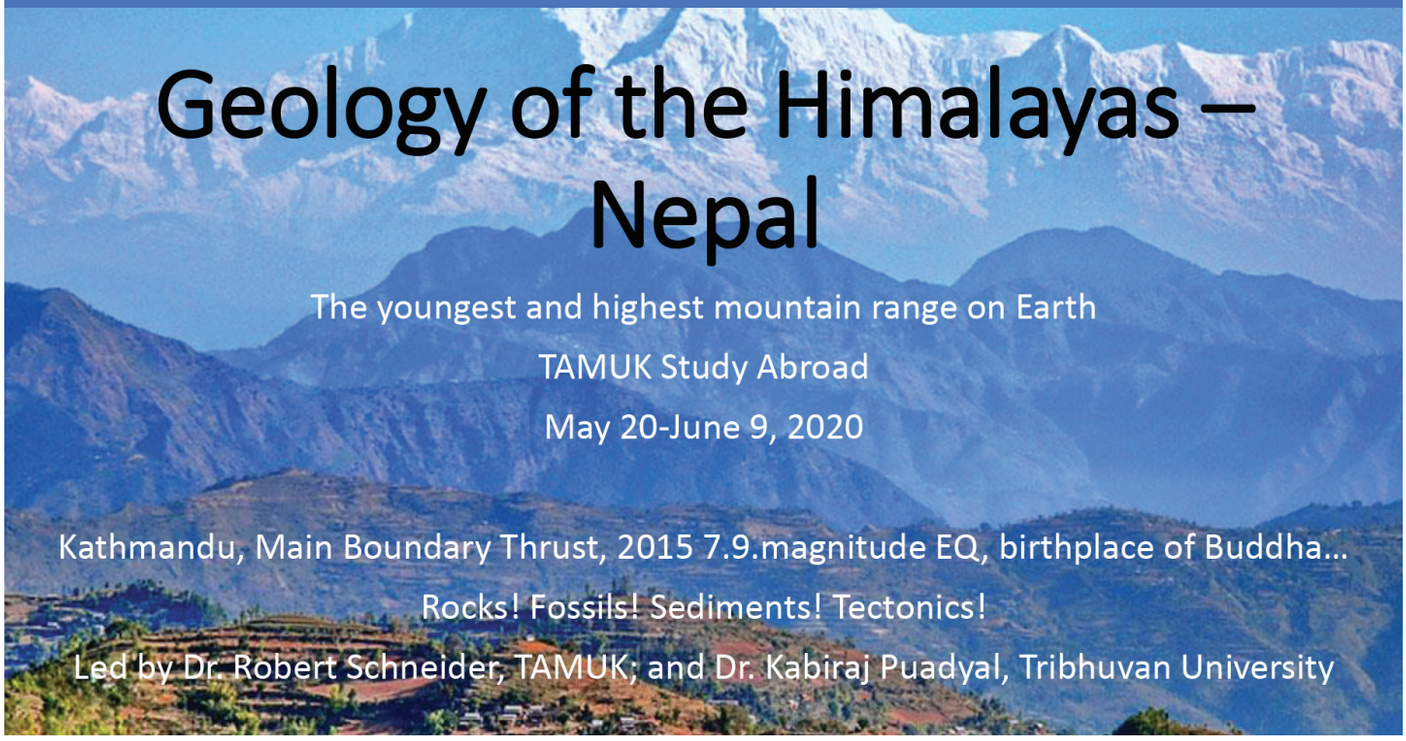
Texas A&M University Kingsville (TAMUK) is opening up their next study abroad program to non-students. Anyone can go on the trip and just needs to register as a "transient" student at TAMUK and sign up for the class. Cost of the trip will likely be no more than $4400. Please contact Dr. Robert V. Schneider at TAMUK for more information (Robert.Schneider@tamuk.edu).



Geology of the Himalayas – Nepal

The youngest and highest mountain range on Earth

TAMUK Study Abroad

May 20-June 9, 2020

Kathmandu, Main Boundary Thrust, 2015 7.9.magnitude EQ, birthplace of Buddha…

Rocks! Fossils! Sediments! Tectonics!

Led by Dr. Robert Schneider, TAMUK; and Dr. Kabiraj Puadyal, Tribhuvan University

Second EAGE/HGS Conference on Latin America

19-20 NOVEMBER 2020 • CARTAGENA, COLOMBIA

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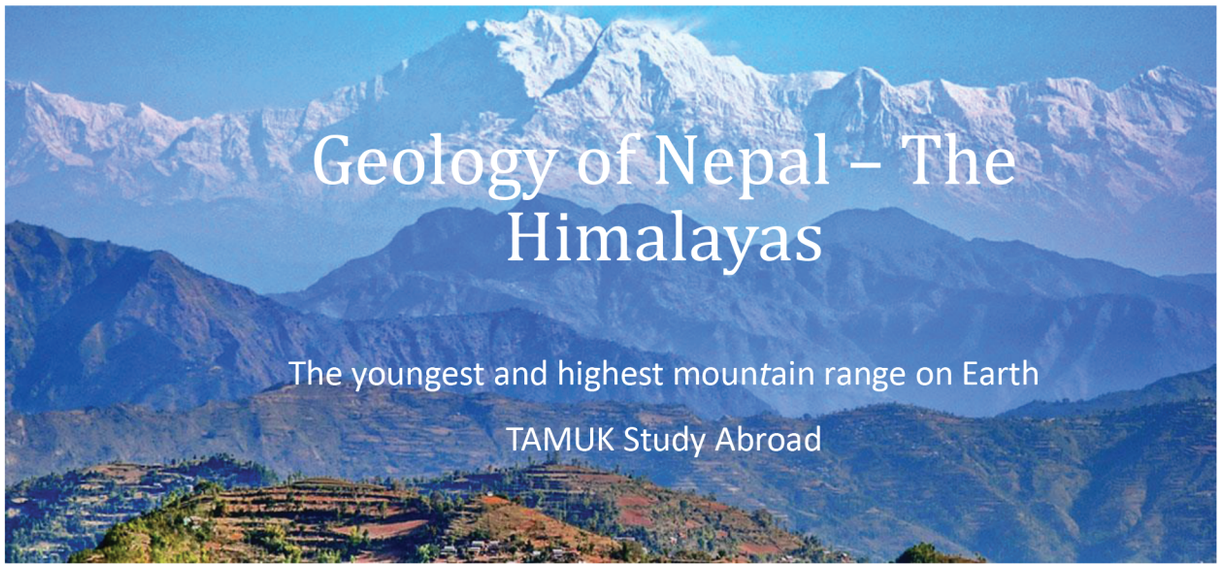

Dr. Robert V Schneider
Texas A&M University – Kingsville
Dr. Kabiraj Paudyal
Tribhuvan University, Kathmandu, Nepal
May 20-June 9 2020

Objectives:

- Main Aims: Study of features associated with continent-continent collision
- Others: Petroleum geology/Geo-disasters
- Number of students: 10-14
- Level: Undergraduate
- Date of visit: May-June of 2020 (Approximately 20 May to 15 June).

Proposed Plan in Nepal

Day (–)two (May 20): Leave Houston IAH on our epic journey. Travel time will be such that we will take two calendar days to arrive in Nepal.

Day zero (May 22): Arrive in Kathmandu. Feet on the ground; short tour (see below) meeting for rules, safety, review of itinerary; and opening dinner.

1. First Week:_ (study geology, tectonics of Nappe formation, paleo lake deposits, surrounding hills, ethnic culture, religious places, University, experience of taking class in Nepal etc.

- Day one (May 21): Visit to historical and religious places in Kathmandu.
- Day two (May 22): Study the geology, tectonics and river system at and around the Kathmandu/Lalitpur/Bhaktapur

Lalitpur:

Bhakpatur: World Heritage City…

- Day three (May 23): Visit to University and interact with students and teachers (morning); Service work (afternoon) care to old-aged people or orphan, disables etc.). Half day preparation for next sites.

- Day four (May 24): Visit to Pokhara-Jomsom-Kaligandaki River section (A very famous mountain route).

This route looks incredible:

- Day five (May 25): Kathmandu to Bandipur. We show the geology, geomorphology etc in between. Bandipur is a touristic area from where we see snow-capped mountains. Team will enjoy in home stay environment and interact with local community/family etc.
-

Pics of Bandipur:

- Day six (May 26): Bandipur to Pokhara.

Picture of Pokhara:

Pokhara is a very beautiful city in Nepal. It is a city of lakes. The team will enjoy the scenes of snow-capped mountains, lakes, caves, waterfalls, river gorge, and culture, foods, religions etc in Pokhara. Boating/rafting in lake will be one memorable journey of the trip. It is a heaven city in Nepal.

- Day seven (May 27): Pokhara to Tato Pani. In Nepali Tato Pani means hot springs! It is released due to active tectonic belt of the Himalaya. Break here in the afternoon/evening. Refresh after the first week. Maybe do laundry, etc.

2. Second week:

- Day eight (May 28): Ghasa. Students will observe the classical tectonic collision features like the Main Central Thrust (MCT) that separates the Lesser Himalayan tectonic unit from the Higher

Himalayan tectonic unit. We can see low-grade to high-grade metamorphic rocks and deformation and complex geological structures like folds, shear zones, steep slopes, poly-metamorphism, meta-basic rocks etc.

Ghasa: 

- Day nine (May 29): Tukuche. Students will observe normal fault system of the Himalaya, fold-and-thrust belt, STDS, inverted metamorphism, high mountain belts, river gorging, antecedent rivers, large terraces etc. Local wines, local Nepali Thakali foods etc.

Tukuche: 

- Day ten (May 30): Jomsom. Students will observe sedimentary rocks and rocks of the paleo-sea. Culture is remarkable of this reason.

Jomson: 

- Day eleven (May 31): Kagbeni. Students will observe fossiliferous sedimentary rocks, ammonites, high mountains, places of natural gas leakage, windy area, famous religious place (Muktinath temple of Hindus), different foods, culture etc.

Kagbeni: 

- Day twelve (June 1): Morning: Jomsom to Pokhara (by domestic flight).Afternoon: Drive to Gorkha.

THE FOLLOWING LOCATIONS (days 13-15) ARE WHY WE ARE TAKING THE TRIP.

- Day thirteen: Gorkha (June 2): to observe the epicentral region of Gorkha Earthquake-2015/Rafting in River (optional)
- Day fourteen (June 3): Jugedi section (by reserved micro-bus/jeep. Observation of the Main Boundary Thrust (MBT) which separates Sub-Himalaya from the Lesser Himalaya. It is the active thrust of the Himalaya. A number of large landslides will be observed there.

Jugedi: 

3. Third Week
   - Day fifteen (June 4): Butwal. Observation of Terai plain (Indo-Gangatic Plain): border of India and Nepal. There we can see the Himalayan Front Thrust which separated the Sub-Himalaya (the youngest mountain of the world) with southern Terai/Plain area.

Butwal: 

- Day sixteen (June 5): Visit to Lumbini (birth place of Lord Buddha): A very famous religious place of Nepal and Asia too.
- Day seventeen (June 6): Visit to Palpa/Tansen: To host at the crest of the mountain hill. There we can see the rocks of the Gondwana time (source rocks of petroleum). Observation of rock falls, rock cliffs, landslides, mineral deposits like iron and coal etc as well as fossil hunting.

Palpa and Tansen:  

- Day eighteen (June 7): Visit to Schools and take classes to share the ideas with school students (up to 12 classes); Afternoon - Observe drilling or construction sites for ground water and site investigation areas in Butwal.
- Day nineteen (June 8): Bhairahawa to Kathmandu (by domestic flight); R&R, Farewell Dinner
- Day twenty (June 9): Back to Texas!

Kingsville: 

Wednesday, January 8, 2020

HGS Environmental & Engineering Dinner Meeting

New Location: Craft Republic Houston • 11470 Westheimer Rd.
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

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

Steve Follmer

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.

Flood Risk and Mitigation Analysis of the Brays Bayou Watershed

Flooding has been a problem of Houston since it was established in 1837. However, over the past 60 years Houston has gone from a city of about 900,000 people in 1960 to over four million today. This dramatic increase in population has greatly changed the landscape of Houston. The city has been and continues to expand outwards in all directions. The Brays Bayou Watershed is currently home to over 700,000 people in Houston. This study will examine the implications due to the recent updated annual exceedance probability (AEP) values on the Brays Bayou watershed. ESRI ArcGIS has been utilized to conduct a hydrological analysis of the watershed. A new model of HEC-HMS has been built using 2018 Lidar data to study the hydrology of the rainfall-runoff in the watershed. A new model of HEC-RAS has been built to analyze the changes that the new AEP values have on the depth and extent of flooding. The results from HEC-HMS show that the median AEP values will cause the discharge to rise by 29% for the 100-Year 24-Hour event and 33% for the 500 year 24-rainfall event at the outlet. The model showed that the peak discharges from Hurricane Harvey could have been reduced by at least 3.5% and volume reduction of 15% with the addition on the proposed detention ponds. The analysis for the 2040 projections shows that the peak discharge could increase in the range from 3.4% to 5.1% depending on the rainfall event. The HEC-RAS model shows three areas of increased water depth at the stream. The three areas coincided with areas of significant elevation change, and adjacent to highways crossing the streams. The lack of space left in the watershed will cause many challenges on the mitigation projects in the future. ■

Biographical Sketch

Steven Follmer has a master's degree from the University of Houston-Clear Lake in Environmental Science with a specialization in Environmental Geology. He also holds the license of Geoscientist in Training. His career began in the Marine Corps in 2005 where he held a number of positions while stationed in Afghanistan, Japan and the U.S. Given his years of military experience, Steven was asked to serve his final assignment as a recruiter for the northeastern region of Texas from 2012-2014. Upon completion of his military service, he pursued a Bachelor of Science degree in Geology with a minor in Environmental Science at Stephen F. Austin State University.

Monday, January 13, 2020

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.
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Dr. Jory A. Pacht
Altair Resources

Energy 101

Perhaps the most important thing to understand about energy is just how much of it we use. Every man, woman and child in the world uses 20 million watt-hours of energy per year. In developed countries, the number is far higher. The reason energy use is so high is that energy is in everything we do. For example, food for a family of four takes the energy equivalent of 22 gallons of gas to grow, ship, process and sell. If energy is in everything we do, then the cost of energy is in everything we do and worldwide, most decisions on energy sources are made based on cost. This is particularly true for undeveloped and developing countries, whose per capita GDP is far below the U.S. However, it is also true for industrial powerhouses like China, that have prioritized economic growth.

So, as we hear various pundits and politicians are calling for a carbon-free world in 30, 20 and now 15 years, we have to ask if this is realistic? Can we accomplish this without devastating our economies? And if the U.S. takes this step, will the rest of the world, including economic competitors like China, follow suit? Currently ~86% of all energy in the world is produced using fossil fuels. Solar and wind comprise only 4%. Are the worldÕs citizens ready to accept the increased economic and land use costs that come with a switch to renewable sources of energy? In countries that are desperately poor, is it moral to insist that they forgo the benefits of cheap energy that we enjoy?

Anthropogenic global warming is an inconvenient truth. But so are the huge benefits that every country in the world has enjoyed and is enjoying as a function of cheap fossil fuel energy. Managing global CO_2 will therefore require rational market-based solutions that may be different for different countries. Political invective on both sides is counter-productive and only creates division. ■

Biographical Sketch

Dr. Jory A. Pacht began his career at ARCO in the exploration research department in 1980, where his work focused largely on using seismic and wireline data to delineate depositional sequences and facies. One of his projects resulted in the development of a new program to analyze closely spaced well-log data – a predecessor to today's 3D reservoir analysis programs. ARCO recognized his contribution in its 1987 Annual Report and his team was credited with adding $350 million of reserves from the Long Beach Unit – Wilmington Field. His work continued at RPI International as a Senior Scientist working on sequence stratigraphic and structural projects and at TGS-Calibre as the principal geoscientist on large regional offshore studies in the Gulf of Mexico and offshore Africa. In 1992, Dr. Pacht founded Seis-Strat Services, Inc., a full service geological and geophysical company which employed up to 35 geoscientists in seven countries on a full-time and contract basis. He sold Seis-Strat Services in 2007 to a staffing company. In 2003, Dr. Pacht started EnergyQuest, an oil and gas production company with two other partners. They became EnergyQuest Resources in 2004 and they purchased and developed oil and gas fields in Oklahoma, Kansas, Louisiana and Texas. In particular they developed a large CBM position in the Cherokee Basin in Oklahoma and Kansas. In 2007 EnergyQuest sold their conventional assets to Layline Production and their unconventional assets to Constellation Energy Partners Shortly thereafter, Dr. Pacht and his partners started EnergyQuest II, which owned and operated multiple oil and gas fields in Louisiana and Texas. EnergyQuest II was producing approximately 5500 BOEPD when Dr Pacht and his partners sold the producing assets to TPIC in 2010. Dr. Pacht started Altair Resources LLC shortly thereafter and served as President. In 2013 he has assembled a team and secured Private Equity Funding from Ridgemont Equity Partners to form Pintail Oil and Gas Company where he served as CEO. Pacht and his team completed four acquisitions and operated eight fields producing 1850 BOEPD. Dr. Pacht left Pintail in late 2016 and after doing conventional exploration in the Gulf Coast has assembled a team to conduct unconventional exploitation of conventional Gulf Coast reservoirs.

Dr. Pacht has won five best paper awards for his work on sequence stratigraphy and has published over 80 papers and abstracts. He serves on the Alumni Advisory Board of the School of Earth Sciences at Ohio State, where he received his PhD.

Monday, January 27, 2020

HGS 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.

A Panel Discussion

The State of Private Equity in Oil and Gas

With sluggish market prices, the dynamics between sources and uses of private equity funds has become vital and relevant in benchmarking returns and value add in portfolio assets.

The value chain that drives the production of hydrocarbons from pore to pump allows integration of new techniques and technologies in helping de-risk the opportunities.

Private equity and other capital resources are challenged to deploy creative solutions for debt and equity strategies. The covenants and thesis for allocating the investment capital plays a role in shaping the performance of these portfolio assets.

The event will bring together stakeholders in the sources and uses of the oil and gas private equity ecosystem as the state of the dynamics is explored with a view to driving sustainable value in the industry.

Panelists who will participate in the discussion at the event include:

Clark Sackschewsky	National Practice Leader BDOs Energy and Natural Resources Practice
Glenn Reitman	Partner DLA Piper Energy and Oil & Gas
Ashely Gilmore	CEO Tracts
David Wishnow	Head of Energy Technology Identification at Darcy Partners
Gabrielle Guerre Morrow	SVP & Group Coordinator Ryder Scott.

Tuesday, January 28, 2020

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

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

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

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

HGS General
Luncheon Meeting

Ursula Hammes
Texas A&M University, Austin, TX
Hammes Energy & Consultants, Austin, TX
Salome Mignard
Total Oil and Gas, France
ursula@hammesenergyconsultants.com

Recent Mudrocks of the Cariaco Basin, Venezuela: Modern Analog for Shale Oil/Gas Unconventional Reservoirs?

The recent worldwide unconventional shale oil and gas boom raises questions about controls on the deposition and diagenesis of organic-rich, fine-grained rocks. Environmental and depositional factors such as upwelling, nutrient supply, preservation, and paleo-oxygenation ultimately contribute to the organic richness and hydrocarbon potential and richness of the source rock. In fine-grained rocks such as mudstones, geochemical investigations have proved useful in identifying productive source intervals for unconventional plays. Most studies on Paleozoic and Mesozoic producing source rocks compare redox-sensitive metals and major elements, TOC, and mineralogy to identify sweet spots and probable producing zones (e.g., Hammes et al., 2016). Geochemical and sedimentological studies of modern anoxic basins offer analogues for ancient basins and have the potential to elucidate answers to long-standing questions. Therefore, a study was conducted to compare a Holocene anoxic basin (e.g., Cariaco Basin offshore Venezuela; **Figure 1**) to Mesozoic source rocks, such as the Jurassic Haynesville or Cretaceous Eagle Ford Formations of Texas (e.g., Hammes et al., 2011; Hammes and Frebourg, 2012; Hammes et al., 2016).

The Cariaco Basin is currently thermally stratified and anoxic waters have been prevailing for the past 12,600 years (Peterson et al., 1991). It is a silled basin that is anaerobic below ~375 meters to 1400 meters at the bottom. Open ocean exchange occurs above a sill with a suboceanic depth of ~150 meters (Richards and Vaccaro, 1956). Silled basins are often conducive to anoxic bottom waters and comparable to the Haynesville and Eagle Ford basinal configurations

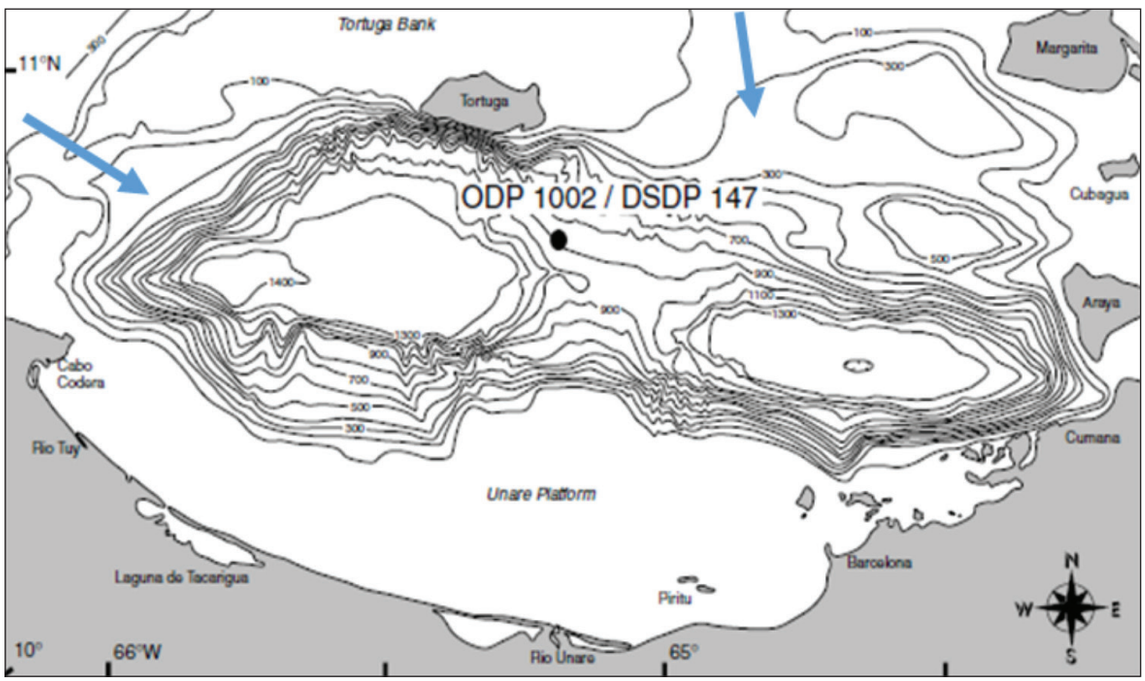

Figure 1: *Location of Cariaco Basin north of Venezuela and drilling location of ODP core 1002, Leg 165 (Peterson et al., 2000). Contours of basin depth are shown. Blue arrows indicate exchange with deep ocean.*

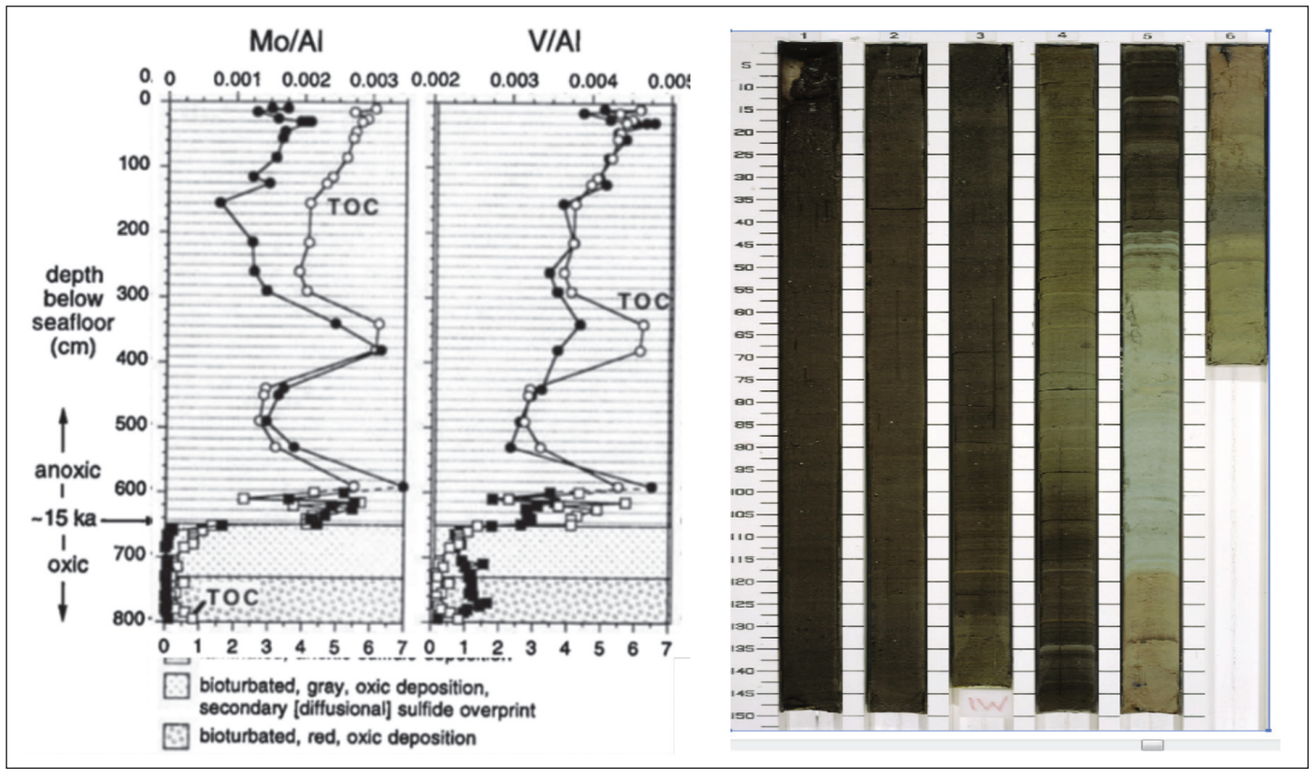

Figure 2: *A. TOC and Molybdenum and Vanadium concentrations in first 800 cm of Cariaco basin sediment indicate anoxic conditions down to 645 cm (arrow) as indicated by high TOC, Mo and V concentrations and oxic conditions below. B. Cariaco basin core of first 10 meters showing anoxic (dark) and oxic (light) sediments (from Lyons et al., 2003).*

(e.g., Hammes et al., 2011, 2016). Five cores from drill site 1002 in the Cariaco Basin offshore Venezuela were taken during IODP cruise 165 of 170 m (561 ft) each in 1996 (**Figure 1**). The best-preserved core, 1002C, was examined, described and sampled to 170 m depth below sediment/water interface analyzing sedimentological structures, lithofacies types, pore types, permeability, grain size, fauna, and mineralogy (Hammes et al., 2018). Geochemical analyses of these cores in addition to existing IODP analyses include major and minor elements indicative of anoxic to oxic conditions, TOC, and isotopes (**Figure 2**).

The sedimentary and geochemical record of suboxic/anoxic and oxic intervals of the Cariaco basin, Venezuela, is well documented and related to sea-level fluctuations, upwelling, and varying terrigenous input (e.g., Petersen et al., 2000; Gibson and Peterson, 2014). The cores from IODP expedition 165 in the Cariaco Basin sediments offer a relatively uncompacted and undisturbed view on varying lithology, fauna, and sedimentary structures and which factors control their variability. For example, the latest ~600k year anoxia is related to high sea-level, whereas the oxic sediments are related to low sea-level (**Figure 2**). While the majority of the Cariaco

HGS General Luncheon *continued on page 23*

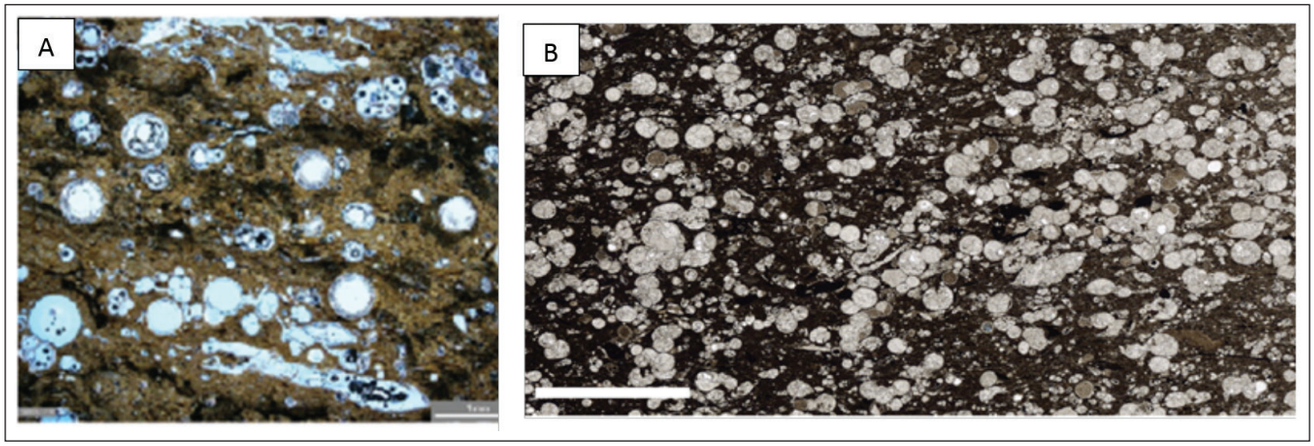

Figure 3: *A. TOC and Molybdenum and Vanadium concentrations in first 800 cm of Cariaco basin sediment indicate anoxic conditions down to 645 cm (arrow) as indicated by high TOC, Mo and V concentrations and oxic conditions below. B. Cariaco basin core of first 10 meters showing anoxic (dark) and oxic (light) sediments (from Lyons et al., 2003).*

HGS General Luncheon continued from page 21

basin sediments are composed of laminated mudstones, intervals of bioturbation and clay-rich and calcite-rich turbidites are present throughout the interval. A comparison to Eagle Ford shale samples shows uncompacted lithologic, geochemical, organic, and pore-type similarities to Cariaco basin sediments because Eagle Ford sediments are also composed of laminated marlstones, claystones, and carbonate-dominated planktonic-foram wackestones and mudstones (**Figure 3**; Denne et al., 2014). Exploring the external factors that control deposition of these sedimentary and lithologic variations will provide a model for exploring in shale-gas/oil basins predicting best producing intervals. ■

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Biographical Sketch

Dr. Ursula Hammes is currently President of Hammes Energy & Consultants and Adjunct Professor at the Department of Geological Sciences, Texas A&M University, teaching and assessing various shale oil/gas systems. Dr. Hammes has 25+ years of experience in the oil and gas industry and academia in Europe and USA in positions ranging from exploration, development, research and management. She has provided advanced consulting in shale-gas/oil and carbonate systems and has taught industry short courses and in-house training courses for universities and oil companies.

Dr. Hammes obtained her Diploma at the University of Erlangen, Germany, and her PhD at the University of Colorado at Boulder. Her graduate studies specialized in carbonate depositional environments, sequence stratigraphy, carbonate diagenesis, and rock-water interactions. Her background is diverse ranging from exploration, exploitation and business development for Anadarko Petroleum, consulting for Marathon Oil, Equinor, and various other independent oil/gas companies, conducting research in Texas and the Gulf of Mexico as Research Scientist and Principal Investigator of $3+ million projects for the State of Texas Advanced Resource Recovery project and leading research and advising students at the University of Potsdam, Germany, Texas A&M University, and Bureau of Economic Geology at the University of Texas at Austin.

Dr. Hammes served as president of the Gulf Coast Section of SEPM (GCSSEPM), was elected Energy and Minerals Division (EMD) president (2020), currently assists as associate editor for the AAPG Bulletin, and has been chair of many AAPG conventions and sessions. She serves as shale liquids and gas committee chair for EMD. Her research interests range from tight shale, sandstone, and carbonate analyses to clastic and carbonate sequence stratigraphy, reservoir characterization, and sedimentology. She has published extensively in recognized sedimentologic and petroleum industry professional journals.

Monday, March 2, 2020

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

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

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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 M. Rine
Wayne State University

How a Carbon Tax Could Benefit US NG Producers, But for How Long?

The analyses presented show how a Federal carbon fee could benefit US natural gas (NG) producers while meeting the COP21 goal of avoiding an increase in global temperatures of +2ºC (3.6ºF) above pre-industrial levels (Rine, 2019a). Absent a Federally mandated carbon tax, however, unilateral reductions in production by petroleum companies could result in costly opposition from stockholders and investors. The basis of the analyses are modeled responses to a 25-year national carbon fee and dividend (CFD) program beginning in 2025 at $10/metric ton (t) of CO_2 emissions and increasing annually by $10/t. The CFD program, if enacted nationwide, would within a decade begin the elimination of coal usage for electrical power generation while incentivizing carbon capture and storage (CCS) for NG. In theory, US NG producers with a CFD stimulated CCS program could not only attain an 80% drop in US carbon emissions by 2050 (for combined coal and NG usage), they could produce more NG than following a business as usual approach (BAU; **Figure 1**).

Also addressed are how growth rates of renewable energy and cost of commercial energy storage might impact US demand for NG (Rine, 2019b). Present day levelized costs of energy from new commercial-scale solar and wind powered facilities are already competitive with NG facilities. But growth of US renewable energy projected by the Energy Information Administration (EIA) for 2025 to 2050 (~130%) is a fraction of the growth necessary to replace fossil fuel usage by 2050. Other studies of past growth in renewable energy calculated that between 2004 and 2010 there was a growth of approximately 300%. Assuming the EIA projected growth through 2024 is correct (~160% from 2015 to 2024), growth in renewable energy would have to exceed 700% from 2025 to 2050 to completely replace energy produced from NG and coal. This unprecedented growth requirement indicates there will be continued need for energy from NG during this period. The competitiveness of commercial- or municipal-scale battery storage versus NG powered peaking plants is difficult to predict

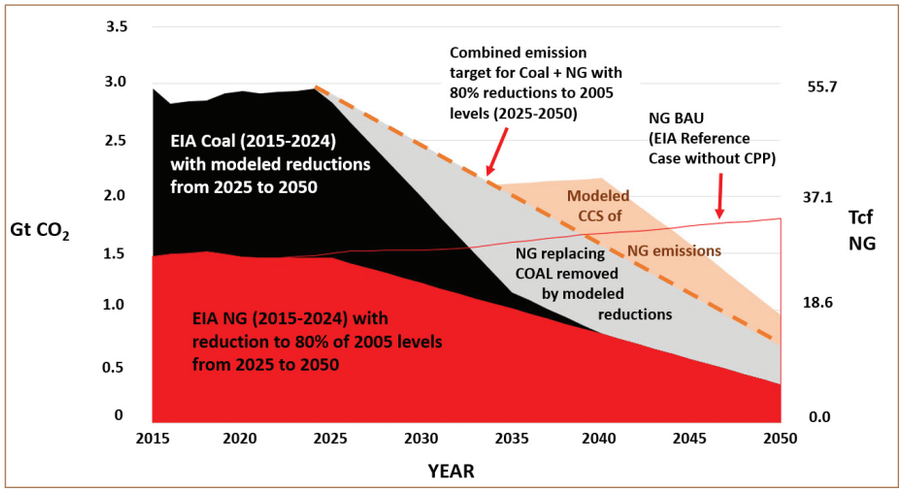


Figure 1. *Figure graphically illustrates the relative CO_2 emissions (in gigatonnes [Gt]) and consumption of natural gas (NG) and coal within the United States from 2015 until 2050 under the scenario proposed in Rine (2019a). Emissions levels between 2015 to 2024 are based on US Energy Information Administration (2017) projections without the Clean Power Plan (CPP). Emission reductions starting in 2025 reach 20% of 2005 levels by 2050. This scenario incorporates early termination of coal usage and utilization of carbon capture and storage (CCS) based on the Citizens' Climate Lobby (2014) model (***Figure 2***) but extrapolated to 2050. The NG emissions sequestered by CCS (pale orange) are not tallied with the total allowable emissions. From Rine (2019a).*

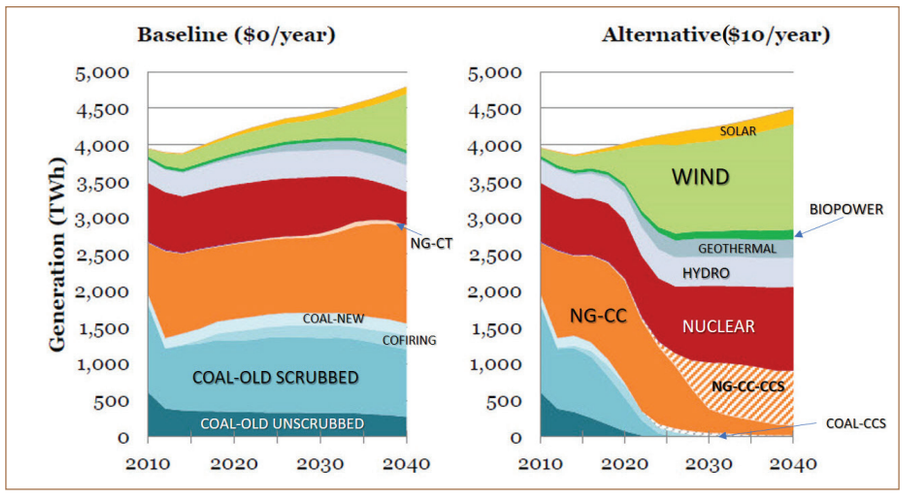


Figure 2. *Citizens' Climate Lobby (2014) modeled United States electrical power generation for the period between 2010 to 2040 without a carbon tax (baseline [$0/yr]) and with a carbon tax (alternative [$10/yr]). The alternative modeled a carbon tax starting at $10/t CO_2 in 2015 and increasing $10/t annually until 2035. The Citizens' Climate Lobby (2014) model replaces NG combined cycle (NG-CC) with NG CCS. Figures are modified from Citizens' Climate Lobby (2014). NG-CT = combustion turbine. From Rine (2019a).*

because of the large variability in both the levelized costs of energy from gas peaking plants and storage costs for batteries. Present-day estimates for low-cost battery storage could replace high-cost NG peaking plants immediately after instituting a CFD plan. Whereas a low-cost NG peaking plant may still be competitive decades after the initiation of an annually increasing carbon fee. ■

References Cited

Citizens' Climate Lobby, 2014, The economic, climate, fiscal, power, and demographic impact of a national fee-and-dividend carbon tax, accessed March 14, 2019, https://citizensclimatelobby.org/remi-report/.

Rine, J.M., 2019a, How action on climate change could benefit US natural gas producers, but not without federal mandates, *AAPG Bulletin* (archives, ahead of print).

Rine, J.M., 2019b, How a Carbon Tax Could Benefit US NG Producers, But How Much and for How Long?, AAPG Annual Convention and Exhibition (ACE 2019), San Antonio, TX, poster presentation, accessed December 18, 2019, http://www.searchanddiscovery.com/pdfz/documents/2019/42392rine/ndx_rine.pdf.html

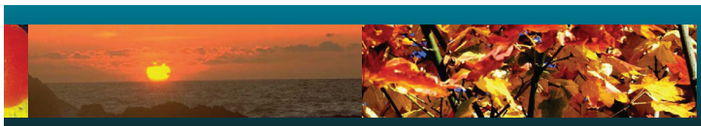
US Energy Information Administration, 2017, Annual energy outlook 2017 with projections to 2050, accessed December 18, 2019, https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf.

Biographical Sketch

James (Jim) M. Rine earned a PhD in 1980 at the University of Miami where his research on modern shallow marine siliciclastic muds received the 1985 SEPM outstanding paper award with R. N. Ginsburg. Rine's other published research includes shallow marine and deltaic sedimentation, groundwater hydrogeology, porosity characteristics of siliciclastic mud rocks, and the relationship of the petroleum industry to climate change. Jim, who currently is an adjunct professor within the Department of Geology at Wayne State University, has spoken numerous times to HGS over the past three decades.

January 2020

Sunday	Monday	Tuesday	Wednesday
	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.**		**1**
5	**6**	**7**	**8** **HGS Environmental & Engineeering Dinner Meeting** *"Flood Risk and Mitigation Analysis of the Brays Bayou Watershed," Steve Follmer, Page 17*
12	**13** **HGS General Dinner Meeting** *"Energy 101," Dr. Jory A. Pacht, Page 18*	**14** **HGS Board Meeting** *6 p.m.*	**15**
19	**20**	**21**	**22**
26	**27** **HGS North American Dinner Meeting** *Panel Discussion "The State of Private Equity in Oil and Gas," Page 19*	**28** **HGS General Luncheon Meeting** *"Recent Mudrocks of the Cariaco Basin, Venezuela: Modern Analog for Shale Oil/Gas Unconventional Reservoirs?," Ursula Hammes, Page 20*	**29**



GeoEvents

Thursday	Friday	Saturday
2	3 Don't wait, make your reservations online at hgs.org	4
9	10	11
16	17	18
23	24	25
30	31	**Members Pre-registered Prices:** Dinner Meetings members..... $40 Emeritus/Honorary members..... $40 Student members ..... $10 Nonmembers & walk-ups ..... $45 Except - Env. & Eng. ..... $30 Nonmembers & walk-ups ..... $35 Emeritus/Honorary members..... $15

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

Renew Your HGS Membership HGS.ORG

October and November Were Busy Months for HGS Volunteers at K-12 Events

Editor's words: Multiple outreach events were hosted by HGS members in October 2019. We published the reports on Earth Science Week Field Trip event and Earth Science Week Celebration at HMNS event in the December issue of HGS *Bulletin*. Here are a few more reports on the great work that our volunteers are doing in our community in the last Fall. Thanks to HGS member Janet Combes for providing the reports.

Getting Ready

October and November were busy months for the HGS volunteers for K-12 events. Before the activities started, the Hockley Salt Mine of United Salt Corporation donated several hundred pounds of salt to be given away at the various events. THANKS to Hockley! On the last weekend in September a "salt party" was held – completed with rock hammers and baggies. **Ken Green, Gregg Zelewski, Terri Bannister** and **Mollie Kish** joined **Janet Combes** to break up the rock salt into suitable sizes and to put them in baggies with an identification label. The salt was given away at seven events so far.

Reach for the Stars! Stem Festival
October 12, Rice University

On Saturday, October 12, four HGS volunteers set up a booth at the "Reach for the Stars! STEM Festival. Formerly known as the "Sally Ride Science Festival," this event is focused on exciting and inspiring middle school-aged girls to pursue their interests in science. The event includes a street fair, an inspiring talk by a woman astronaut, and many women-led science and engineering workshops.

The exceptionally cool weather on that Saturday morning contributed to a great turn-out! Many girls and their teachers or parents stopped by the booth to examine the various rock samples, hear about the formation of those rocks, and learn about petroleum exploration and how petroleum products are used in our everyday lives. HGS volunteers involved with the planning and the staffing of the booth included **Jim Tucker, Michelle Pittenger, Amanda McGill**, and **Aubrey Waddail**. Once again, United Salt Corp. generously donated samples to give away at the event. The salt samples were often received with surprise as the girls learned that there are "rocks" you can eat!

Energy Day
October 19, Downtown Houston

The HGS did not have a booth at Energy Day this year, but the American Association of Blacks in Energy asked for rocks for their display, and HGS member Steven Johansen arranged for rocks to be displayed. Salt from the Hockley Mine was provided for give-aways. The AABE organizer was much appreciative and said that "All of the samples, handouts, and delivery of materials were all so appreciated. You just have to look at the faces of our booth goers. One student knew so much we brought her behind the table to facilitate".

Reach for the Stars Display: HGS volunteer behind the table and at the posters – Amanda McGill, Jm Tucker, and Michelle Pittenger

Reach for the Stars Display

Energy Day: Teachers taking rock salt samples back for class project

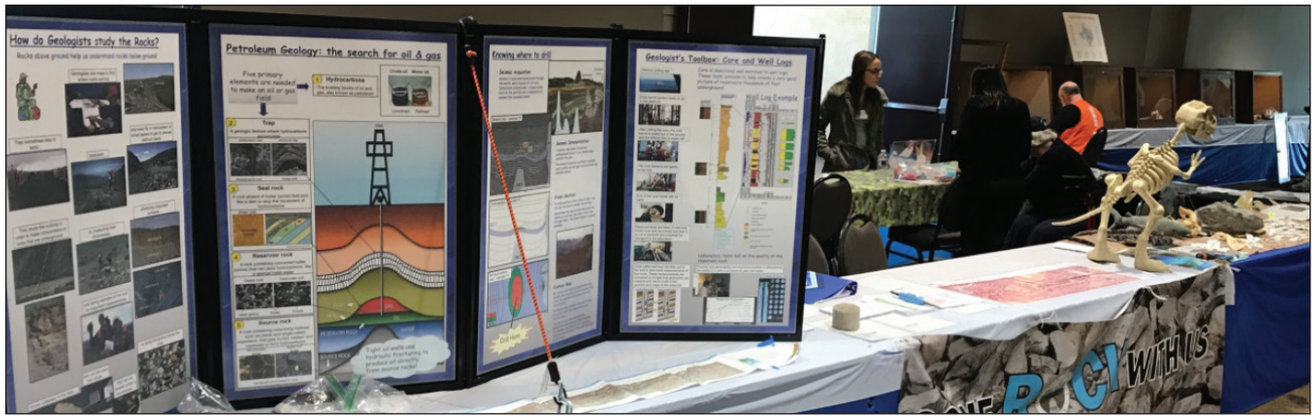
HGS K-12 OUTREACH at THE 2019 HOUSTON GEM AND MINERAL SHOW

On November 8, 9, and 10, 2019, the HGS K-12 group participated in the Houston Gem and Mineral Society (HGMS) Show at the Humble Civic Center. The annual HGMS show sponsors school field trips on Friday and Scouts for geology badges on the weekend. The HGS booth is a designated stop for both the field trips and the scouts. Attendance at the 2019 HGMS show was over 4,938 with just over 950 students for the Friday field trips. On Saturday about 150 Scouts went through the Geology Merit Badge programs.

The HGS had multiple volunteers to staff the booth for all 3 days, plus geology student volunteers from University of Houston Downtown. Volunteers at the HGS booth included: **Amanda McGill, Amanda Powell** (UHD), **Annabella Betancourt, Carlos Gonzalez** (UHD), **Diana Allard, Dylan McLane, Edgar Martinez** (UHD), **Eric Beam, Gregg Zelewski, Huw James, Janet Combes, Jazzy Ogbonnaya** (UHD), **John Jordan, Kira Mitchell** (UHD), **Luis Mendoza** (UHD), **Lorenzo Izarra, Marsha Bourque**, and **Steven Johansen**.

Posters explaining what a geologist does were displayed and discussed; there were 3D maps with 3D glasses for viewing. Hand lenses were available along with sample rocks of various types (including a piece of pumice that floats). United Salt Corporation's Hockley Salt Mine provided multiple bags of salt to use as give-aways to attendees.

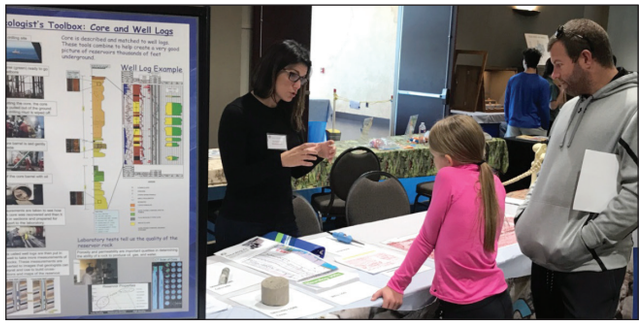
The HGS display area always shares space with the Houston Museum of Natural Science which provided Q & A sessions with discussions, had crafts with kids and provided fossil shark teeth to give away. The Museum booth was also active in the field trip and scout programs. **Inda** and **Neal Immega** organized the HMNS area; **Wally Harper, Tom** and **Melva Duboise, Tracy Marmande** and **Jeffery Wahrmund** (UHD) were enthusiastic volunteers. ■



HGS posters and seismic line ready for the crowds

Dylan McLane and Huw James – Ready to GO!

Wally Harper talking about the seismic



Annabella Betancourt explaining the displays

Amanda McCain with a Scout

WOW – look at the volcanic crater!

Edgar Martinez, Luis Mendoza, and Steven Johansen showing the rocks and hand lenses

HGS Applied Geomechanics Conference November 6–7, 2019

Student Poster Winners

1st Place – AbdullahBilal with James Kessler

1st runner up – JuanAcosta with James Kessler

2nd runner up – JennyMeng with James Kessler

First Annual HGS/EAGE Latin America Exploration Conference

19-20 November 2019

The First Annual Latin America Exploration Conference co-sponsored by the Houston Geological Society (HGS) and the European Association of Geoscientists and Engineers (EAGE) was held on November 19-20, 2019, at the Norris Centers at CityCentre in Houston and was attended by 165 industry professionals. The theme of the conference was *South America Petroleum Plays for Future Decades of the Third Millennium*. The conference was presided over jointly by HGS President **John Blickwede** and by EAGE Director of Regional Development, Peter Verweij. The Second Annual Latin America Exploration Conference will be held in Cartagena, Colombia, in November 2020.

This year's conference focused on a broad range of topics including oral sessions on the business side of exploration, the distribution of regional source rocks, new developments in seismic imaging and de-risking strategies, unconventional resources, and a number of presentations on specific conventional plays including Central America, the Caribbean, and northern and southern South America, in particular Venezuela, Trinidad, Guyana, Suriname, Brazil, Uruguay and Argentina. Poster sessions contributed mainly by students and academics included topics of regional tectonics and basement geology as well as petroleum engineering and specific plays.

Poster Winners

1st place winner – Abdulah Eljalafi
University of Texa at Austin

1st runner up – Sean Romito
University of Houston

2nd runner up – Dhrupada Beti
University of Utah

Some of the highlights of the 2019 HGS-EAGE Latin America Exploration Conference were as follows:

- Business-focused topics included "Diversity of Opportunity" (Alana Tischuk, Wood Mackenzie), Shell Upstream Argentina (Ed Kruijs, Shell) and Investing through political cycles (Richard Chuchla, Jackson School, UT Austin)

- A number of presentations focused on new exploration plays and/or remaining hydrocarbon potential of Guatemala, Honduras, Nicaragua, Panama, Jamaica, Colombia, Venezuela, Trinidad, Guyana, Suriname, Brazil, Uruguay and Argentina.

- Several presentations offered a regional compilation of source rock studies of the Caribbean and eastern margin of South America and across to South Africa.

First Annual HGS/EAGE Latin America Exploration Conference *continued on page 32*

First Annual HGS/EAGE Latin America Exploration Conference continued from page 31

- Several presentations focused on carbonate build-up plays within the Caribbean and elsewhere in South America.

- Several presentations offered insights into basement type and thickness and provided a definition of continent-ocean boundaries offshore.

- At least two presentations outline improved techniques for improved seismic processing and strategies for remote sensing and seep detection.

Each day featured a lunchtime keynote address. The first was by Ed Kruijs of Shell who spoke on the topic of the upstream Unconventionals of the Neuquen basin onshore Argentina. The second was by Richard Chuchla who spoke on the topic of investment strategies across political cycles. Altogether there were eight oral sessions comprised of twenty six presentations, and twelve poster presentations, including one from the University of Texas at Austin, seven from The University of Houston and two from The University of Utah.

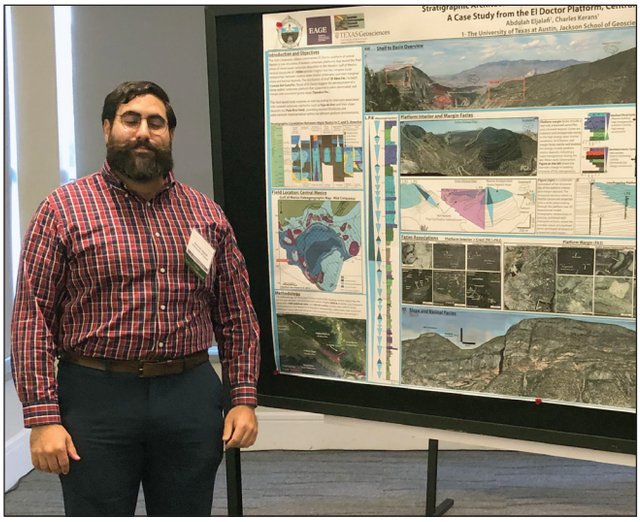
A number of committee members assisted in organizing this conference, led by HGS President **Jon Blickwede**, Event Director **Andrea Peoples**, General Co-Chairs **Pete Emmet, Steven Getz** and **Cheryl Desforges**, and two technical program co-chairs, **Mariela Araujo Fresky** and **Steven Getz**. The poster sessions were coordinated by **Mike Effler**. In addition, twelve Session Co-Chairs introduced speakers and moderated questions. Many other volunteers helped to make the meeting a success. Conference attendees received the transactions volume which included abstracts and speaker biographies for all of the talks and posters. Efforts are on the way to archive the released version of the PowerPoints presented during the conference at the HGS website. The transactions are also available for purchase through the HGS office. The two keynote speakers and the oral program speakers received HGS speaker awards through the efforts of **Mike Deming**, the HGS Award Committee Chairman.

The Best Poster Award went to PhD student Abdulah Eljalafi from the University of Texas at Austin who presented "Stratigraphic Architecture of Isolated Cretaceous Carbonate Platforms: A Case Study from the El Doctor Platform, Central Mexico".

The First Runner Up Poster Award went to went to PhD student Sean Romito from the University of Houston who presented his research entitled "Caribbean Basement Terranes; Boundaries, Sedimentary Thickness, Subsidence Histories, and Regional Controls on Hydrocarbon Source Rocks, Oil Seeps, and Shows".

The Second Runner Up Poster Award went to Dr. Dhrupada Beti from the University of Utah who presented his research entitled "Application of a New Resource Assessment Workflow to Offshore Suriname: Correction for Mineral Matrix Effect and Reclassification of Organofacies".

This event was generously supported by industry sponsors including Thunder Exploration, TGS and ION Geophysical and by exhibitors Actus Veritus, Geoscience, GeoEdges, LYNX and RPS.


A Case Study from the El Doctor Platform, Central
Abdulah Elalaili*, Charles Kerans*
1- The University of Texas at Austin, Jackson School of Geoscie
EAGE
TEXAS Geosciences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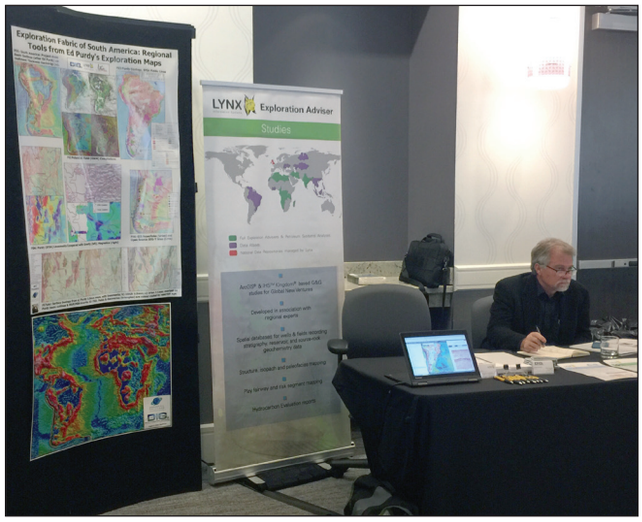
Exploration Fabric of South America: Regional
Tools from Ed Purdy's Exploration Maps
LYNX Exploration Adviser
Studies


EAGE
JOIN
US!

HGS Welcomes New Members

New Members Effective December 2019

ACTIVE MEMBERS
Geoffrey Bent
Jim Brenneke
Diege Dajczgewand
Laurie Geiger
Robert Grabb
Kelly Lindloff
Christopher Matchette-Downes
James Pasley
Jeffrey Reinprecht
Kerly Sanchez Mederos
Hector Sepulveda
David Sheley
Jeffrey Walsh

STUDENT MEMBERS
Ality Aghedo
Patricia Ascanio-Pellon
Sayoni Banerjee
Katelyn Barton
Olga Castaneda
Kaitlyn Dooley
Daniella Easeley
Lazaro Garza
Nicole Gonzalez
Porter Henze
Matthew Hernandez
Matt Hess
Aaron Lee
Wen Lin
Anya Marquez
Linnea McCann
Dylan McDougall
Haley Mosher
Samuel Neely
Callistus Obunadike
Jordan Oefinger
Ogochukwu Ozotta
Andrew Robertson
Schuyler Robinson
Sean Romito
Ryan Roney
Karen Silva
Yasuko Smith
Matthew Toro
Falon Treis
Larry Tuttle
Matt Wanker

Welcome New Members

Remembrance

Leonid A. Buryakovsky
1930–2019

Leonid Alexandrovich Buryakovsky, 89, passed away peacefully at his home on Sunday, November 24, 2019 in Houston, Texas. He was born October 12, 1930 to Rebecca Pachepskaya and Alexander Gregorevich Buryakovsky in Dnipropetrovsk Ukraine. In 1939 World War II erupted and Leonid's father went to serve in the Red Army to fight the Nazis. At the age of eleven, Leonid and his family were forced to evacuate their home and resettled in Uzbekistan. Following the war, the Buryakovsky family came back to their home in the Ukraine. Following graduation in 1953 from Mining Institute USSR, he moved to Armenia where he worked as a geologist. Leonid worked as a geologist and offshore engineer in the Caspian Sea while continuing his studies in geology and geophysics. In 1960 he earned a Master's Degree in geophysics, and in 1965 Leonid was invited to become a member of the Academy of Sciences. In 1969 Leonid earned a PhD in geophysics and quickly became a world-renowned expert in his field. He authored dozens of highly acclaimed geological books, journals and research publications. Following Leonid's immigration to the United States in 1991, he continued his geological work as an academic, until his reluctant retirement at the age of 78. He was an avid reader and collector of books. He is survived by his wife Rena; a son and a daughter, five grandchildren, and six great-grandchildren,

Summarized from the Life Tributes section of the Houston Chronicle published on December 1, 2019

HGS *Bulletin* Instructions to Authors

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

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

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

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

HGS *Bulletin* Advertising

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

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10	$950	$1,350	$2,550	$4,750	$8,000	$7,500	$7,050	$6,850	$6,650	$3,000
9	$800	$1,300	$2,500	$4,700						
8	$750	$1,250	$2,250	$4,300						
7	$600	$1,100	$2,200	$3,850						
6	$550	$950	$1,800	$3,500						$2,000
5	$500	$800	$1,600	$3,000	$4,700	$4,500	$4,350	$4,000		
4	$450	$650	$1,300	$2,500						
3	$300	$550	$950	$2,000						$1,000
2	$250	$400	$700	$1,500						
1	$150	$250	$450	$1,000	$1,500	$1,400	$1,250	$1,000	$1,250	$850
Professional Directory Section Business Card Ad: 10 Issues – $160 ($30 for each additional name on same card)										

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

Application to Become a Member of the Houston Geological Society

Qualifications for Active Membership

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

Qualifications for Associate Membership (including students)

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

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.

Mail this application and payment to:

Houston Geological Society

14811 St. Mary's Lane, Suite 250 • Houston, TX 77079-2916

Telephone: 713-463-9476 Fax: 281-679-5504

Payment method:

❑ Check, ❑ VISA, ❑ MasterCard, ❑ American Express, ❑ Discover

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Expiration Date: _____ Card I.D. _____

(Card I.D. – 3 or 4 digit number on front or back of card)

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.

Name: _____

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Home Phone: _____ ***Spouse's Name:*** _____

Email: _____

Job Title: _____

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Work Phone: _____ ***Fax Number:*** _____

Circle Preferred Mailing Address: Home Office

Professional Affiliations: _____

❑ AAPG member No.: _____

Professional Interest:

❑ Environmental Geology
❑ International E&P
❑ North American E&P (other than Gulf Coast)
❑ Gulf Coast E&P (onshore & offshore)

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Degree _____ ***Major*** _____ ***Year*** _____

School _____

Degree _____ ***Major*** _____ ***Year*** _____

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