HGS Bulletin

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Houston Geological Society

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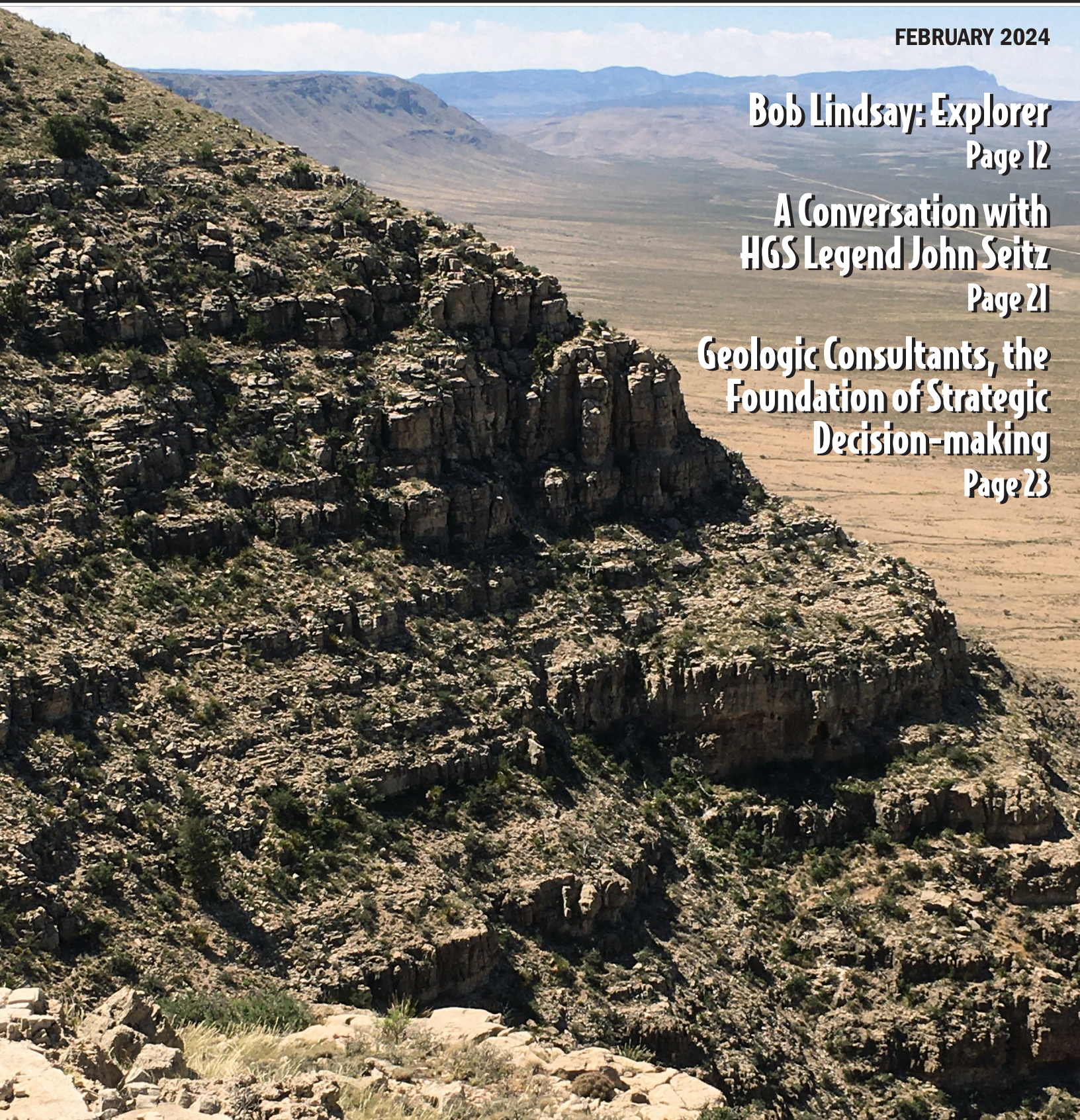

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Houston Geological Society

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In Every Issue

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About the Cover: Seismic line highlighting the Nanushuk Formation (NAN 3). Sandstone reservoirs at Pikka field are found in two individual clinothem sequences informally named the Nanushuk 3 and Nanushuk 2 zones that were deposited on a subaqueous shelf and shelf-edge delta.

Technical Meetings

Features

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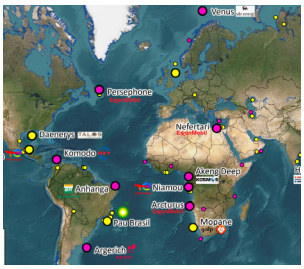

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Support the HGS: Sponsorships and Scholarships

We enjoyed our fiscal mid-year last month, and *so far, the budget seems to be holding fast*. Attendance at the dinners and luncheons has been good, including the Sherif Lecture and Legends Night. We held a Gala celebration for our 100th anniversary year and commemorated the year with a special edition of the Bulletin. We hosted the annual golf tournament, and revived the skeet shoot — now the sporting clays — which had a terrific turn out. We held the second holiday party at the Cadillac Bar, and it has now officially become an annual event. And of course, the outstanding Student Expo event in September is one of the only remaining student job fairs for geoscientists. The continuing education committee has held its usual dynamic programs under the guidance of a new chairman, Angel Callejon, who with co-chair Thom Tucker, led vibrant and engaging events.

I thank the sponsors for their generous support of our programs and events.

In the second half of our year, we will see Scholarship Night, a field trip to the Guadelupe Mountains, the annual Shrimp Peel in April, more continuing education classes, and much more. It is shaping up to be a good year. And none of this would be possible without the support from our many sponsors, recognized on the Sponsorship List every month and on page 4 of this issue. I thank the sponsors for their generous support of our programs and events.

The Scholarship Night dinner honoring student recipients will be held on Monday, February 12. Student awardees, their parents, friends, and professors will attend the event. The HGS hosts the dinner for the Warren L. and Florence W. Calvert Memorial Scholarship Fund, chaired by Jeff Lund, and the HGS Undergraduate Foundation Fund, chaired by Joe Lynch. These HGS funds provide many scholarships to deserving graduate (Calvert) and undergraduate (Foundation) student applicants. Industry and individuals have provided generous sponsorship of this event, and the profit from these events is equally divided between the two scholarship funds.

The following is a brief synopsis for the Calvert Fund by Chairman Jeff Lund: "The Calvert Memorial Scholarship Fund was created in the mid 1970's by HGS member Warren Calvert. His original grant was $8,000. The financial *corpus of the fund* has grown dramatically over time due to the inheritance of the Calvert estate when Warren's son, William Calvert, passed away. In addition, the fund has grown from HGS Member donations, and HGS Past President John Tubb's vision to hold a Scholarship Night dinner to honor scholarship recipients and solicit additional sponsorship donations. The event allows sponsors to meet many of the students and raises tens of thousands of dollars in additional funds. The fund is administered by a board of dedicated HGS volunteers.

Calvert Fund scholarships will help support 18 graduate geoscience students in 2023-24, selected on the basis of faculty recommendations and financial need. In the 46 years since the first scholarship was granted in 1978, the Calvert Fund has awarded 269 scholarships to students at 31 universities with a total of $960,050 being awarded."

The HGS Undergraduate Foundation Fund was started in 1984 to provide scholarships to deserving undergraduate geosciences majors. The Foundation has provided over $300,000 in scholarships since its inception.

Other student support comes in the form of summer internships at the Houston Natural Science Museum. The Engineering Council of Houston (ECH) committee and the Science and Engineering Fair (SEF) committee work cooperatively to support the yearly Science and Engineering Fair of Houston. Each year, several science fair participants are selected for HGS-sponsored summer internships. These internships are funded from the annual HGS budget and are subject to the financial ebbs and flows from year to year. I would like to see a program that has sponsors supporting these ECH and SEF events independently

From the President *continued on page 8*

Caroline Wachtman
editor@hgs.org

Networks, Connections and the Geoscience Ecosystem

I began the month by interviewing eight new HGS members to learn more about their education, careers, and what they hope to gain from membership in the Society. (Look for the *We are the HGS* column in upcoming editions of the *Bulletin* to read their stories.) These new members all seek to build their networks among geoscientists in Houston. Some were hopeful that network connections could turn into future jobs or business partnerships, and others hoped to gain mentorship. Their stories encouraged me to think more about the science of networking and how geoscientists build connections.

USE THE SCIENTIFIC METHOD

Networking can be approached by using the scientific method. First, specifically determine your question. Do you want to learn about a new role, a company, or a discipline? Are you looking for collaborators or financial supporters? Next, conduct background research to define the methods. Determine the people or groups who have experience with the topic. For example, if you are interested in learning about Energy Industry startups, you could check out free events at Greentown Labs or the ION. If you want to learn about being an independent geologist, you could check out SIPES. Third, develop a methodology to answer your question. For example, you might set a goal of attending at least one in-person event per month for six months. Plus, you might reach out to 10 people on LinkedIn or other social media. Fourth, evaluate your results. Did your actions help you answer your question? Re-evaluate your methods and pivot tactics if you aren't moving closer to your goal.

The steps listed above require the user to be deliberate in setting goals and making a plan, and require the user to be resilient and tenacious. Meeting new people can be uncomfortable and awkward. Allow yourself to accept the discomfort and do it anyway!

GIVE BEFORE YOU GET

In Adam Grant's book *Give and Take*, he describes the "Five-Minute Favor" that was pioneered by Adam Rifkin, a Silicon Valley entrepreneur and highly skilled networker. A five-minute favor embodies the idea that building network connections can be short but impactful. Examples of five-minute favors include making an introduction for someone in your network, sharing knowledge, offering direct feedback, writing a helpful comment on social media, and others.

Making introductions is a five-minute favor I enjoy. For example, I recently introduced one of the newest HGS members to one of the longest-serving HGS members, because both individuals share similar business interests. This deepens my own network connections, is quick to execute, and it feels good to help people!

BE DIRECT

In recent years, I have connected with other Energy-focused professionals working in Houston through the Energy Underground network (Energy Underground|Eventbrite), organized by entrepreneur and energy advocate Kevin Doffing. Doffing's meetings always start the same way: each person introduces themselves by stating where they work, what they want from the group, and what they can offer to the rest of the group. Although it may seem inconsequential, being direct about what you want to give and get has a profound impact on focusing discussions. The result is more meaningful networking relationships. For example, after learning about an attendee's question involving partnering with national labs, I connected to share my own experiences and challenges.

ENGAGE IN THE HGS ECOSYSTEM

The benefits of networking may not be realized immediately. However, by purposefully growing your network with other geoscientists, you develop community, can increase your knowledge, and potentially gain personal or professional value.

Learn more about other geologists who are building connections across the HGS community:

- Read about Graeme Bagley's role in connecting Upstream Oil and Gas leaders to exploration insights in *Pivot Profile*.
- Read HGS Legend John Seitz's lessons on a nearly 50-year career, including the importance of leaders connecting and communicating with technical workers.
- In *We are the HGS*, see Craig Schiefelbein's take on participating in HGS events to grow his network of potential customers, and see Robert Aylsworth's model for utilizing network connections to help pivot his career.
- Hear from HGS NeoGeos chair Bryan Bottoms, along with Rachel Schelble and Megan Janzen, about the importance of helping clients connect data with business outcomes. ■

We Are The HGS

Craig Schiefelbein, HGS member since 2002

"Torturing data from the late 70's" is how Craig Schiefelbein jokingly describes his most recent endeavor to expand the geochemical knowledge base in the South Atlantic Margin. Schiefelbein says he loves developing integrated basin analyses, which he has been doing for over 40 years.

While an MS student at Tulsa University in 1975, Schiefelbein began his work in the geochemistry lab of Cities Service. He studied all aspects of geochemistry until the company's acquisition by Occidental prompted his move to Conoco in 1985. At Conoco, he focused primarily on geochemistry of data from West Africa before pivoting to the service company sector with Core Labs in 1990. There, Schiefelbein helped conduct the first regional-scale crude oil and source rock study of West Africa followed by a Sub-Andean Crude Oil Study. And so began his passion for "torturing data – until it confesses," he says.

The success of the West Africa and Sub-Andean studies led Schiefelbein to create Geomark Research, a service company that continues to specialize in regional geochemical studies. After evaluating data from more than 5000 oils from all over the world, Schiefelbein left Geomark to co-found Geochemical Solutions International (GSI) in 1998. Since then, GSI has worked closely in Brazil with the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (ANP) to develop an extensive geochemical database focused on the conjugate margin basins of Brazil.

And so began his passion for "torturing data – until it confesses"

Schiefelbein has been an active participant in the HGS, including sponsoring the "Vendor Corner" at International Dinner meetings. He says the decline in face-to-face meetings during and after the COVID 19 pandemic has made it more challenging to connect with clients. Additionally, he has observed a decline in the number of explorers from Oil and Gas Majors who attend meetings and conferences at HGS and other societies. His business model relies on marketing to these companies, which is harder to do if they are not showing up to events.

Schiefelbein shares that one key piece of career advice is the importance of staying focused and organized in work. He says he learned this lesson during the West Africa project consortium meetings at Core Labs. "It was a lot of work to put these together, but at the end of the day the client feedback helped us stay focused and ultimately improved the final product," says Schiefelbein.

Schiefelbein says the most impactful pieces of advice in his career came early from a manager at Cities who encouraged him to find his purpose in working. "You go to work to make a contribution," says Schiefelbein, of how he answered that question. Schiefelbein feels that his purpose is to contribute to the understanding of integrated basin analysis. That purpose has kept him in an industry through downturns, canceled projects and technical challenges. Contributing to students by offering mentorship, support and feedback is also a key purpose for Schiefelbein. He routinely engages with the Conjugate Basins, Tectonics, and Hydrocarbons Consortium (CBTH) at the University of Houston to exchange ideas and data. ■

Robert Aylsworth, HGS member since 2023

"How does this help us get better at producing Oil and Gas?" is a question Robert Aylsworth, Business Development Manager at RevoChem, asks before he attends professional society events. Aylsworth says he recently joined the HGS because he has seen the quality of technical talks improve over the past couple years. "Now, I have no problem justifying the time and cost of meeting attendance to my boss," he says.

you never know when the person you meet could help you three years from now

Aylsworth also sees value in the networking HGS offers. "While you shouldn't go in with a mindset of 'help me now,' you never know when the person you meet could help you three years from now," he says. Aylsworth's 15-year career that spans geophysics, rock physics, geology, petrography, geochemistry and business development is a study in effective networking.

"I wanted to be a nuclear physicist, but it was so boring," laughs Aylsworth. In his Junior year at

We Are The HGS *continued on page 8*

We Are The HGS is a series that highlights the careers and contributions of HGS members with the intention of building community. Would you like to be featured in We Are The HGS? Send a note to editor@hgs.org.

We Are The HGS continued from page 7

Michigan State, he took a Geology 101 course that caused him to reflect on his education. Aylsworth, who spent his summers as a park ranger, says, "I missed natural resources, but I did not miss calculus." He pivoted to Geology and Geophysics and never looked back. Aylsworth went on to complete a Master's degree in near-surface geophysics.

Aylsworth's graduation in 2008 coincided with the arrival of Hurricane Ike, which led some Houston-based companies to retract their employment offers. Aylsworth pivoted his skill set and started his career with Ingrain, a startup focused on rock physics where he ran the SEM and CT lab and handled client interfaces. In 2017, Aylsworth pivoted again. Apache, who was one of Ingrain's clients, offered Aylsworth a full-time role as petrographer working on exploration projects such as Alpine High, and later on Suriname.

"You have to be flexible," says Aylsworth, who explains that he can apply his skills to geology, geophysics, petrography, business development, and more. In 2021, he expanded his skill set to include geochemistry. He leveraged an industry connection to join RevoChem, where he is currently the Business Development Manager. RevoChem is a start-up using geochemistry and machine learning to improve landings in unconventional reservoirs. Aylsworth views that his job is to learn what clients are doing and then offer them solutions to drill effective wells. "It's not a sales role," says Aylsworth, "You need a strong technical background."

Aylsworth is looking forward to increasing his participation with HGS and appreciates that many of the talks over the past year have been focused on Oil and Gas. He is also looking forward to getting back to in-person networking. "Recently, I see professional value in HGS; it's not just for academic or personal interest," he says. ■

From the President continued from page 5

so they are not subject to budget effects. As of now, the ECH and SEF do not directly get any sponsor support.

I am sure many of you know about all of these activities that are the core of what HGS is about, but I find as I write about them, I re-learn about them and their significance to our mission. As I said earlier, so many things that we do for HGS members and the Houston geoscientific community in general are dependent on those generous sponsors, from large corporate ones donating thousands, to individual members donating hundreds, or even tens, of dollars, every year. I would again like to thank all of the sponsors, and I encourage all of you to recognize and thank them for their support as you enjoy the many HGS events this year. ■

73rd Annual GCAGS Meeting
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- Technical Sessions
- Networking Events

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Houston Geological Society

Scholarship Night

FEBRUARY 12, 2024 | 5:30pm - 9:00pm

Norris Conference Center, Houston, TX

How Geological Field Work in the Guadalupe Mountains Helped Solve Oil Field Production Problems in the Permian Super Basin: Real Case Studies - Introducing the Houston Geological Society Guadalupe Mountain Field Trip.

Guest Speaker
Robert (Bob) Lindsay

Member $65.00
Non-Member/Walk ups $75.00

Online & pre-registration closes Monday, February 12, at 5:00 a.m.

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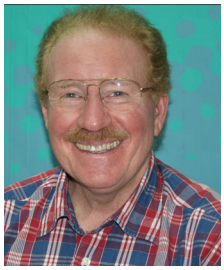
Bob Lindsay: His Career Story and Exciting Life as a Geologist and Canyon Explorer

As told to Linda Sternbach



Bob Lindsay worked in the Permian Super Basin for Chevron as a carbonate petrographer and stratigrapher. He was assigned to work on Eunice Monument field on the northwest corner of the Central Basin Platform, Lea County, New Mexico, in late 1988. Eunice Monument was discovered in 1929 and is composed of a series of unitized oil fields. Prior to this assignment, Bob had worked for Gulf Oil in Oklahoma City, Oklahoma and Houston, Texas, and Chevron in Denver, Colorado.

Part of Eunice Monument field, Eunice Monument South Unit (EMSU) was unitized in 1984 and was infill drilled from 80 acre to 40 acre spacing and put under secondary recovery (waterflood). Chevron management was concerned with the lack of waterflood performance from the Middle Permian (Guadalupian) Grayburg Formation. Bob's assignment was to describe cores and build a series of reservoir-scale sequence stratigraphic cross sections through the unit to characterize the reservoir.

The first problem in EMSU was variable reservoir thickness, with a thin Grayburg reservoir up-dip only 300 ft (91 m) thick while down-dip the reservoir was nearly 600 ft (183 m) thick. This variation in thickness, through cored wells, was across 3 miles (4.8 km). How were the reservoirs strata connected? Bob realized that working with 4 inch-wide (10 cm) cores alone did not give him the 3-d information he needed to characterize Eunice Monument Field.

Thanks to a chance conversation with Jerry Lucia, a world renown geologist with the Texas Bureau of Economic Geology, Jerry mentioned that there were excellent Grayburg outcrops in Stone Canyon along the western escarpment of the Queen Plateau in the Guadalupe Mountains.

When Bob first set his eyes on Stone Canyon from "Inspiration Point," he instantly realized that Grayburg Formation outcrops were nearly identical to facies he was describing in EMSU cores. Here was the 3-D information needed to characterize EMSU. Bob went to his manager and asked him to spend a day or two measuring a Grayburg section. The measured section turned out to be a perfect fit with the west side of EMSU. What a surprise! His manager was stunned. Bob suggested that additional sections should be measured, and his manager agreed. A series of measured sections in Stone Canyon on both north and south rims of the canyon revealed interwell-scale reservoir heterogeneities.

However, there were other canyons up-dip and down-dip of Stone Canyon. Bob soon realized that additional Grayburg reservoir in EMSU could be characterized by measuring additional sections in other canyons. Each canyon was dip-oriented. Key beds of strata were walked out into up-dip canyons. Down-dip required jumping from the Algerita Escarpment and El Paso Ridge to the Shattuck Valley Escarpment. Luckily, there were plenty of interbedded dolomitic sandstones to correlate with, which made the jump down-dip to Shattuck Valley Escarpment easy. An additional series of sections were measured along Shattuck Valley. By combining measured sections in Stone Canyon and other canyons both up-dip and down-dip, Bob was able to reconstruct the same 300 ft (91 m) thick up-dip and 600 ft (183 m) down-dip Grayburg architecture and identical facies to what was present in EMSU. Thus, the outcrops in the Guadalupe Mountains served as a guide to reconstructing the subsurface reservoir architecture in EMSU.

Bob led field trips to the Guadalupe Mountains for geologists and engineers from the Hobbs office. **Bob Lindsay** *continued on page 13*

Bob Lindsay (second from left) on a drilling rig in 1975.

Bob Lindsay continued from page 12

After seeing how well the outcrops in Stone Canyon tied to the reservoir at EMSU, management agreed to let Bob continue to work in the Guadulupe Mountains measuring sections. Nearly all his outcrop work was done by himself. Bob learned outdoor survival skills in U.S. Army Special Forces, known as the "Green Berets." So, measuring Grayburg outcrops in the Guadalupe Mountains was a piece of cake.

Correlations were made from Guadalupe Mountain Grayburg outcrops into the subsurface of the Northwest Shelf and on into EMSU in the northwest corner of the Central Basin Platform. Correlations were made easy by utilizing interbedded dolomitic sandstone horizons. These dolomitic sandstones were correlated around the length of the Grayburg ramp margin from Stone Canyon to Eunice Monument, a distance greater than 100 miles (>161 km).

Based on this outcrop field work a series of subsurface reservoir-scale sequence stratigraphic models were produced in Eunice Monument. These sequence stratigraphic models were periodically updated as more cored wells became available. These were followed by conformance work to improve vertical and lateral reservoir sweep efficiency.

Bob routinely ran field trips for Chevron personnel in the spring and fall that focused on reservoir-scale sequence stratigraphy, with a total of 36 field trips. Field trips showed geologists and engineers Grayburg strata and equivalent high perm thief zones in outcrop. Once engineers saw the high porosity-permeability ooid dolograinstone thief zone equivalents in outcrop they asked to have an additional field trip where they could walk the ooid dolograinstone up-dip to where it pinched out into the lateral stratigraphic trap. Additional short, measured sections of the high porosity-permeability ooid dolograinstone were captured, starting down-dip in Stone Canyon where the dolograinstone was 12 ft (3.7 m) thick with sections measured every few hundred feet for a total distance of 10,000 ft (3 km) to where the ooid dolograinstone thinned to only 18 inches (0.5 m) and then pinched out into non-porous strata up-dip.

Bob retired from Chevron in 2002 and went to work for Saudi Aramco in Dhahran, Saudi Arabia from 2002 to 2015. He used what he learned in the Guadulupe Mountains to help build a sequence stratigraphic model of Ghawar Field Arab-D reservoir. Ghawar field is the largest conventional reservoir in the world. In the Middle East he ran field trips for Saudi Aramco that started in Late Permian strata and continued up section into Triassic, Jurassic, and Early Cretaceous outcrops in central Arabia, which included an Arab-D outcrop. He ran 36 field trips for Saudi Aramco, including one for Stanford University.

Bob Lindsay loves exploring canyons in Guadalupe National Park.

In the evenings after work from 2004-2014 Bob worked on and finished a PhD through the University of Aberdeen, Scotland, utilizing Permian Basin Grayburg Formation for his doctoral thesis.

Bob is now retired and lives in Midland, Texas with his wife Linda, and visits his children (5), grandchildren (20), and great grandchildren (2) when he can find time. Bob spends his retirement giving back by teaching a few classes at his alma mater Brigham Young University (BYU). He is also an adjunct professor at the University of Texas at the Permian Basin (UTPB).

The Houston Geological Society (HGS) is planning a field trip to the Guadulupe Mountains on April 4-7, 2024, with Bob Lindsay the field trip leader. Come along on the HGS field trip and learn from the master geologist what to look for in outcrops and better understand Permian Basin subsurface geology. Each field trip participant will have the opportunity to build a 38 mile (61 km) regional composite-scale sequence stratigraphic model of Middle Permian strata through the Guadalupe Mountains into the western edge of the Delaware Basin.

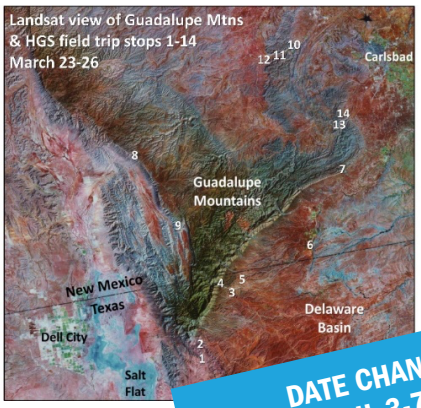
Don't miss the February 12th HGS Scholarship Night and meet Bob Lindsay in person at the Norris Center. ■

FIELD TRIP TO THE GUADALUPE MOUNTAINS NATIONAL PARK

HGS plans a field trip to the Guadalupe Mountains National Park on April 4-7, 2024. Meet Bob Lindsay on the HGS field trip and learn from the master geologist how outcrops can help you understand the subsurface. (See page 14)

Register at HGS.org

GUADALUPE MOUNTAIN AND DELAWARE BASIN FIELD TRIP



~~March 2~~ **DATE CHANGED TO APRIL 3-7, 2024**

Where: Starts/ends in Midland, Texas and base camp is Carlsbad, New Mexico

Itinerary: Carbonates Galore – Debris flows, turbidites, shelf margins, basin floor deposition, and sponge-algal reef as presented by Dr. Robert Lindsay who will be giving a talk on the topic on February 12, 2024 during HGS Scholarship Night in the Magnolia Room Norris Conference Center. Dr. Lindsey has led dozens of field trips in this area in the past.

Cost: $1,400 (Deposit of $800 due with registration; Final balance due by March 7, 2024) includes local transportation to and from Midland airport, van transportation to the various geologic stops, van snacks and water, guidebook, welcome dinner, daily lunches, 3 nights lodging at the Stevens Inn. Cost does not include airfare/ transportation from home to Midland and back.

Registration Deadline: **DEADLINE CHANGED TO MARCH 21, 2024**

Please contact the HGS (713-463-9476) to reserve a spot early (Limited spaces left).


Drawing Middle Permian lithofacies onto 38 mile cross section – Guadalupe Mtns into Delaware Basin


Guadalupe Mountains: View of El Capitan with Guadalupe Peak, highest peak in Texas, in the background

The Houston Geological Society Continuing Education Committee Presents

Geological Problem-Solving Using Biostratigraphy

February 13-14, 2024 • 8:00 AM Assemble and breakfast
Course 8:30 AM – 5:00 PM CST
In-person event, maximum registration 15
Ellington Geological Services • 1414 Lumpkin Rd, Houston, TX 77043

OVERVIEW

Learn how biostratigraphy can enhance your understanding of the sub-surface. This course will showcase how biostratigraphy can be utilized to solve geological problems in Oil and Gas operations. Most of the time will be spent on case studies and practical exercises. Participants are encouraged to bring their own data to discuss.

PRICING

$650 for HGS Members
$325 Student/Emeritus/ In-transition members
$900 Non-Members

Non-members can receive the member price by submitting a membership application and paying their HGS dues online (https://www.hgs.org/membershipApplication), before calling the HGS office, 713-463-9476 to register

DESCRIPTION

Micropaleontology has been widely used in the oil and gas industry for decades. It plays an important role in understanding the subsurface, de-risking prospects, steering deviated wells and identifying casing points while drilling. This course will focus on case studies and practical exercises, such as well correlations and bio-steering a horizontal well.

AFTER THIS COURSE, YOU WILL BE ABLE TO

- Understand the principles of biostratigraphy and which fossil groups can be used in a specific geological setting
- Awareness of how to use biostratigraphic data in basin- to reservoir-scale projects; including understanding the pitfalls of sampling and sample preparation
- Understand how to correlate wells using biostratigraphy data
- See the added economic value of biostratigraphy during well operations; including understanding how biostratigraphy is used to TD wells in real-time operations and how to bio-steer a horizontal well using micropaleontology

You will not be a paleontologist after this course, but you will be able to ask the right questions.

COURSE OUTLINE

- Introduction to fossil groups used in biostratigraphy: nannofossils, foraminifera, palynology, and others
- Sampling and preparation for biostratigraphic analysis
- Applications of biostratigraphy to interpretation of age, paleoenvironment, and sequence stratigraphy

CASE STUDIES

- Exploration phase: Well correlations and volumetrics
- Wellsite Operations: TD-ing a well using biostrat
- Baffle/Barrier modelling using micropaleontology

EXERCISES

- Well correlation
- Bio-steering exercise

Continuing Education *continued on page 16*

February 13-14, 2024 • 8:00am – 5:00pm
Ellington Geological Services 1414 Lumpkin Rd, Houston, TX 77043
Please make your reservations on-line
https://www.hgs.org/civicrm/event/info?id=2546

For more information about this event, contact Angel Callejon, callejon@yet2find.com

Continuing Education continued from page 15

BIOGRAPHICAL SKETCHES

Katrin Ruckwied has a PhD in Geology and Paleontology from Darmstadt University of Technology (Germany). In 2007 she joint Shell as a biostratigrapher and provided support to Exploration and Production Teams globally. She has worked projects in the GoM (USA and Mexico), US Onshore (Unconventionals), Nova Scotia, Kazakhstan, North Africa, South Africa, Australia and South America. She also taught biostratigraphy courses for students as well as for oil and gas professionals. Katrin is a Geological Advisor for EGS and enjoys framing projects and integrating different geological data sets.

Iain Prince has a PhD in Palynology from the University of Wales, Aberystwyth (1996) where he studied dinoflagellates from the Late Cretaceous (UK). After his PhD he worked as a consultant looking at North Sea, West of Shetlands and Danish Basin wells. In 1998 he joined Statoil where he supported active drilling in the Faroes and Norwegian Sea, completing the first wellsite biostratigraphy completed in Statoil and the first offshore acid palynology. He was also actively involved in geosteering wells in the Tertiary (N Sea) Siri and Glitne fields. Outside of the North Sea he worked on West Africa, Venezuela and Brazil. In 2003 he became head of the biostratigraphy group. During this time he began working on the GOM when Statoil entered this basin. Subsequently in 2007, he moved to Statoil in Houston where he farther gained experience in the GoM and began using palynology to assist with the Wilcox. In 2008 he joined Shell as their team leader and head of biostratigraphy. Since that time he has worked extensively in the GoM (more lately the Mexican GoM) and is still active looking after wells. His most recent wells were from Mexico and involved drilling megaflaps and repeated thrusts; wells in which the wellsite biostratigraphy was critical to reaching a safe TD.

Maria Antonieta Lorente is a highly experienced biostratigrapher with expertise in the study of spores, pollen, palynofacies, and palynological organic matter. Her expertise includes fossil assemblages from the Paleozoic throughout the Pleistocene, such as the Paleozoic of the western-northwestern US and the Permian Basin, the Triassic-Jurassic of Kurdistan, and the Mesozoic-Cenozoic of Belize in Central America, Venezuela and Colombia in Northern South America, Brazil, and the South Atlantic. She has managed biostratigraphy teams in the oil and gas industry for several decades and has taught stratigraphy courses at the Central University of Venezuela and for major professional private training programs for many years. ■

The Houston Geological Society Continuing Education Committee Presents

Clastic Depositional Systems

Mike Sweet
Thursday, March 28, 2024
Core Lab, Building 2
6323 Windfern, Houston, TX 77040
8:00am – 5:00pm

COURSE OBJECTIVES

1. Understand how sediment is routed through clastic depositional systems from source to sink
2. Learn to identify clastic depositional environments using core, log and seismic data
3. Understand how the spatial organization of facies in each environment of deposition affects the subsurface flow of fluids.

COURSE OUTLINE

This course will cover the following topics:

- Source-to-Sink concepts
- The controls of grain size, sorting and diagenesis on porosity and permeability
- Eolian Depositional Environments
- Fluvial Depositional Environments
- Shoreface Depositional Environments
- Deltaic Depositional Environments
- Marine Shelf Depositional Environments
- Slope and Deep-Water Depositional Environments
- Final Exercise

PRICING

$295 HGS Members
$140 Emeritus
$95 Student
$350 *Non-Members

Registration will close Wednesday, March 27, 2024 at 4 p.m.

Attendees will receive a Certificate of Continuing Education for 8 Professional Development Hours and digital course notes. Lunch is included. *Students should bring pencils, a ruler and their laptops.*

*Non-Members can submit an application and pay their dues before registering to get the member price. Please call the HGS office at 713-463-9476 to be registered only AFTER your application and dues are submitted.

ABOUT THE INSTRUCTOR

Mike Sweet began his role as Co-director of the Gulf of Mexico Basin Depositional Synthesis Project (GBDS) at the University of Texas, Jackson School of Geosciences Institute for Geophysics since 2019. The GBDS is an industry-supported research project that assembles and synthesizes well, seismic, and other data to establish a basin-scale depositional history of the Gulf of Mexico. His work focuses on Cenozoic depositional systems, particularly on quantifying how sediment moves between shallow marine and deep-water environments.

Previously, Sweet spent 18 years working as a stratigrapher for the ExxonMobil Research Company where he described kilometers of core and taught numerous field and classroom courses in clastic stratigraphy. He won the ExxonMobil Excellence in Instruction Award seven times. In addition to his experience in research, Sweet worked as the geoscience led for Angola Production and as a Geologic Advisor to the Caribbean exploration team. Before joining ExxonMobil, Sweet spent 10 years at BP Exploration as a sedimentologist working on clastic reservoir description projects in the North Sea, North Slope, Gulf of Mexico and Colombia. Throughout his career, Sweet has published extensively on deep-water clastic facies and reservoir geology.

Sweet received his PhD in Geology from The University of Texas-Austin in 1989. He is the current President of the Gulf Coast Section of SEPM, has served on the GeoGulf Technical Program Committee (2020-2021), and was Editor of the AAPG Bulletin from 2013-2016

Thursday, March 28, 2024 • 8:00am – 5:00pm
Core Lab, Building 2, 6323 Windfern, Houston, TX 77040
Registration will close Wednesday, March 27, 2024 at 4 p.m
Please make your reservations on-line
https://www.hgs.org/civicrm/event/info?id=2538

For more information about this event, contact Bill DeMis, billdemis@aol.com

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HOUSTON, TEXAS

KEYNOTE SPEAKER

Chris Kendall, *President and CEO, Denbury Inc.*

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A growing desire for lower emissions and a sustainable energy future has unleashed record levels of private sector investment and government funding creating an unprecedented concentration of global carbon capture, utilization, and storage projects.

As hosts of Carbon Capture, Utilization, and Storage (CCUS) 2024, from 11–13 March at the George R. Brown Convention Center in Houston, Texas, SPE, AAPG and SEG, have engaged technical experts from all aspects of the carbon capture lifecycle to explore the latest CCUS work and address related challenges and opportunities.

Much like our industry, this event has sparked exponential growth doubling in size year over year since its inception in 2021 establishing one of the fastest growing events in the CCUS arena. CCUS 2024 in Houston looks to build upon this success and will continue to be the industry's leading event for CCUS management and development.

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SPONSORING ORGANIZATIONS:

ENDORSING ORGANIZATION:

Register Now:

CCUSevent.org

Pivot Profile
Graeme Bagley on the Business of Exploration Insights: Selling, Listening, and Helping Others Succeed

By Caroline Wachtman

"What's great about this job is that I'm learning new geology every day," says Graeme Bagley, Head of Global Exploration and Appraisal at Westwood Global Energy Group. Bagley says he "gets to learn about the geology of the whole planet," takes deep dives into the data, and synthesizes insights that are highly appreciated by global clients.

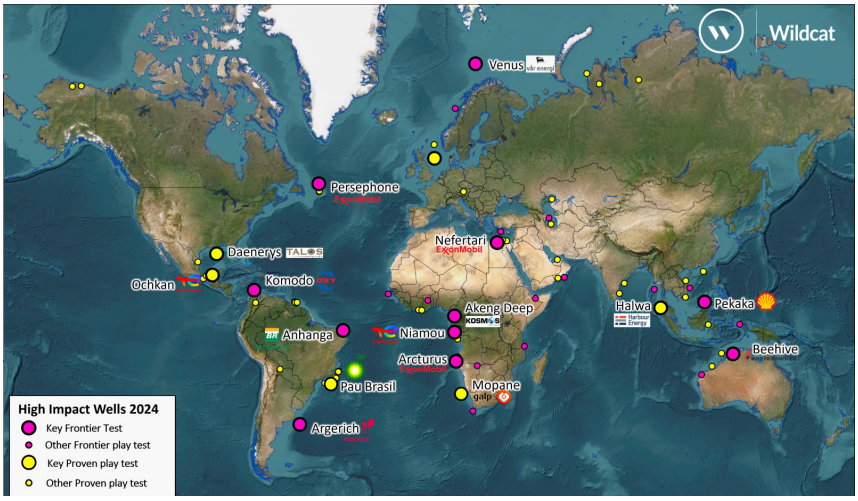
Bagley pivoted to the data insights business after a long career working as a geophysicist and technical manager with operator companies. Bagley says that his nature is to be optimistic and creative, which allows him to be a successful explorer, but that he leans into his background in quantitative geophysics to bring objectivity and detail-oriented data analysis to his current role of delivering exploration insights.

Now in the fourth decade of his career, Bagley has depth and breadth of technical experience to back up his insights. After starting as a seismic processor for BP and holding multiple development and exploration geophysicist roles on North Sea assets, Bagley spent several years as a development geophysicist in Venezuela. He later took on leadership roles for exploration in the Gulf of Suez, where he laughs, "I had to become an explorer because the seismic data was terrible." In 2010, Bagley became BP's Exploration Discipline Capability Manager, which involved technical quality assurance and people development for approximately 600 employees globally. In 2014, Bagley moved to Maersk Oil in Copenhagen, where he continued to manage exploration technology, assurance and capability. Then in 2017, he founded his own consulting company, Exploration Excellence.

a large part of his time is devoted to reviewing and revising technical insights to ensure the right mix of deep technical work and high-level insights

Bagley was offered the opportunity to run global exploration and appraisal for Westwood in 2019. Although he was not convinced that the service sector would be a good fit for him, he decided to give it a try. One key difference of working for a service company v. an operator is that it requires a different mindset; one that is focused on sales. "In every conversation, I'm thinking what questions we can answer that can generate revenue?" says Bagley.

His job also hyper focused on listening. "I work with exploration leadership teams from every major oil company on the planet," says Bagley. He notes that there has been a significant shift in the leadership conversations before and after the COVID19 pandemic. Before 2020, the conversations tended to be fairly brief and transactional. During and after the pandemic, Bagley says he noticed that leaders started to listen to external insights with more interest and attention. The virtual relationships developed during those years have persisted and developed in the post-pandemic world.



Location of planned high impact wells in 2024: key wells to watch and their operators

Most of Bagley's business is focused on researching public domain data. However themes developed during leadership

Pivot Profile *continued on page 20*

Pivot Profile is an occasional series that highlights geoscientists who have utilized their geology skills to interesting career applications. Are you interested to learn more about unique geology-inspired careers or do you have a suggestion of someone to profile? Contact me at editor@hgs.org.

 continued from page 19

conversations can lead to research that yields material insights for both Westwood and for its clients. Bagley says that his team generally has the 80% solution of the play-level geology and correctly predicts exploration performance on a portfolio basis.

In addition to listening, researching and providing valuable insights, Bagley says that his job is about helping others to succeed. He says a large part of his time is devoted to reviewing and revising technical insights to ensure the right mix of deep technical work and high-level insights. Calling back to his prior experience as a people-development manager, Bagley says he also spends a significant portion of his time developing the skills of his team. Because of the nature of the work, geologists in the team cannot develop deep prospect maturation skills, but they are exposed to the breadth of global exploration. "It's like a small team pursuing a Master's thesis each month," he says. Bagley supports their career development, many of whom continue their careers in business intelligence or business development.

STRATEGIC CHANGES

Bagley has seen a shift in exploration strategy over the past few years. Prior to the pandemic and concerns around climate change, exploration budgets tended to fluctuate with oil price. Now companies appear to be demonstrating exploration capital discipline and keeping exploration programs relatively constant. Companies are focusing more on core areas rather than frontier exploration and reducing the time between discovery and payback. Westwood is pivoting its business strategy to serve the evolving market, and to expand its research into renewables.

Bagley notes that another key shift over the past few years is the decline of university students pursuing Geology. He says that many universities in Europe are no longer offering Petroleum Geoscience courses and that most of the geologists graduating with oil and gas skills are now coming from the global south. He hopes that through advocacy with trade bodies and universities, and conversations with students he can help to reverse this trend. ■

For more information on Westwood Global Energy and its Global Exploration and Appraisal services please see https://www.westwoodenergy.com/wildcat

A Conversation with HGS Legend John Seitz

By Caroline Wachtman

John Seitz was named to the inaugural class of "HGS Legends in Wildcatting" in 2000, along with George Mitchell, Joe Foster, Marlan Downey and Gene Van Dyke. At that time, Seitz was nearly 25 years into his career and in senior leadership roles with Anadarko Petroleum, where he led successful exploration campaigns in Algeria and Nigeria, among others.

Seitz hasn't slowed down in the twenty-four years since being named a Legend. Seitz rose to the role of President and CEO of Anadarko before departing in 2003. Seitz then co-founded North Sea New Ventures that became Endeavor International, where he led key discoveries in the North Sea. In 2014, he co-founded GulfSlope Energy, where he is currently the President, CEO and COO.

Over his nearly 50-year career Seitz has learned key lessons about being a successful geologist: learning from mistakes, valuing commercial skills, and staying close to the technical work. These lessons, along with a passion for exploration, keep him going even when the commercial landscape for exploration is challenging.

BE WILLING TO LEARN FROM MISTAKES

Seitz says one of the core lessons he learned at Anadarko was to make data-driven decisions and be willing to learn from mistakes. He describes that it is critical to document the basis for a decision and then to "thoroughly post-appraise" the outcome of the decision. Seitz stresses that the post-appraisal process is not intended to find a guilty party, but instead to understand whether decision-makers took unnecessary risk.

Good technical decisions are based on good data.

Good technical decisions are based on good data. "You have to invest in science—the data, the people and tools. Not to invest is a mistake," Seitz says. Once the data is gathered, the next step is to build a portfolio of opportunities. The third step is to balance the portfolio with a mix of risk v. reward probabilities. "Balance your gut feel with confidence from data," he says. Seitz explains that with each success at Anadarko he was given more room "to run faster, run harder."

COMMERCIAL SKILLS ARE AS ESSENTIAL AS TECHNICAL SKILLS

"Early in my career, I was frustrated that my prospects weren't getting funded," says Seitz. He entered an MBA program at University of Houston in 1976 where he learned foundational economic and commercial skills. Although he didn't complete the program, he says the skills he learned allowed him to view opportunities differently and bring forward prospects that had both technical and commercial potential. "The ability to speak the language of returns helped me to get into management," he says.

In the past two decades, Seitz has been trying to get prospects funded by capital markets or private equity. He says the ability to raise risked capital is just as important as having good technical opportunities, but the skill sets are very different. Seitz notes that engineers have an advantage because they typically are involved more than geologists on economic evaluations.

Raising capital has been a challenge. "You earn your stripes well to well," he says. While at Endeavor, Seitz had a 61% success rate of exploration **John Seitz** *continued on page 22*

HGS LEGENDS

2000 George Mitchell
Joe Foster
Marlan Downey
John Seitz
Gene Van Dyke

2003 Michel T. Halbouty
Tom Barrow
Robbie Gries
Bill Barrett
Marvin Davis

2006 Pete Rose
Arnold Bouma
Peter Vale
Bert Bally

2007 Legendary Oil Fields
(Zafiro) Joe Bruso
(Mars) Mike Mahaffie
(Cantarell) Jesus Garcia Hernandez

2008 T. Boone Pickens

2011 John Amoruso
Dan Smith
Dick Bishop
Dave Rensink

2012 Unconventional Plays
Dan Steward
Gregg Robertson
Michael Johnson
William Zagorski

2013 Sedimentology
George Devries Klein
James Coleman
Miles Hayes
Robert Folk

2015 IBA Mentors
Brian Lock
Chris Zahm

2016 Geophysicists
Alistair Brown
Tom Smith
Peter Duncan

2023 Bill Armstrong

John Seitz continued from page 21

and appraisal wells. Endeavor's discoveries and appraisals included the 30 MBO Rochelle field. Another Endeavor appraisal well confirmed that the Cygnus discovery was one of the largest North Sea discoveries in recent history (AMEX_END_2008.pdf (annualreports.com). These successes, however, were not enough to keep investors motivated through the development phase and the company was closed in 2014.

When Seitz co-founded GulfSlope, he intended to raise capital for drilling prospects. However, GulfSlope's launch coincided with the 2014-15 shale boom and subsequent industry downturn. Seitz laments that today's investors want to put their capital towards unconventionals or Energy Transition projects rather than exploration. "Sometimes it feels like butting my head against the wall," says Seitz, "But we are still going."

STAY CLOSE TO THE TECHNICAL WORK

Seitz says that his last role at Anadarko was too far away from the people conducting the technical work. Similarly, he finds board roles weren't sufficiently satisfying because he was too far removed from technical decisions. Seitz jokes that he prefers to be no more than "three offices away" from the landman and the geologist because it allows for efficient decision-making. "It's all about the people, their creativity, and the small role I can play in having my ideas contribute to the process," he says.

Similarly, it is critical to have a strong technical team whose skills complement one another. The days of the "sole contributor" are over, says Seitz. Specialized skills are needed to understand each aspect of the risk profile to make good decisions. While it is easier to learn those skills at a big company, it's most important to work for a company that values learning, he says.

GOING FORWARD

Reflecting on the current push for renewables, Seitz says that the Energy Transition is not likely to happen quickly, and hydrocarbons will continue to play an important role going forward. He also reflects on the positive impact of hydrocarbons to economies around the world. "Oil means jobs and jobs mean stability," explains Seitz.

Throughout his nearly fifty years in the Oil and Gas business, Seitz says he has learned to "stick to your guns." Although he is currently looking for the right producing property to acquire, he plans to continue working to convince investors of the value of exploration and production, and to seek like-minded partners. ■

Geologic Consultants: the Foundation of Strategic Decision-making

By Caroline Wachtman

Nearly 30% of HGS members identify as consultants (see the December 2023 *Bulletin* for more survey results), yet this number masks the diversity of consulting geologist roles. While some consultants are independent contractors, other consultants are employed by firms. Some roles are focused on subsurface technical evaluations, yet others are focused on corporate strategy. In short, the term "consultant" encompasses a wide spectrum of roles for geologists.

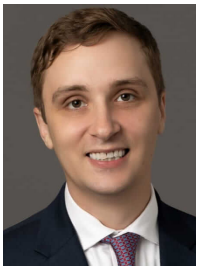
Although consulting geologists come in many different forms, they use similar skill sets and leverage a strong technical foundation. This article explores three different types of consulting company roles: corporate research, corporate strategy and business transformation, and acquisitions and divestments (A&D). Each of these diverse roles coalesce into a common goal: helping a client make strategic decisions.

Although consulting geologists come in many different forms, they use similar skill sets and leverage a strong technical foundation.

WHAT DOES IT MEAN TO BE A "CONSULTANT?"

Rachel Schelble joined Wood Mackenzie in 2021 as the Head of Corporate Carbon Management and Infrastructure after 15 years of working across technical and strategic assignments in the Oil and Gas industry. Her research helps Oil and Gas companies to better understand the value chains, business models, emerging technologies, and policies driving the Energy Transition. Recent corporate research insights have focused on the role of private equity in the Energy Transition, transportation infrastructure for carbon management projects, and corporate approaches to managing carbon emissions. Like her management-consultant counterparts, clients leverage Schelble's work to make strategic decisions. Schelble uses her subsurface background, plus a keen interest in profitability drivers, and an ability to integrate diverse datasets to succeed in her role.

"Subsurface is where it starts for strategic questions in the Oil and Gas business," says Megan Janzen, a consultant with Boston Consulting Group (BCG). Janzen moved to Norway in 2021, after an eight-year career as a geologist and prior roles in nuclear energy. Janzen works across BCG's energy practice, but primarily focuses on helping European Oil and Gas clients to evaluate questions such as how to reduce geoscience costs, strategically allocate Capex, or navigate the Energy Transition.



A third type of consulting is "real estate for Oil and Gas," says Bryan Bottoms, Vice President of Geology at Detring Energy Advisors. Bottoms evaluates mineral rights and production acreage for clients seeking to divest assets. He commenced his role with Detring nearly five years ago after working as a geologist for an operator in Oklahoma. Detring specializes in selling mineral rights, operated and non-operated working interest, in deals that are ~$250 million USD or less across the lower 48.

PRIORITIZATION, COMMUNICATION, AND DATA ARE CRITICAL

"It's prioritize or perish," says Schelble. "It's critical to know what to focus on and what needs to be achieved, because there is too much to learn and write about in Energy," she says. Schelble has learned to approach her work by clearly defining a viewpoint at the outset. She acknowledges that the path to strategic insights is seldom linear and often involves multiple course corrections. It can be tough to strike the right balance between exploring intriguing topics yet constraining the research scope.

The criticality of prioritization is echoed by Janzen, who says she has learned to strategically map out the key milestones and stakeholders required for project success. Janzen has learned to prepare for client meetings by clearly defining the objectives of the meeting, determining what decisions need to be made, and carefully considering the participant list. While she utilized prioritization skills in her role as a geologist and supervisor, Janzen says the skills required for effective project management at BCG require a higher level of deliberate planning and prioritization.

The length of typical consulting assignments is a key driver for prioritization. For Bottoms's work in A&D, the duration of initial geologic investigations typically lasts only a few weeks. Depending on the deal, Bottoms sometimes extends the evaluation and works alongside a company's technical team. Janzen says her assignments typically range from a couple weeks long to a few months. Schelble echoes that clients typically don't want consultants or researchers to expand their scope, so it's imperative to accomplish the objectives in the allotted timeframe.

Consulting Geologist *continued on page 24*

Consulting Geologist continued from page 23

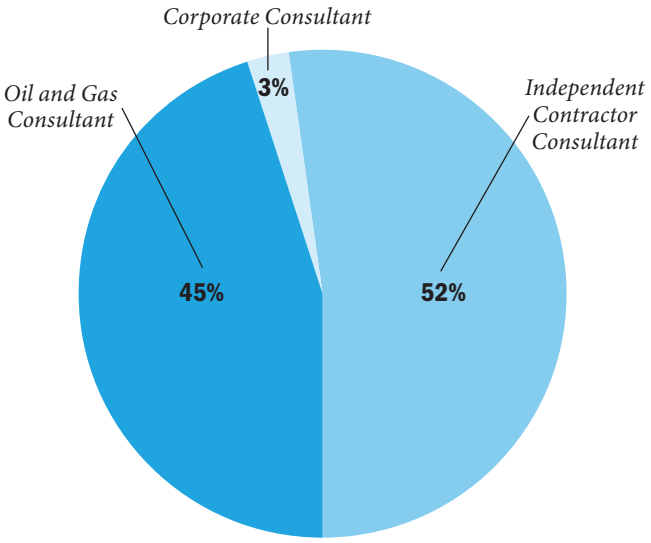
Communication skills are another core competency emphasized across consulting roles. Bottoms says that he went to college in 2012 to study geology and geography with aspirations of becoming a park ranger. The thought of working in beautiful natural places appealed to Bottoms. But, upon reflection, he realized he was also interested in communication aspects of the job. "I like to tell people about the geology. I get to do some of that now, by getting people up to speed on the geology of an area," he says. Bottoms describes that each deal is different and therefore communication becomes an art. He says he approaches the communication strategy by asking, "What would make me see the value in this deal or asset?"

For Janzen, communication is also a critical part of her role. Janzen says that she has learned to tailor her style to her audience. She communicates at a detailed-level to middle management and at an executive summary level to the C-suite. Schelble says that verbal and written communication are both equally important in her role. To provide the most value to clients, it's important both to write clearly about the topic and be able to verbally explain the nuances.

Data is the most important enabler for Schelble, Janzen, and Bottoms. Schelble says that data on Hydrogen, Carbon Capture, or other Energy Transition topics are required to answer many of her clients' questions. Wood Mackenzie has dedicated teams focused on developing wide-ranging data sets in Carbon Capture and Storage, emissions, and carbon policies.

Janzen echoes the importance of having robust databases for her work with clients in the North Sea. Because it is a mature basin, it can be tough for geologists to get out of a task-oriented mindset and into a creative, opportunity generation mindset. If a client wants to better understand remaining potential, they need an easily query-able database of drilling results—but oftentimes that database doesn't exist. Some companies don't keep detailed records, and in other cases the data are not easily accessible.

Bottoms says that identifying upside potential is a critical part of his geologic investigations, because it increases the value of the asset. A robust database of competitor activity is critical to identify new benches or recomplete potential. Bottoms says that he first started tracking competitor activity as a hobby while working for Tapstone Energy, and he soon became "the de facto industry knowledge guy." In addition to an interest in tracking industry data, Bottoms appreciates that he has a natural ability to memorize the relationships of geologic data across multiple fields..



Over 700 HGS members identify as consultants: 52% are self-employed independent contractors, 45% work for small companies consulting primarily on Oil and Gas evaluations, and 3% are involved in corporate consulting roles.

CONSULTANTS ARE PROBLEM-SOLVERS

All three of the geologists who participated in this article are leveraging problem-solving skills plus subsurface expertise in a new way. "If you can learn the consulting toolkit, a background in subsurface makes you really valuable," says Janzen. Because of her subsurface experience, Janzen says that she can better understand a client's pain points. Although she is not involved in conducting geologic evaluations for clients, she understands the drivers for both geologic and economic success. Similarly, Bottoms says his early experience as an operator helps him to think through a deal from a client's perspective. Subsurface skill sets are transferable to many new disciplines and strategic problems. "You can make a career out of how to solve problems, and apply that skill to lots of different situations," says Schelble. ■

Straight Talk on the Oil Business: Takeaways from Bill Armstrong at The Legends in Wildcatting Dinner

By Linda Sternbach and Charles Sternbach

Bill Armstong (left) meets with the Legends audience.

The much-anticipated Legends in Wildcatting special HGS dinner attracted more than 100 HGS members and guests to the Norris Center on January 8. The goal was to start 2024 with a well-attended program, celebrate past HGS Legends programs, and rekindle exploration interest. Bill Armstrong met the moment perfectly. The HGS dinner offered an entire evening of stories and answering audience questions that attendees thoroughly enjoyed. People stayed past 9:30 pm on a rainy Houston night to hear about the multi-billion-barrel Pikka Super Giant Oil onshore field, a geopolitical game-changer, from the discoverer who made it happen.

EARLY CAREER

Armstrong entertained the audience with colorful stories of being an independent in Denver, trying to make enough money to survive and pay his staff while dreaming of "hitting it big" and finding a significant oil field.

Pursuing new field drilling on your own is not for the faint of heart, but for the right person, it's the way to go.

Armstrong told the audience, "Wildcatters have been my heroes since I was young. I've worked with famous guys like T. Boone Pickens (Mesa Petroleum). I've always had a natural kinship with these guys. I've often thought about what makes a person a Wildcatter. They have a few things in common: one, they're not afraid of risk, and two, they're almost always optimistic. They're always looking at the high side of life and I've always been that way. I was naturally attracted to exploration."

Armstrong recounted, "I was exposed to the life of a wildcatter from my dad when I grew up in Abilene, Texas. He was an oil independent as well. One time when we were driving home in the car, I asked my dad, 'what do all your friends do?' and Dad said, 'We are all independent geologists,' and I loved it. You couldn't tell if they were rich or poor or had made or lost it. They were always happy and full of life. I was very lucky to figure out when I was young to major in geology." Armstrong added, "A wildcatter must be willing to endure much hardship. My wife and I probably bet our net worth no less than 25 separate times, and most people are not up for that."

PATH TO DISCOVERY

"Let me tell you how I got into wildcatting in a big way," says Armstrong. "I did everything that an independent was supposed to do. Those were good places to start, but I quickly learned that the best competitors were other tenacious Independents. I realized I was 'picking with the chickens.' I struggled for a long time. My wife and I were as broke as a joke from the age of 25 to the age of 40. I realized the need to get in front of the pack if I wanted to do well. I gravitated to deeper stratigraphic oil and gas plays, and the competition melted away! All the Independents were playing the typical shallow stuff. So, I decided to go deeper and suddenly found that my only competition on deep plays was the major oil companies. They had big staffs and deep pockets, but I could run circles around them with big ideas" he says.

In 2000, Armstrong went to Alaska to try a big new play. Armstrong realized the Trans Alaska pipeline needed more oil in it. His new exploration efforts would fit into a waiting infrastructure and greater global geopolitical opportunity.

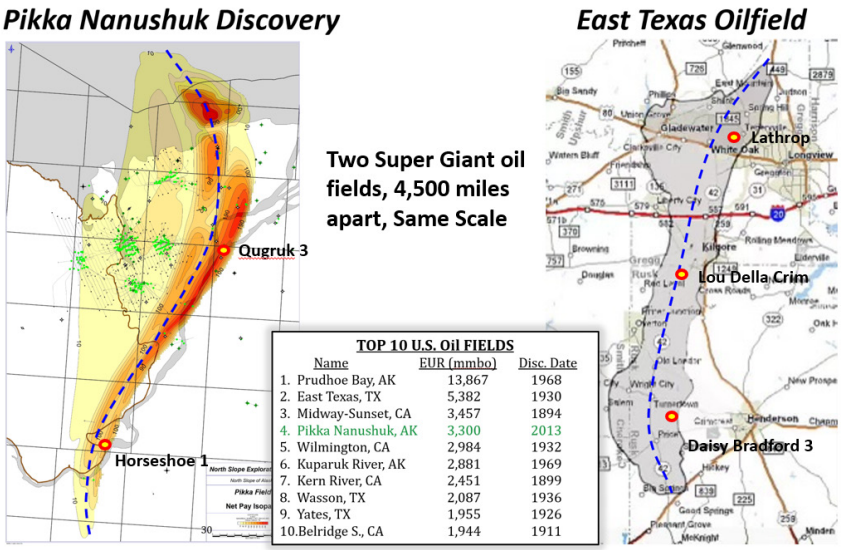
He told the Legends Night audience, "I don't want to live a boring life and do small things. I always wanted to do something big that would move my needle, excite me about life, and make the world a better place for many people." Armstrong continued, "At our company, we always tear a play apart. You can't just look at a prospect. You've got to look at everything to make sure it makes sense. When I first went to Alaska in 2001, people told me that all the big guys had found all the big fields. That was the mentality. But then I realized I needed to back away from perception and study geology."

The Pikka field was found among established older oil fields in Alaska, south of the Prudhoe Bay field, in an onshore area that most companies did not think had oil. Armstrong's geology and geophysics team noticed shows in "dry holes" drilled by previous major oil companies. They shot seismic to define a potential play in downlapping clinoforms that appeared to be a stratigraphic trap.

Bill Armstrong *continued on page 26*

Bill Armstrong continued from page 25

Pikka Prospect started as a test of Jurassic reservoir objectives, but the initial well found pay in shallower Cretaceous clinoforms. After additional seismic acquisition and processing showed AVO amplitudes in the far offsets, the game was on! The Quguruk #3 was a major discovery, followed by the Horseshoe 1 well, a successful step-out 21 miles away.



TOP 10 U.S. Oil FIELDS

Name	EUR (mmbo)	Disc. Date
1. Prudhoe Bay, AK	13,867	1968
2. East Texas, TX	5,382	1930
3. Midway-Sunset, CA	3,457	1894
4. Pikka Nanushuk, AK	3,300	2013
5. Wilmington, CA	2,984	1932
6. Kuparuk River, AK	2,881	1969
7. Kern River, CA	2,451	1899
8. Wasson, TX	2,087	1936
9. Yates, TX	1,955	1926
10.Belridge S., CA	1,944	1911

"We immediately knew that we had found a big field. I've drilled many wells, and the big discoveries are unambiguous. This discovery well had 300 ft of pay up with 30% porosity, almost a darcy of permeability, low water saturation, good crude oil and a huge hydrocarbon column. We found 13 billion barrels of new oil in place!" Armstrong says. The recoverable oil at Pikka Field could make it the third-largest oil field in the United States. Armstrong's discovery will be transported using the TransAlaska pipeline, possibly adding 300,000 bbls daily to the oil market.

Every Super Giant oil field has lessons to teach. Pikka's size is humbling compared to an East Texas Oilfield. East Texas taught us to search for truncation traps, and Pikka teaches us to search for clinoform pays. When East Texas was discovered in 1931 with the Daisy Bradford #3 well, the Lou Della Crim and Lathrop step outs seemed like they had to be separate fields because no one had seen a continuous field that big before! So it is with supergiants—they expand our thinking.

ARMSTRONG'S VIEWS ON THE OIL BUSINESS

Armstrong gave a humorous, engaging, and insightful talk on the other famous oil finders he has worked with, including Michel T. Halbouty and Boone Pickens. One of the best Armstrong quotes is, "Big companies may have a big staff and a big wallet, but independents have a lot of big ideas."

Armstrong told the audience he hates unconventional oil plays like the Bakken and the Marcellus Shale. He says, "I've lost a lot of money by drilling unconventional wells. If you want to light your money on fire, drill a bunch of unconventional wells. Here's a reason- everybody brags about how great the unconventional play is. It's great for our country, it's great for the world, it's great for supply. But I am in those plays, and unlike everybody else, I am paying for it with my own money. I'm not paying for it with shareholders or private equity money. I'm paying for it with my money and telling you it doesn't work. There is nothing better than a successful conventional new field wildcat."

He cautions, "Pursuing new field drilling on your own is not for the faint of heart, but for the right person, it's the way to go. Not everyone is cut out to be a wildcatter. But we need wildcatters to make the discoveries that employ large communities, including other geoscience and engineering technical specialists."

Armstrong was asked about hiring geologists and what makes a good oil geologist during the question period. He described, "I think in 3D and can imagine the oil business better than most people. I recognize talent, especially wildcatting. Talent is rare. What I look for most of all is a person who will fight for their ideas. You have to fight for your right to party in our company. It's called 'running the gauntlet.' All of our geologists are so incredibly technically competent. To convince me to do a project, you have to run your idea past every one of my staff. Running the gauntlet is the hardest thing that my employees go through. I've lost 50% of my hires because they couldn't handle the gauntlet."

"We're putting our own money in our deals. If I convince somebody else to put their money into it, I will show them that I'm putting my money in first. Unlike many professionals in big companies, this is my money, not a corporation's or private equity money."

Wildcatting success is not just about making the discovery but seizing the moment. ■

YOU CAN READ MORE ABOUT THE PIKKA FIELD IN THE THIS AAPG PUBLICATION:

J.V. Sommer, Dorrington, K., VanDenberg, C., Bonelli, J.R., Algeibez Alonso, J.L., 2021. "Pikka Field and the Opening of the Nununshuk Play, North Slope, Alaska," pages 301-338, in the AAPG Memoir 125 Giant Fields of the Decade 2010-2020, Edited by Sternbach, C.A., Merrill, R.K., Dolson, 455 pp.

Check out the YouTube channel "HGS GeoEducation" for videos of this meeting.

Salt Party with the Educational Outreach Committee

By Janet Combes

The HGS Educational Outreach committee had a "salt party" in January to prepare give-away samples of salt from the Hockley Salt Mine donated by United Salt Corporation. HGS volunteers met on Janet Combes's driveway to break up the large salt pieces into smaller pieces, then bag and label the samples. The group prepared over 800 samples that are now ready to be shared with students at upcoming events.

January Volunteers at the salt party included: Marsha Bourque, Sue Pritchett, Nancy Engelhardt-Moore, Michelle Pittenger, Janet Combes, Steve Johansen, Daniel Allen, Jim Tucker, Paul Riegler, and Chuck Caughey. All were busy!

In January, the Educational Outreach committee presented at two elementary school career fairs, and helped at a science fair for Conroe schools. In addition, the Committee hosted a trip for 240 students from four HISD high schools to the UT Bureau of Economic Geology (BEG) Core Lab. The BEG event was organized by a Carnegie.edu team and Letha Slagle from the HGS Educational Outreach committee.

If interested in volunteering with the Educational Outreach Committee, please contact the chair listed on the HGS website or on page 2 at the beginning of the *Bulletin*. ■

Bags of salt samples — 25 pieces per bag, over 800 pieces

Jim Tucker and Daniel Allen breaking salt with the rock hammers.

Michelle Pittenger, Sue Pritchett and Marsha Bourque bagging, sorting, and labeling salt

WORD BRECCIA – A GEOLOGY WORD JUMBLE

Unscramble the words below and rearrange the circled letters to find the answer to the clue.

ASCILTC _ O _ _ O _ _

TENRABCOA _ _ _ _ _ O O _ _ _

IFCAM _ O _ _ O

DENUMOST _ O _ _ _ _ O _

LAKASA O _ _ _ _ O

For a straegic decision, you might seek advise from a _ _ _ _ _ _ _ _ _ _

Science and Engineering Fair of Houston: Join us in Making a Difference in 2024!

By Dorene West, Chair of the Science and Engineering Fair Committee

Are you enthusiastic about earth sciences? Do you enjoy listening to students talk about geology? If so, share your love of geology by joining the HGS Special Awards Agency team of volunteer judges at the annual Science and Engineering Fair of Houston (SEFH), Saturday, February 17, 2024, at the Fort Bend Epicenter, 28505 Southwest Fwy., Rosenberg, TX 77471.

HGS SPECIAL AWARDS

The HGS team reviews Earth science related projects in the Junior and Senior Divisions at the SEFH. Phase II and Special Awarding Agency Judging is from 1:15 PM – 4:15 PM Saturday afternoon. We give two types of awards: rank and internships. HGS Special Awards are meant to encourage students to pursue Earth science related careers.

RANK AWARDS

A top project is picked for each division; 2nd and 3rd place projects are picked for the Senior Division. HGS presents these winners with a certificate and congratulation letter at the SEFH Awards Ceremony. We also usually invite these winners to be recognized at Guest Night (June).

share your love of geology by joining the HGS Special Awards Agency team of volunteer judges at the annual Science and Engineering Fair of Houston (SEFH)

INTERNSHIPS

Through our membership in The Engineering, Science, and Technology Council of Houston (ECH), HGS funds two summer interns at the Houston Museum of Natural Sciences (HMNS). These Finalist HMNS Summer Intern Awards are nominated by HGS but awarded to two Senior Division finalists by ECH. Students must meet work requirements (so are not necessarily the top ranked project winners). The awardees are invited to an ECH awards banquet (or Zoom meeting), where the students showcase their projects.

NOTE ON JUDGING

An effort is made to remove "community bias" from our judging. Students are judged on their individual effort; those who have fewer resources cannot compete with student projects from areas with more resources/community support. We are charged with encouraging students to participate in STEM; not to penalize students from schools/communities with fewer resources.

There are also opportunities for HGS members to volunteer in the Saturday morning SEFH Place Judging session. Some Place Award Judges get assigned to review projects that have advanced to Phase II on Saturday afternoon (if you volunteer to be a Place Award Judge you may not be able to serve as a Special Award Judge for HGS). Judging ends at 4:00 p.m.; the public can view projects from 4:30 PM – 6:30 p.m.

To volunteer as a Place Award Judge (in any category) use the link on the SEFH 2024 website to register yourself https://sefhouston.stemwizard.com/public_site/judge_register.

HGS members can volunteer to be an HGS Special Awards judge on Saturday afternoon, please email Dorene West (dbwesthou@earthlink.net; please put *SEFH Special Awards Judging* in the subject line).

Additional info: https://sefhouston.org/general-information/ or https://sefhouston.org/for-volunteers/.

BE A JUDGE FOR THE

ANNUAL SCIENCE AND ENGINEERING FAIR OF HOUSTON (SEFH)

SATURDAY, FEBRUARY 17, 2024

AT THE FORT BEND EPICENTER, 28505 SOUTHWEST FWY., ROSENBERG, TX 77471

HTTPS://SEFHOUSTON.ORG/GENERAL-INFORMATION/ *OR* **HTTPS://SEFHOUSTON.ORG/FOR-VOLUNTEERS/**

HTTPS://SEFHOUSTON.STEMWIZARD.COM/PUBLIC_SITE/JUDGE_REGISTER

HGS MEMBERS CAN VOLUNTEER TO BE AN HGS SPECIAL AWARDS JUDGE

FOR MORE INFO — DBWESTHOU@EARTHLINK.NET

Monday, February 12, 2024

5:30 – 9:00 p.m.

HGS Members/Emeritus/Honorary Life $65
Students $65 • Non-Members & Walkups $75
Norris Conference Center, Citycentre
816 Town and Country Blvd #210 • Houston, TX 77024
https://www.hgs.org/civicrm/event/info?id=2474
Event Contact: Linda Sternbach • linda.sternbach@gmail.com

Robert F. Lindsay
Lindsay Consulting LLC,
Affiliate Professor at Brigham Young University, and Adjunct Professor — University of Texas at the Permian Basin

Scholarship Night 2024

Meet Student Awardees in Person

Scholarship Night recognizes students receiving well-deserved financial support from the HGS Calvert Fund. Students will attend with their guests and academic advisors from Gulf Coast Universities including University of Houston, Rice University, Stephen F. Austin University and more. Geologists from sponsoring companies, including Shell, Chevron, Oxy and others also plan to attend.

Fang Lin, Scholarship Night Chair, will co-host the event with Jeff Lund, Judy Schulenburg, Nicole Villarreal, and Angela Hammond. The social hour festivities start at 5:30 pm in the Norris Center Magnolia Room, followed by dinner and award ceremony at 7:00 pm.

The featured speaker at Scholarship Night will be Dr. Bob Lindsay, retired geologist from Chevron and Saudi Aramco, and adjunct professor at both BYU and UT. Lindsay is a consultant, well known for organizing in-person field trips to Guadalupe National Park. HGS is planning a field trip with Lindsay to Guadalupe Park on April 4-7 this year. Registration for this field trip is open on the HGS website at https://www.hgs.org/civicrm/event/info?id=2474

Lindsay is also a renowned expert on core evaluation and interpretation. He continues to teach geology students how to use core data in mapping.

How Geological Field Work in the Guadalupe Mountains Helped Solve Oil Field Production Problems/Questions in the Permian Super Basin: Real Case Studies

Guadalupe Mountain outcrops have proven to be the perfect laboratory for subsurface reservoir studies in the Permian Super Basin. This talk focuses on Grayburg Formation outcrops, composed of grain-rich to mud-rich dolostone and interbedded dolomitic sandstone, and how these strata helped answer key production-related problems/questions in Grayburg oil fields that transitioned from primary recovery to secondary recovery (waterflood) and on to tertiary recovery (CO_2 enhanced waterflood) operations.

Bob Lindsay has studied the stratigraphy of the Grayburg in both the Guadalupe Mountains and in the subsurface of giant oil field like Eunice Monument field in the Permian Basin. He will talk to the audience about his experience solving oil and gas production problems and complex sub surface stratigraphy. His presentation style focuses on audience interaction.

The Grayburg formation presents the following problems/

HGS General Dinner *continued on page 30*

HGS General Dinner continued from page 29

questions for the audience to consider, such as:

- Is the Grayburg reservoir associated with a ramp, distally steepened ramp, or rimmed shelf margin geometry?
- Is the Grayburg reservoir associated with inner ramp/inner shelf, ramp crest/shelf crest, and middle ramp/shelf slope, or basin lithofacies?
- How does reservoir architecture and connectivity change from up-dip to down-dip?
- What lithofacies/rock types are up-dip and down-dip?
- How thick are individual flow units up-dip and down-dip?
- What are reservoir stacking patterns up-dip and down-dip?
- Does the Grayburg reservoir act like one big tank, or is it subdivided into small-scale cycles, cycle sets, high frequency sequences, simple sequences, and a composite sequence?
- How were interbedded dolostones and dolomitic sandstones deposited and what are their reservoir potential?
- How was reservoir connectivity created?
- Are high porosity-permeability flow units of strata present?
- Is there interwell-scale heterogeneity?

Surprisingly, Grayburg outcrops in the Guadalupe Mountains are striking similar to subsurface reservoirs with respect to:

1. Overall thickness variations
2. Reservoir geometry
3. Position upon ramp/shelf
4. Reservoir architecture and connectivity
5. Lithofacies/rock type distribution
6. Flow unit distribution
7. Stacking patterns
8. Cyclicity
9. Depositional setting;
10. Reservoir connectivity creation
11. High porosity-permeability distribution
12. Interwell-scale heterogeneity

This presentation will be both challenging and informative. ■

BIOGRAPHICAL SKETCH

Robert (Bob) F. Lindsay hails from Utah, and served in the U.S. Army Special Forces, known by their nick name "The Green Berets." He graduated from Weber State College 1974 with a BSc in Geology; from Brigham Young University 1976 with a MS in Geology; and from the University of Aberdeen Scotland in 2014 earning a PhD in Geology. Lindsay's professional career includes employment at Gulf Oil (1976-85) and Chevron (1985-2001) as a research geologist in production, supervisor of Enhanced Oil Recovery. His other duties included applied research, carbonate petrography, laboratory supervisor, and stratigrapher.

Lindsay worked for Saudi Aramco (2002-2015) as a Geological Specialist, Sr. Geological Consultant (Geological Technical Services Division), carbonate sedimentologist and sequence stratigrapher. He organized many Aramco carbonate field trips and taught graduate level carbonate sedimentology at King Faud University of Petroleum and Minerals (KFUPM). Currently, Lindsay consults as Lindsay Consulting LLC and teaches as Affiliated Professor at Brigham Young University. He consults on Permian Basin oil fields, leads field trips, and teaches graduate level courses.

WELCOME TO NEW MEMBERS, EFFECTIVE JANUARY 2024

Ashna Abraham	Daniel Hughes	Amanda Reynolds
Austin Bruner	Charlie Kergaravat	Muhammad Siddiqui
Yoryenys Del Moro	Jess Kozman	Anthony Zak
Maurice Gilbert	Jerry Okose	

February 2024

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
RESERVATIONS The HGS prefers that you make your reservations online 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, contact the HGS office at OFFICE@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	2	3
4	5	6	7 **NAPE Summit** *George R. Brown* *https://www.hgs.org/civicrm/event/info?id=2471*	8	9	10
11	12 **HGS General Dinner Meeting** *Scholarship Night 2024 with Bob Lindsay* *Page 29* *https://www.hgs.org/civicrm/event/info?id=2474*	13 **Continuing Ed** *Geological Problem-Solving using Biostratigraphy* *Page 15* *https://www.hgs.org/civicrm/event/info?id=2546*	14	15	16	17
18	19	20	21	22 **HGS NeoGeos Happy Hour** *Page 16* *https://www.hgs.org/civicrm/event/info?id=2532*	23	24
25	26	27	28	29		

Make your reservations online at hgs.org

INSTRUCTIONS TO AUTHORS

Materials are due by the first of the month for consideration to appear in the next month's publication. Submissions should be emailed to editor@hgs.org. The Editor reserves the right to reject submissions or defer submissions for future editions.

Text should be submitted as a Word file. Figures or photos may be embedded in the document or submitted separately. The following image formats are accepted: tif, .jpg, .png, .psd, .pdf.

Feature submissions, e.g., Rock Record, should be approximately 600 words. Technical papers should be approximately 2000 words or less (excluding references).

Remembrance

Donald E Owen

1936-2023

Don passed away in Beaumont, Texas on December 30, 2023. He was born in Galveston on November 27, 1936, where he first became acquainted with hurricanes and coastal geologic processes, which provided early inspiration for his interest in geoscience. After graduating at the top of his class at Lamar University in Beaumont, Don earned his MS and PhD degrees at Kansas University. A self-described "fanatical geologist," his passion for science was reflected in his research, teaching and consulting accomplishments.

Don's primary interest was field geology, particularly classical stratigraphy. Those of us who went to the field with him could count on long days spent measuring sections, digging up bentonites, characterizing sediments and describing depositional environments. He did not have time for anything else. Don's outdoor kitchen consisted of a cooler full of diet cokes, a can opener, and a fork.

Don spent the majority of his career as a professor, first with Bowling Green University (14 years), followed by a 37-year tenure at Lamar University, where he retired as Emeritus Professor of Geoscience in 2012. He was a prolific author and editor of over 100 technical papers and guidebooks, many of which focused on the San Juan Basin of northern New Mexico.

When he wasn't teaching field camp, Don spent his summers doing field research, and consulting for petroleum companies in New Mexico. He was known as "Doctor Dakota" for his work in the complex Cretaceous Dakota Formation. His collaboration with petroleum geologists resulted in the first basin-wide resource assessment of the Dakota Formation. That work remains an industry standard for integrating enormous outcrop and subsurface datasets over an entire petroleum system.

Don was active in many professional organizations, including AAPG, SEPM, HGS, NMGS, FCGS, NMBEG, and he was a commissioner with the North American Commission of Stratigraphic Nomenclature. Highly respected by peers and students, Don was a positive influence on multiple generations of students and colleagues, and his enormous contributions to academia, teaching, and the petroleum industry are lasting legacies. ■

Charles Head

HGS Membership Application

Houston Geological Society
14811 St Mary's Lane Suite 250 Houston
TX 77079
Phone: (713) 463-9476
Email: office@hgs.org

Active Membership

In order to qualify for Active Membership you must have a degree in geology or an allied geoscience from an accredited college or university or, 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 5 years. Active Members shall be entitled to vote, stand for election, and serve as an officer in the Society. Active Members pay $36.00 in dues.

Associate Membership

Associate Members do not have a degree in geology or allied geoscience, but are engaged in the application of the earth sciences. Associate Members are not entitled to vote, stand for elections or serve as an officer in the Society. Associate Members pay $36.00 in dues.

Student Membership

Student membership is for full-time students enrolled in geology or an allied geoscience. Student Members are not entitled to vote, stand for elections or serve as an officer in the Society. Student Member dues are currently waived (free) but applications must be filled out to its entirety. Student applicants must provide University Dean or Advisor Name to be approved for membership.

Membership Benefits

Digital HGS Bulletin

The HGS Bulletin is a high-quality journal digitally published monthly by the HGS (with the exception of July and August). The journal provides feature articles, meeting abstracts, and information about upcoming and past events. As a member of the HGS, you'll receive a digital copy of the journal on the HGS website. Membership also comes with access to the online archives,with records dating back to 1958.

Discount prices for meetings and short courses

Throughout the year, the various committees of the HGS organize lunch/dinner meetings centered around technical topics of interest to the diverse membership of the organization. An average of 6 meetings a month is common for the HGS (with the exception of July and August). Short courses on a variety of topics are also planned throughout the year by the Continuing Education Committee. These meetings and courses are fantastic opportunities to keep up with technology, network, and expand your education beyond your own specialty. Prices for these events fluctuate depending on the venue and type of event; however, with membership in the HGS you ensure you will always have the opportunity to get the lowest registration fee available.

Networking

The HGS is a dynamic organization, with a membership diverse in experience, education, and career specialties. As the largest local geological society, the HGS offers unprecedented opportunities to network and grow within the Gulf Coast geological community.

Please fill out this application in its entirety to expedite the approval process to become an Active/Associate member of Houston Geological Society.

Full Name _____ Type *(Choose one)*: Active Associate Student

Current Email *(for digital Bulletin & email newsletter)*_____

Phone _____

Preferred Address for HGS mail_____

This is my home address _____ business address _____

Employer *(required)*_____ Job Title *(required)*_____ Will you volunteer? ____ (Y/N) Committee choice: _____

Annual dues Active & Assoc. for the one year *(July 1st-June 30th)* **$36.00**_____

Student **$0.00**_____

OPTIONAL Scholarship Contributions- Calvert/HGS Foundation-Undergraduate **$5.00**_____

Total remittance_____

Payment:

Check #_____

Credit card: V MC AE Discover

Credit Card#_____

CVV code (req'd): _____ Expiration: _____ (mm/yy)

Signature: _____ Date: _____

To the Executive Board: I hereby apply for membership in the Houston Geological Society and pledge to abide by its Constitution & Bylaws.

Company*(required, mark 'in transition' if unemployed)*_____

Company Address _____

City *(Work)* _____ **State** *(Work)* _____ **Postal Code** *(Work)* _____

School *(required)*_____

Major *(required)*_____ **Degree** *(required)*_____

Year Graduated _____

School *(optional)*_____

Major *(optional)*_____ **Degree** *(optional)*_____

Year Graduated _____

Years Work Experience *(required)*_____

Please submit a brief statement regarding your work experience in the practice or application of earth science or an allied science.

AAPG Member Number _____ OR

HGS Sponsor's Name _____

Signature: _____ **Date:**_____

Professional Directory

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