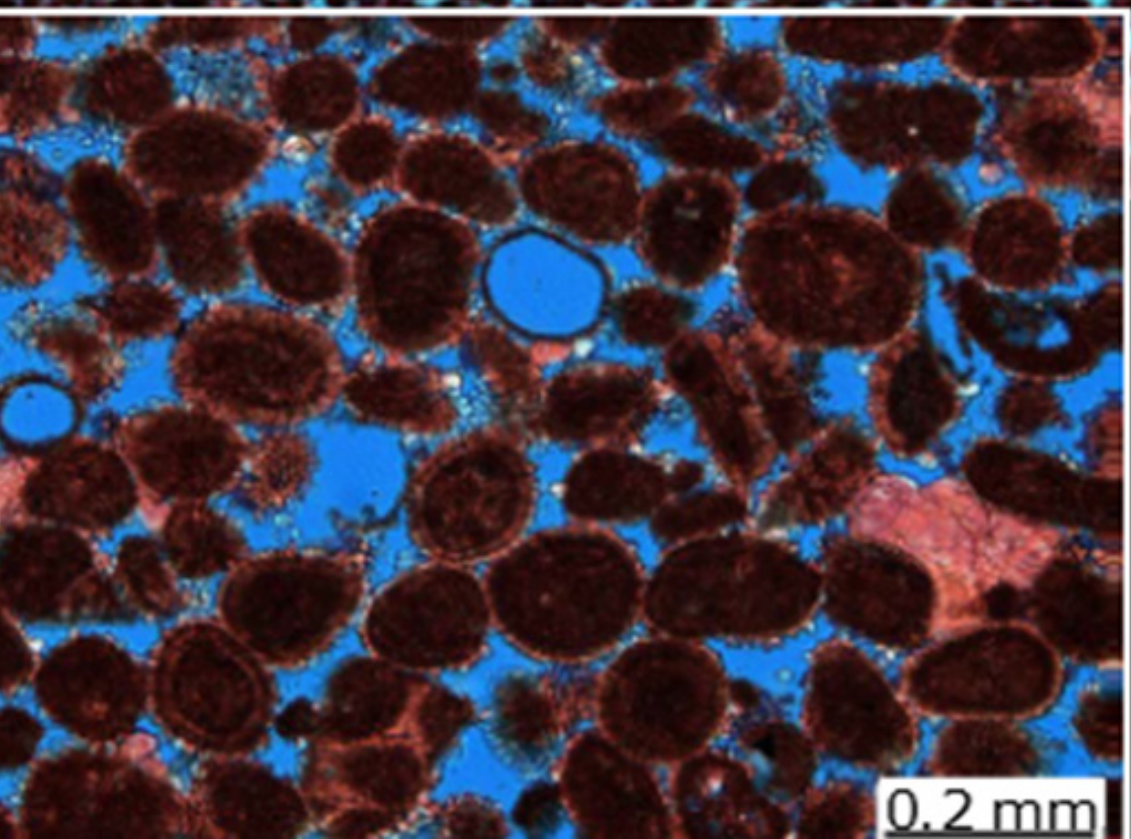
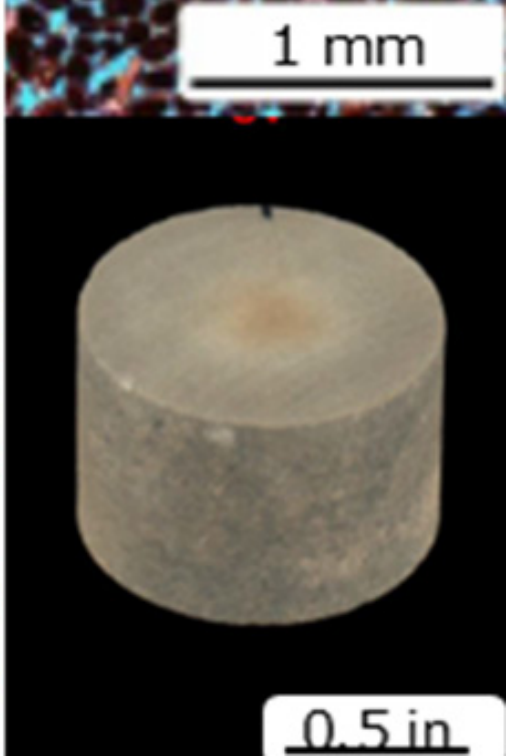
HGS Bulletin

Volume 67, Number 3

Houston Geological Society

NOVEMBER 2024





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In Every Issue

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About the Cover: The cover photo is a thin section (two magnifications) taken from 20,023ft in the Raptor original hole (Anadarko 535#1) showing the peloids and oolite grains with the porosity field in blue. The sidewall core is shown in the lower right. (photo is publicly released data available from BOEM)

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Penny Patterson, HGS President 2024-25
pennyp70@att.net

HGS Is a Resource Organization

HGS is committed to being a "resource organization" for its members and the greater Houston-area geoscience community. As a resource organization, HGS is dedicated to promoting the advancement and integrity of our diverse and far-reaching disciplines in the field of geoscience and providing a variety of networking opportunities for the exchange of informative and innovative technologies, leading-edge research developments, and training for the enhancement of skill sets for our geoscience community. In short, HGS strives to be the "go-to" organization for our geoscientists, from our youngest pre-teen explorers to our more seasoned adventurers!

There are numerous opportunities within the HGS organization to access, engage, and network with fellow Houston-area geoscientists. A quick look at HGS's website and calendar shows how diverse the resource base is available to our geoscience community. I have assembled HGS's diverse resource opportunities into five categories in this newsletter, specifically listing upcoming events. Check out our full year's calendar to see more.

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1. TECHNICAL EXCELLENCE AND NETWORKING

Several HGS-hosted events are incorporated in this category, including **HGS Dinner and Luncheon Meetings**, **New Energies Meetings**, and **Engineering and Environmental Meetings**. All these meetings host invited speakers to give informative presentations on current and ongoing science subjects. For example, on **November 11, 2024, HGS will host the University of Houston Sheriff Lecture**. This HGS Dinner Meeting is a special event in which HGS and the University of Houston join together to showcase poster sessions of graduate student's research, in addition to a highly informative presentation by Dr. Lesli Wood, who will speak on "Seismic Geomorphology of Ancient Earthscapes - Strengthening our Perspectives of Deep Time and Clarifying Our Role in the World's Future."

2. CAREER DEVELOPMENT AND GEOSCIENCE ADVANCEMENT

In our evolving and ever-growing discipline of geoscience, career development, and geoscience advancement are critical for our geoscientists to remain at the leading edge of technology and research. This category includes seminars, continuing education courses, and field trips.

On November 14, 2024, GHS and HGS are co-hosting a one-day seminar, "Integrated Geoscience Case Studies: "Lessons from Missed Opportunities and Surprise Successes." This seminar will provide valuable insights, including trials and tribulations that arise in oil and gas exploration. Charles Sternbach, the seminar co-chair, invites us to "… learn from success and failure, postmortem dry hole analysis, multiple conjugate margin development models, seismic imaging improvements, seismic interpretation integration, structural restorations, petroleum systems analysis, meaningful shortcuts, and more." This will certainly be an exciting, "must-attend" seminar.

The Continuing Education Committee has several courses scheduled for this year. **On November 7, 2024, HGS will host the short course "Mastering the Modern Job Search: From CV to Social Media".** Attendees will receive 1.5 credit hours for attending this course.

June 1-8, 2025, HGS and Hatch River Expeditions are organizing a Grand Canyon rafting trip down the Colorado River. Rafting down the Colorado River through the Grand Canyon is a "must-do" adventure of a lifetime and a fantastic opportunity to refresh your outcrop observational expertise and, at the same time, enjoy the dynamic processes of the river as it carves its way through the Colorado Plateau region. Please see the article in this HGS Bulletin for more information.

3. PRE-TEEN THROUGH EARLY-CAREER GEOSCIENCE DEVELOPMENT AND NETWORKING

HGS is dedicated to assisting our pre-teen geoscientists and our early career geoscientists. HGS members volunteer in several educational outreach programs for our pre-teen scientists, including **Earth Science Week** and the **Science and Engineering Fair of Houston (SEFH)**. For our early career geoscientists, HGS

From the President *continued on page 12*

Ted Godo, HGS editor 2024-25
editor@hgs.org

Rockhounding, What to do with Them after Collecting

Greetings, fellow rockhounds. If you are like me, you might not recall all the cool-looking rocks you have accumulated over the years. Perhaps, like in my case, they are stored in boxes in your garage and attic. Sometimes, it takes a big event to cause one to look for or stumble upon them and then think again about what to do with them. Particularly if you must sort through everything in the home and move as we did after the Harvey (2017) flood. Our Houston house was gutted and rebuilt, sold, and we moved to a hill in Huntsville to avoid future floods. But what about the rocks I had in Houston? Well, those rocks in cardboard boxes that weren't flooded were put in the pickup truck and moved into the attic of the new house. Other cardboard boxes that fell apart in the water and the rocks were then repacked in fresh boxes and moved. Why did I do that? I blamed it on the brain fog created by the flooding turmoil, but now these treasures are still with me. My brain fog is gone, and yet I still haven't decided what to do with them while continuing to collect! The two feature articles in this issue discuss rockhounding and what you might do with the rocks after you bring them home. The Houston Gem and Mineral Society is where you can donate the rocks to have them find a new home, or you can cut, polish, and otherwise expose the rock/minerals' true beauty.

…two feature articles in this issue discuss rockhounding and what to do with them after you bring them home.

On a different subject, being the editor of your *Bulletin* presents an exciting challenge, such as increasing the quality of the *Bulletin* by offering a wide range of technical and feature articles. Our current team has set that as one of our goals for the year. This goal can continue to be emphasized as we steadily increase the *Bulletin*'s quality and quantity of articles. For each month's issue, I consider at least one technical article and a feature article to be a minimum. But who wants to meet the minimum monthly requirement when we have so many potential articles from many members that might contribute? So, if you have or know of someone who might write even a short, 1500+ word article, please let me know, or anyone on the board, a director, or a subcommittee person, and have it forwarded to me. We want one of the *Bulletins* (December-January?) dedicated to international articles. We do not have any, but we are networking to make it happen. Many recently retired staff members may have time to give back to their industry. The HGS team would appreciate it even if we can only feature a dry hole analysis sporadically; it would always be an open column to submit an article.

We have been considering adding a recurring theme section to the *Bulletin* titled the "Dry Hole Corner." If we get enough submissions, this themed section could be featured monthly or quarterly. It will present a detailed dry hole analysis from a well. The purpose is to share valuable learnings, including a pre-well prognosis and post-drill findings. These learnings obviously would be for the betterment of all HGS members. This section will keep you informed and engaged, enhancing your understanding of the whys, the how, and the results of an exploration or development well. Following a similar concept, HGS, in partnership with GSH (Geophysical Society of Houston), is offering a one-day symposium on case studies on November 14 at the Norris Center.

This "Case Study Academy" will have four themed sessions titled

- Practical Paths to Informed Decisions
- Look Back Studies and New Ideas in Mature Areas
- Petroleum Systems Fundamental
- Geophysics in Play-Based Portfolios

The speakers at the "Case Study Academy "are well-known, experienced professionals in the industry. Check out the two-page ad in this issue and on social media. Attend and hear talks and experience interactive discussion periods, class exercises, and a lunchtime talk, with plenty of time saved for networking with peers. This is a unique opportunity to engage with industry experts and fellow members, enhancing your understanding and expanding your network.

Lastly, the popular annual clay shoot tournament will be held on November 22 on Pattison Road in Katy. This event is always a highly attended and enjoyable experience, featuring gun raffles, door prizes, Lunch and Drinks, and more. Check out this ad also in this issue. We look forward to seeing you there for a day of fun and camaraderie. ■

GEOGULF2025

NACOGDOCHES

6-8 APRIL 2025

Open call for abstracts

Open Sept 1 - Dec 1

Sessions Include:

- *Gulf Coast Geology*
- *Seismic Applications*
- *Salt Studies*
- *Lithium and Critical Minerals*
- *Haynesville, Eagle Ford & Other Shale Plays*
- *Deepwater GOM*
- *CCUS*
- *Geothermal*
- *Special Session: East Texas Basin*
- *ML, AI & Data Analysis*
- *And more*

For more information visit:

www.geogulf2025.org

Or email

Kurt.Ley@kingwoodexploration.com

Hosted by:

GSH/HGS Integrated Case Studies: Lessons from Missed Opportunities and Surprise Successes

1-day Program
Thursday, November 14, 2024, 816 Town & Country Blvd. Ste. 210, Houston, TX 77024

"Case Study Academy"

Co-Chaired by Katya Casey (GSH) and Charles Sternbach (HGS)

Morning Schedule

Networking Breakfast 7:00-7:45 am

Session 1 "Practical Paths to Informed Decisions"

- ❑ **Integration as a Key Exploration Practice-Case Studies of Missed Opportunity and Surprise Success** Jeff Lund, Portfolio Exploration LLC
- ❑ **The DHI, the "Miss," and the Discovery-Shwe Gas Complex Offshore Myanmar** Steve Cossey, Cossey & Assoc., David Kim, Total Energies
- ❑ **The Giant Appomattox Discovery-- An Overnight Success, 10+ Years in the Making!** Ted Godo, retired from Shell and Murphy Oil

Session 2 "Look Back Studies and New Ideas In Mature Areas"

- ❑ **Reducing Reservoir Image Uncertainty with Multiple Working Models.** Juan Francisco Arminio, U3 Explore Value Network
- ❑ **Can We Find New Discoveries in Proven Basins? Linking Geologic Thinking and Business Results** Brian Frost, retired, Anadarko.

Event Includes Luncheon and Two Networking Breaks, Plus Interactive Discussions led by Mike Forrest (retired, Shell), Charles Sternbach, Star Creek Energy, Brian Horn, Next Era, President-Elect AAPG, and Joe Reilly (retired Exxon) President-Elect SEG with Presidential Comments from Mihai Popovich GSH, and Penny Patterson, HGS

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OR the GSH site (www.gshtx.org)
To become a sponsor, contact office@hgs.org or office@gshtx.org

REGISTER ONLINE NOW:

Member Price	$275
Non-Member Price	$325
Geoscience Student	$150

Join or Renew @ HGS or GSH

HGS/GSH Integrated Case Studies: Lessons from Missed Opportunities and Surprise Successes
Nov 14, 2024, Norris Center, Houston

Afternoon Schedule

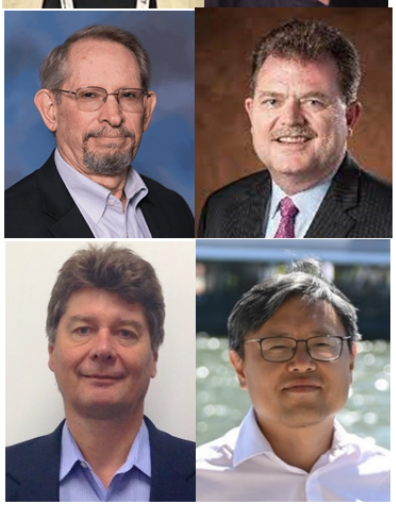
***Special Luncheon Presentation,* Jeff Nealon, Geophysics Manager, Chevron**
Advancing the Frontiers of Imaging for Exploration: GOM to the Globe

Session 3 "Petroleum System Fundamentals"

- ❑ **Plate Tectonics Controls on Continental Margins and their Differences in Petroleum System Development** Katya Casey, U3 Explore and Catie Donohue, Murphy Oil
- ❑ **Paradigm Busting- Combining Regional Seismic Data, Source Rock Observations, and Creativity to Define New Super Basins** Karyna Rodriguez, Searcher
- ❑ **Reducing Risk in Exploration Portfolios Exploration Portfolio Analysis: Lumping, Splitting, and Heuristic Pitfalls** Kevin Schofield, GEOadvisors, U3 Explore Value Network
- ❑ **Key Elements to Oil Exploration Prospect Risking – Personal Lessons From the Dark Side** Mark Shann, Westlawn

Session 4 "Geophysics in Play-Based Portfolios"

- ❑ **Accurate DHI Evaluation Requires Accurate Geological Evaluation** Rocky Roden and Henry S. Pettingill, Rose DHI Consortium
- ❑ **Ocean Bottom Nodes Acquisition Empowers Full Waveform Inversion** Denes Vigh, Schlumberger
- ❑ **Full Wavefield Inversion Case Studies on Earth Property Estimation and Subsurface Characterization** Young Ho Cha, ExxonMobil.



End-of-Day Networking Reception:
Food and Beverage 5:30 to 7:30 pm
Continuing Education Credits- 8 hrs

Welcome to the first *Case Study Academy*
"Academy: a society or institution of distinguished scholars, artists, or scientists aiming to promote and maintain standards in their field."

We Are The HGS

Gillian Fisher , HGS member since September 2024

Gillian Fisher has been employed at Exxon/Mobil for six years after graduating from BYU-Idaho (BYUI) with her Bachelor's in Geology in 2018. Most of her time at ExxonMobil has been spent in frontier exploration, predominantly in West Africa. More about this later. Gillian was born in Layton, Utah. However, growing up, her family moved around, and she lived in several locations in North America, such as Minnesota, Ontario, CA; Alberta, CA; British Columbia, CA; Washington and Arizona. She attended high school in Arizona, and after graduation, she moved to Idaho to attend college. She remarked that living in Houston and working at ExxonMobil is the longest time she has lived in any single location.

she wanted to join a group that was "geology focused."

Gillian said she grew up living in many beautiful places with great outdoor recreation. During her youth, she often hiked with her family and gained an appreciation and love of the outdoors. In high school, Gillian had a "really great" biology teacher who inspired her interest in pursuing a science field. She enrolled at BYUI and began to pursue a biology major. While there, she thought that to get a more well-rounded science degree, she would also take a geology course. As part of the geology course, Gillian went on a 4-day field trip through

We Are The HGS *continued on page 11*

Ben Geaghan, HGS member since September 2024

Ben Geaghan started his professional career with Schlumberger, now SLB, in 2008. Ben hails from London, England. Growing up, he was passionate about sports, especially soccer and rugby. He is a big Arsenal fan! His father worked as a roughneck in the UK North Sea, and as Ben said, his father's experiences undoubtedly influenced his path into geosciences. However, his natural interest in geology was probably in his DNA. As Ben said, "the awe-inspiring scale of geological systems ignited my interest in geology across time and space." As he delved deeper into the subject, he found the "exposures" in field trips particularly rewarding. Experiencing geologic exposures enabled Ben to "apply theoretical concepts to real-world geological formations." This was both humbling and enlightening for him. Ben chose to attend the University of Leeds because of its strong emphasis on Geophysics and Geology. Another factor in his decision was the school's association with the Russell Group of research-intensive universities. He graduated from the University of Leeds, majoring in Geological and Earth Sciences/Geosciences.

he highlighted the opportunities that HGS offers… as they not only "enrich his knowledge but foster a sense of community"

As Ben moved upward in his SLB experiences, he is currently in a more commercial role. But having a background in geosciences and working his way upward, he truly admires the ambition of the energy industry. Ben described the industry as constantly evolving to solve real-world macro-scale challenging problems every day. His first experience with the HGS came while serving as the Operations

We Are The HGS *continued on page 11*

Juliet Irvin , HGS member since September 2024

Juliet Irvin grew up in High Wycombe, about 30 miles northwest of London. The family took several camping vacations, including visiting caves and other interesting nature sites where geologic features were seen. Neither her parents nor any other family members were geologists or had any inclinations in that direction, but they all loved nature. I asked how she became interested in geology, and she said it was probably from the gift shops at the camping places, where she bought little boxes of rock types to start her own rock collection. That must have been it because, in high school, they offered a physical geology class where she graded out at the top of her class. Starting at around age seven, Juliet developed other interests, such as learning ballet, tap, and folk dancing, which she continued through high school. Her mother also taught her piano, and later, she also learned to play the violin. After high school, Juliet attended college at the University of

To expand my professional network

We Are The HGS *continued on page 11*

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 10

(Gillian Fisher continued from page 10) S. Utah (Monument Valley, Arches, etc.), ending at the Grand Canyon. She remarked, "I had been to many of those places before but had never seen them through a geologist's eyes. I was inspired". After the trip, Gillian was hooked and realized "Geology was a much cooler major than biology. I liked the people in the major, too. The biology major was full of annoying pre-med students, and the Geology major was full of down-to-earth people who liked camping and outdoors. Funny enough, I ended up marrying a pre-med student."

Gillian was awarded the Wheatly Leadership scholarship to attend BYUI. I asked what criteria were used to award this scholarship, and she answered with an inspirational answer. She said, "I honestly can't remember, but I do remember attending a dinner with Mr. Wheatley and other scholarship recipients, and he talked about giving back to others. He emphasized that you could give back at all stages of your life and that you don't have to wait until you've got some magic number of dollars in your bank account to start giving. That has always stuck with me, and I've tried to do my best to find ways to give back (however small) when I felt capable."

At ExxonMobil, Gillian's current assignment is on a technology team. She supports the company's proprietary interpretation technology and investigates new technologies in the industry in which ExxonMobil might bring in-house and further develop. As we all know, large companies have a vast network of in-house experts. This current assignment, however, has allowed Gillian to broaden her connection network as she looks across the industry at new technologies outside the company. When asked about her favorite assignment at Exxon/Mobil, she answered that in 2021 (post-COVID) layoffs, ExxonMobil was in a period with a low exploration budget, and her global frontier group had to examine, even more, their efforts. Her team needed to prioritize, for example, what data to buy, what work they did, and ranking what top plays were to pursue. This allowed her to look globally, gaining a better understanding and appreciation of what makes for the best value propositions. This included assessing both subsurface and above-ground risks. Gillian said she loved exploring, creative thinking, and integrating geologic concepts such as tectonics, stratigraphy, structure, and geochemistry.

When asked why she joined HGS, she explained there were two reasons. The first is that she wanted to join a group that was "geology focused." She said she is part of several other oil and gas groups with a geophysics focus, and while that's not bad, she wanted a more "healthy mix." The second reason she joined was that HGS offered more opportunities to give back, and she is currently looking into that opportunity. Gillian, do we have some ideas for you! Welcome.

(Ben Geaghan continued from page 10) Manager for Mud Logging services at SLB. SLB was experiencing rapid growth in North America at that time, and Ben was heavily involved in student recruitment. The annual HGS Graduate Recruitment event provided him with a fantastic platform to connect with talented students and newcomers to the oil industry. Currently, Ben serves as the Global Sales Manager for Mud Logging at SLB. The expanding growth of the company's Mud Logging value proposition is that being on the rig from spud to TD allows a fuller understanding of what the well is seeing, and their ability is vital to the operator in drilling and completions. With advancements in AI, machine learning, and predictive analysis at SLB, Ben sees the importance of his role in navigating the energy industry's complexities. Back to why he joined the HGS, he highlighted the opportunities that HGS offers, such as insightful talks and social events, as they not only "enrich his knowledge but foster a sense of community" in our industry. At HGS, we welcome Ben into our community. ■

(Juliet Irving continued from page 10) Birmingham, where she continued her geology studies and continued her deepening interest in dance.

At the University of Birmingham, her interest in geology developed into a skill set of integrating various geologic disciplines. Juliet's interest was understanding a basin's full development of sediment types, source rocks, and basin modeling. Upon graduating with a Bachelor of Science, Juliet earned an applied geology Master's degree rather than pursuing a PhD, which focuses more on a geologic specialty. Several colleges were on her list of where she would pursue her Masters, but at the top of the list was Imperial College. Juliet earned funding to attend there and majored in petroleum geoscience, integrated with other fields of geology such as reservoir engineering and economics. If this wasn't enough of a perfect fit, the "cherry on the cake" for Juliet was that they had a dance team on which she could continue her other passion. At Imperial College, she was required to participate and be graded in the Imperial Barrel Award (IBA), founded by the school in 1976, and has grown into a global competition. The IBA competition is the essence of geoscience integration. Imperial College also helps get graduating students into internships with oil companies, and Juliet was offered one at Mobil Oil in 1998. She was subsequently offered a full-time job with Mobil, but only a few months later, the talks on merging with Exxon began. In late 1999, the Exxon/Mobil merger was completed, with a significant portion of staff being let go. Juliet, however, was not and

We Are The HGS *continued on page 12*

From the President continued from page 5

hosts valuable training events and career development networking opportunities that enable them to define their career goals. In that context, in September, HGS hosted the well-attended and highly successful **Student Expo**, which provided networking opportunities with company interviewing for open positions and mentoring sessions on resume improvements. Another successful HGS networking event is the **NeoGeos Meeting,** a monthly social hour held at various locations in the Houston area for our early career geoscientists through our more seasoned geoscientists.

4. COMMUNICATION AND NETWORKING

HGS has three primary communication portals. The **HGS Bulletin** continues to be a key avenue for the exchange of technical advancements as well as critical updates on our geoscience community affairs. **HGS's website** is currently being reviewed for upgrades and enhancements to make it more informative, intuitive, and user-friendly. So, please stay posted! **HGS's Social Media Platforms** are stewarded by our hard-working, versatile, and social network-savvy Communications Committee. You will find up-to-date information on HGS's numerous social portals, including LinkedIn, Facebook, Instagram, YouTube, and X (Twitter).

5. SOCIAL ENGAGEMENTS

HGS hosts a variety of social events. In October, HGS hosted a **Golf tournament**, and on **November 22, 2024, HGS will host a Sporting Clays Shoot Tournament**. But one event that has continued over the years is the springtime **HGS Shrimp Peel**…a testament to HGS's Gulf Coast roots. These are just three of the many HGS-hosted social events. I highly recommend looking at the current HGS calendar!

In closing, HGS is committed to its mission statements of promoting the depth and breadth of geoscience knowledge and awareness and facilitating communication and engagement among all members of our geoscience community. ■

See you at our November events!

WELCOME TO NEW MEMBERS, EFFECTIVE SEPTEMBER 2024

Travis Vick
Erik Scott
Lauren Eberhard
Michael B Johnson
Carole Decalf
James Dodson
Gela Hamilton
Hannah Proffitt
Yueh-Ping Ku
DeMarco DeMarco

STUDENT
Kelly McNair

We Are The HGS continued from page 11

(Juliet Irving continued from page 13) remained at Exxon/Mobil for 23 years until 2021. In that year, with the pandemic in full force, Exxon began reducing staff, and this time, Juliet was offered a package, and she left. However, one year later, Exxon realized they needed Juliet, especially because of her knowledge and skills in risk assessment, volumetrics, and judgments based on cognitive biasing. Exxon contracted her to teach these skill sets globally to Exxon/Mobil employees.

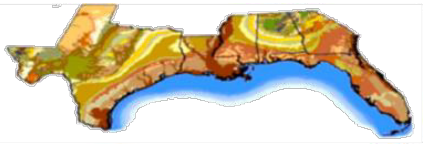
When asked why she joined HGS, she replied immediately, "To expand my professional network." She explained that being at Exxon/Mobil for all those years, she had become a bit lazy with developing an outside network. Juliet's inside network was vast with a company the size of Exxon/Mobil, but after leaving it, she had to build her own. In navigating a different environment from what she was used to, these new contacts have led her to other opportunities. For example, at HGS events, Juliet said several people she had never met introduced her to new and exciting serving opportunities. In closing, we are happy to welcome her into the HGS family along with her many talents and enthusiasm. ■

WORD BRECCIA – A GEOLOGY WORD JUMBLE

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

GAELA __ __ ◯ __ __
LACROA __ __ ◯ ◯ __
DIOO __ __ ◯ __
OYRZABO __ __ __ __ ◯ __ __
NOERIHECMD __ __ __ __ __ __ __ ◯ __ __

Broken Fragments or allochems in a __ __ __ __ N S T __ N __



The GCSSSEPM Foundation

40th Annual Perkins-Rosen Research Conference and Core Workshop

Old Rocks, New Energies

The Energy Transition in the Gulf Coast and Basin

December 2-4, 2024
Equinor US
2107 Citywest Blvd.
Houston, TX 77042

Registration Opening soon at https://sepm.org

Old Rocks, New Energies The Energy Transition the Gulf Coast

PROGRAM

GCSSEPM 40th Annual Perkins-Rosen Research Conference 2–4 December 2024, Houston, Texas

Monday, 2 December

Session I: Plenary Special Session—Chairs: Clare Falcon (LSU), Cindy Yeilding (The Center for Houston's Future)

8.30–9.00am Keynote: Equinor in the energy transition—Sarah Delille* (Equinor)
9.00–9.30 Keynote: TBA—Mark Dean* (Chevron)
9.30–9.55 Gulf of Mexico stratigraphic and structural foundation for the energy transition—John Snedden*

Session IIA: CCUS Regional & Site Evaluation—Chairs: J. Helmich (Equinor), A. İbrahimbaş (Shell)

10.30–11.00 Keynote: From legacy to the future—how vintage seismic is being used to characterize CCS sites with machine learning—Jeni Masi*, Mike Powney, Dan Austin, Theresia Citraningtyas, Monika Dyrendahl, Behzad Alaei, Anastasiia Jacobsen, Sharon Cornelius, Felix Dias, Pete Emmet
11.00–11.25 New energy perspectives for carbon storage along Texas Gulf Coast—A. Fick*, S. Halder,
11.25–11.50 Time-lapse microgravity screening for CCS—Dominik A. Kardell*
1.00–1.25pm CO_2 storage resources of offshore Gulf of Mexico continental shelf—Alex Bump*, I. Faruqi
1.25–1.50 Faulting within and above CO_2 storage interval across the northern Gulf of Mexico shelf—Bryan P. Stephens*, Liepin He, Kevin Trosclair, Cheri Cruz, Erin Elliott
1.50–2.15 Effect of fault geometry and top seal stratigraphy on fault migration of sequestered CO_2 in the Miocene section, offshore Texas—L. Salo-Salgado*, J. Silva, L. Lun, C. Rogers, R. Juanes
2.15–2.40 Enhanced seismic imaging and pore pressure prediction for CCUS in the Gulf of Mexico—Ravi Kumar*, Minshen Wang, Shengda Ding, Mothi Sabaresan, Daniel Carruthers, Paola Fonseca

Session IIb: Modeling and Risking of Carbon Storage & Containment—Chairs: H. Ni (UT), T. Sun (Chevron)

3.15–3.45pm Keynote: Evaluating CO_2 retention risk for geological sequestration sites—J. Steven Davis, Rene Jonk, Kevin Bohacs*
3.45–4.10 Calibrating performance predictions for large-scale injection—C. Okezie, A. Bump*, A. Hovorka
4.10–4.35 Controls on pore-scale properties of mudrocks and their sealing capacity—Hugh Daigle*
4.35–5.00 Modeling CO_2 plume migration and retention with physical analogs—Hailun Ni*
5.00–5.25 Capturing geologically realistic high-resolution reservoir heterogeneity with computational stratigraphy in modeling CO_2 geological storage—Boxiao Li*
5.25–5.50 The impact of capillary heterogeneity trapping on field-scale CO_2 geologic storage simulations—Jose Eduardo Ubillus*, Hailun Ni, Sahar Bahkshian, David DiCarlo, Tip Meckel
6.00–8.00 Icebreaker

Tuesday, 3 December

Session III: Geothermal Energy—Chairs: M. Wright (Rohmtek), M. Ross (UT-Austin, Eavor Technologies)

8.30–9.00am Keynote: Is geothermal energy a viable option for campus/community decarbonization of heating and cooling in the Gulf Coast?—Malcolm Ross*, Andrew Parker
9.00–9.25 Geothermal Play Fairway Analysis (GPFA)—Texas/Gulf Coast mechanisms of heat generation—Kevin McCarthy*, Will Pettitt, Rich Priem
9.25–9.50 Applied petrophysics in geothermal reservoirs: leveraging oil and gas evaluation techniques for energy transition—Katerina Yared*
9.50–10.15 Implications for geothermal energy in the context of a global energy outlook—Richard Chuchla*

Session IV: Critical Minerals—Chairs: Bianca Kennedy (LSU), Rob Bruant (BP)

10.40–11.10 Keynote: Critical mineral potential of the Gulf Coast region—Brent A. Elliott* and J. Richard Kyle
11.10–11.35 Understanding the lithium content trends in the Smackover Formation: potential influencing factors in the Ark-La-Tex region—Julie Bloxson*
11.35–12.00 Data analytics and machine learning workflows for optimization of lithium-rich brine assets. Case study: Smackover Formation, Arkansas—J. Ochoa*, S. Sahoo, S. O'Leary, M . Z

Old Rocks, New Energies The Energy Transition the Gulf Coast

PROGRAM

GCSSEPM 40th Annual Perkins-Rosen Research Conference 2–4 December 2024, Houston, Texas

12.45–1.10pm Exploring for critical metals in Louisiana—Bianca Kennedy*, Matthew Loocke, Clare Falcon
1.10–1.35 Estimating the mass of lithium in Smackover Formation brines using machine learning— Katherine Knierim*, Andrew Masterson, Philip Freeman, Amanda Herzberg, Aaron Jubb, Bonnie McDevitt, Colin Doolan, Jessica Chenault
1.35–2.00 Lithium: a developing industry in ranches of NE Texas and Arkansas—P. Mullin*, D. Daudin, S. Pokrovsky
2.00–2.25 Opportunities for the energy transition in further exploration and exploitation of Gulf Coast salt domes—Matthew Loocke*, Bianca Kennedy, Clare Falcon

Session IIa (continued): CCUS Regional and Site Evaluation—Chairs: Matt Croy (Equinor), Alex Bump (UT-BEG)
2.25–2.50pm Geological characterization of the Chandeleur Sound 3D seismic survey area, offshore Louisiana, and the potential for anthropogenic carbon sequestration within a newly discovered Middle Miocene submarine canyon—Marcie Phillips*, Annie Walker, Dallas Dunlap, John W. Snedden, Michael L. Sweet, Shuvajit Bhattacharya
2.50–3.15 CO_2 storage site screening for depleted fields on the Texas Gulf Coast—an integrated approach—Yijie Zhu*, Sophie Boulter, Tianyu Chen, Marie McKechnie
3.45–4.15 Keynote: CO_2 residence time and geothermal resource potential of the Hosston and Travis Peak Formations, onshore US Gulf Coast region—Laurie A. Burke*
4.15–4.40 Sleipner, Snohvit, Smeaheia, northern lights, and Kalundberg, Norway and Denmark—Michael Schoemann*, Janine Helmich
4.40–5.05 Wedges, bridges, and hockey sticks: exploring the energy transition—Cindy Yeilding

Wednesday, 4 December

Session V: Hydrogen—Chairs: Barry Katz (HGS), Lorena Moscardelli (UT-Austin BEG)
8.30–9.00am Keynote: An overview of hydrogen in the subsurface—Barry J. Katz*
9.00–9.25 The role of salt tectonics in the energy transition: an overview and future challenges—Ol. Duffy, Mi. Hudec, F. Peel, G. Apps, A. Bump, Lorena Moscardelli*, T. Dooley, N, Fernandez, S. Bhattacharya, K. Wisian, M. Shuster
9.25-9.50 The new gold rush—gold hydrogen: why is it important, what do we know and where could it be?—Mike Powney*, Ian Hutchinson, Owain Jackson, Andrew E. Stocks, Andrew C. Barnicoat, Stephen R. Lawrence
9.50–10.15 Keynote: Emerging hydrogen economy in Texas: the role of the subsurface in geological storage—Lorena Moscardelli*, L. Ruiz-Maraggi, N. Lin, N. Schuba, A. Martinez- Doñate, L. Melani, L. Ko, E. R. Calzado, M. Shuster
10.50–11.15 Mississippi salt basin diapirs: considerations for geological hydrogen storage—C. Nur Schuba, Lorena Moscardelli*, L.
11.15–11.40 Hydrogen storage in salt caverns; evaluating the potential of Permian Basin evaporitic sequences for cavern development (USA)—Ander Martinez-Doñate*, Leandro Melani, Leopoldo Ruiz-Maraggi, Lorena Moscardelli
11.40–12.05 Evaluating depleted gas reservoirs for hydrogen storage: a criteria-driven approach—R, Okoroafor*, L. Kumar Sekar, A. Badejo
12.05–12.25 Hydrogen and ammonia projects at Equinor—Stephanie Curran*
1.15–1.40 Determining the favorability of sedimentary lithium accumulation in the geological record: a global approach—David Lee, Amanda Galsworthy, Bill Heins*, Howard Golden
Session VI: Energy Transition Workforce—Chairs: Bianca Kennedy (LSU), Rob Bruant (BP)
1.40–2.05 SEG EVOLVE carbon solutions internship: preparing students for industry—a mentor's perspective—Ryan Ruppert*
2.05–3.15 Panel Discussion: The energy transition: perspectives from the Gulf Basin and global analogs—Moderator: Ayşe İbrahimbaş (Shell), Panelists: TBD

POSTER PRESENTATIONS (listed in alphabetical order)

Determining the favorability of sedimentary lithium accumulation in the geological record: a global approach—David Lee, Amanda Galsworthy, Bill Heins*, Howard Golden
Exploring for critical metals in Louisiana—Bianca Kennedy*, Matthew Loocke, Clare Falcon
Geology for CO_2 is still geology—borehole images for understanding local capillary trapping in reservoirs—A. Kumar, El. Haddad, Adaobi Elekwachi
Opportunities for the energy transition in further exploration and exploitation of Gulf Coast salt domes—Matthew Loocke*, Bianca Kennedy, Clare Falcon
Analyzing critical metal and fluid interactions of a historic subsurface volcanic core drilled from Door Point, LA, US Gulf Coast—Ashlyn Schneida*, Bianca Kennedy, Matthew Loocke
Identification and analysis of reservoir-seal pairs for sequestration of CO2 in the greater Mississippi Embayment, onshore Gulf of Mexico—Robert Wellner*, Kathryn Denommee, Raed El-Awawdeh, Peter Gold

Rockhounds and Treasure Seekers

By Ted Godo

Attention rockhounds and treasure seekers: For about a six-hour drive from Houston, you can find your diamonds for only a $15 admission charge. What is this place, you might ask? The place is called the "Crater of Diamonds" State Park and is near Murfreesboro, Arkansas (**Figure 1**). This park is the only public diamond mine in the world. You can bring or rent useful items such as small gardening tools, shovels, screens, and a bucket. For detailed tips and techniques for finding a diamond, see Howard (2007) or google any of the YouTube videos on the park. The park is 37.5 acres of flat, dry dirt with no vegetation. The park plows or disks the field monthly to help turn over the new material. Diamonds found in the park are one of three colors. In order, they are white, brown, and yellow diamonds. Park staff at the Diamond Discovery Center provide free identification and certification of diamonds.

A recent story about finding diamonds was told by a French tourist named Julien Navas, who stopped by the Crater of Diamonds (google his name and the word diamonds). He visited the park in January 2024, just after an overnight rain. Julian dug around in the morning, but then he stopped and began looking on top of the ground for anything that stood out. After searching for several hours, he found "something that looked like a marble." It was a 7.46-carat diamond. The diamond is yellow, and he named it the Carine Diamond after his fiancée. Navas plans to cut the stone into two diamonds, one for his fiancée and one for his daughter.

Initially, the first diamonds were found in the area in 1906 by the then-landowner, John Huddleson, a pig farmer. From 1906 through 1972, the "Crater of Diamonds" current site was owned and mined by several different people. Over the years, several very large diamonds were found, for example, the pink "Uncle Sam Diamond," found in 1924 at 40.23 carats, and the white "Star of Arkansas," found in 1956 at 15.36 carats. In 1972, the State of Arkansas purchased the land for the Crater of Diamonds for $750,000 to develop the park where you can visit and collect your diamonds today. Every year, people find hundreds of diamonds, with several finding diamonds over 1 carat in weight (**Table 1**).

Geologically, the "Crater of Diamonds" (COD) park is one of a series of eight maar-diatreme volcanoes composed of diamond-bearing lamproite (Howard, 2008; Waldman, 1987) (**Figure 2**). Diamonds occur in only two rock types: kimberlite and lamproite. A maar is a typical hydrovolcanic landform created from the interaction of water and magma. The emplacement of these maars or "pipes" has been dated by mapping the cutting of local stratigraphy to between 113 and 97 million years ago. Based on isotopic data from mica inclusion, the same intrusion narrowed the time window to between 103 and 109 million years ago (Howard, 2008). Paleo reconstruction suggests that the diatreme pipe was likely intruded a short distance offshore of the ocean-land margin (Howard, 2008). The formation of the diamonds was made deep in the earth's mantle a long time ago. The Isotopic age

Rockhounds and Treasure Seekers *continued on page 17*

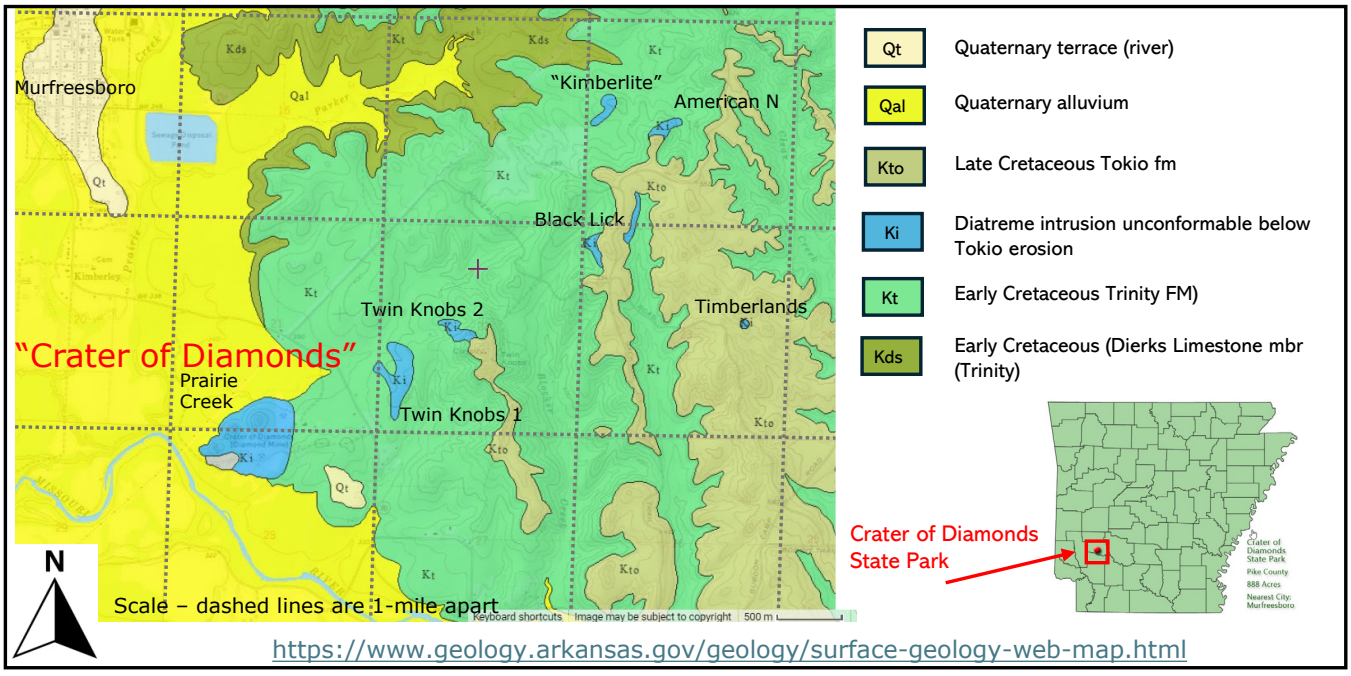
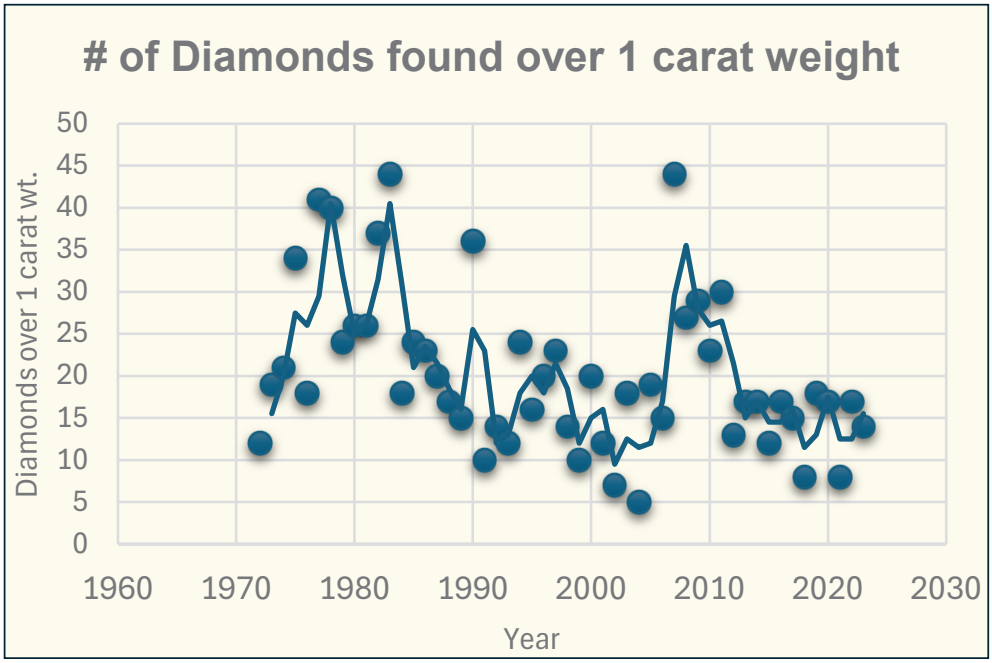


Figure 1 *Surface geologic map of the area around Murfreesboro showing the several Diatreme/Maar types of cretaceous volcanic outcrops (blue). See also Hanson 1998 map.*

Rockhounds and Treasure Seekers continued from page 16

YEAR	TOTAL FOUND	TOTAL CT. WEIGHT	# OVER 1 CARAT	WHITE	BROWN	YELLOW	PAID VISITERS
2003	641	128.37	18	388	136	117	47,864
2004	383	58.72	5	231	90	62	47,373
2005	536	103.43	19	310	137	89	51,852
2006	488	117.51	15	295	106	87	83,576
2007	1,024	252.73	44	698	175	151	171,518
2008	946	192.6	27	662	139	145	136,533
2009	918	182.97	29	651	149	118	123,802
2010	601	131.11	23	434	94	73	119,050
2011	560	149.77	30	347	106	107	106,524
2012	530	95.38	13	299	131	100	100,954
2013	455	96.7	17	232	110	113	115,523
2014	585	121.02	17	346	135	104	144,445
2015	467	99.23	12	287	84	96	168,330
2016	501	96.6	17	339	85	77	161,388
2017	445	103.33	15	299	72	74	182,301
2018	405	77.12	8	282	57	66	124,615
2019	491	99.14	18	336	73	82	138,921
2020	353	81.91	17	269	43	41	129,697
2021	354	62.29	8	248	54	52	201,709
2022	758	117.91	17	509	141	108	162,886
2023	838	130.31	14	608	119	111	159,579
TOTAL	**12279**	**2498.15**	**383**	**8070**	**2236**	**1973**	**2,678,440**



https://www.arkansasstateparks.com/parks/crater-diamonds-state-park/digging-for-diamonds/latest-finds/diamond-statistics

Table 1 *Diamonds found at COD since 2003. Lower chart graphs diamonds over 1 carat found since 1972.*

Rockhounds and Treasure Seekers *continued on page 18*

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dating of mineral inclusions of the diamonds is 3 billion years old (Howard, 2008).

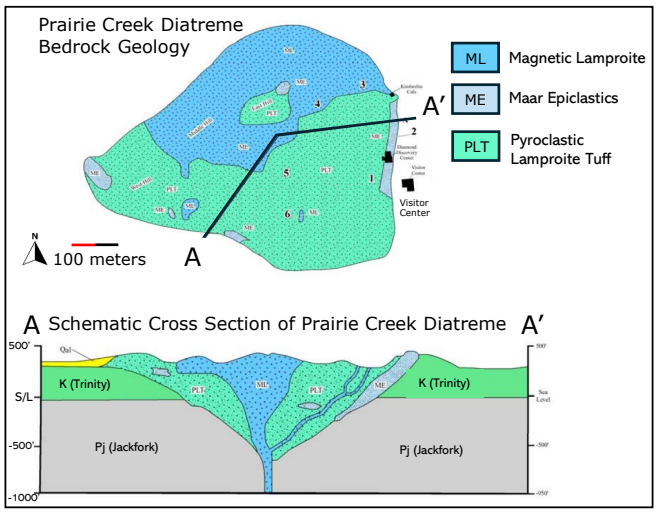

Figure 2 *Surface geologic map of the Prairie Creek Diatreme (aka Crater of Diamonds) and a schematic cross-section. Modified after Howard 2008).*

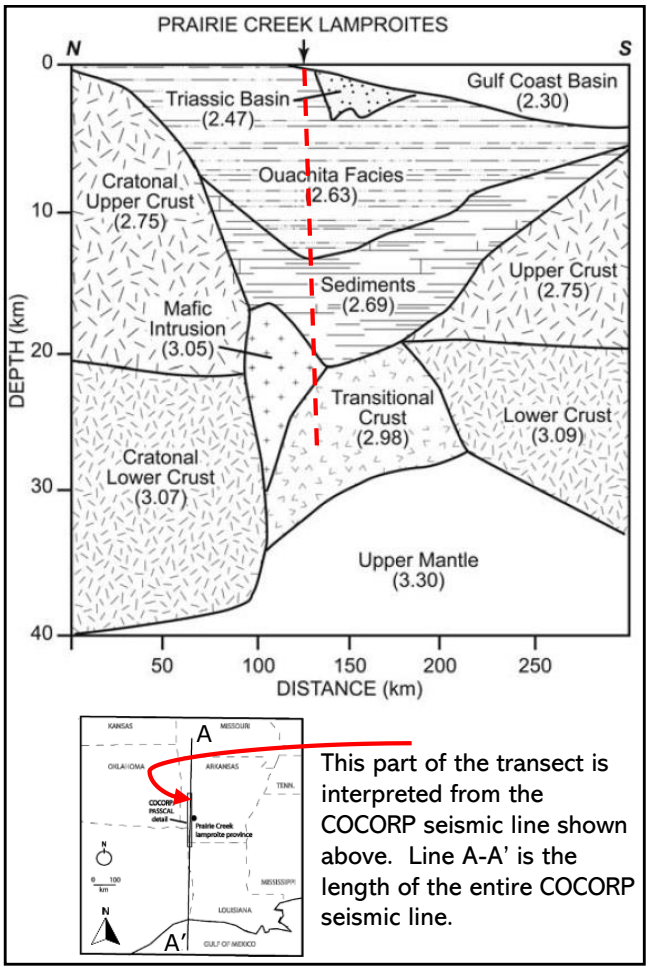

Figure 3 *The cross-section is a detailed portion of the Prairie Creek lamproite (COD). The interpretation is based on the larger view recorded by the COCORP line (Dunn, 2009).*

The magma material of these diatremes started moving out of the earth's mantle a little over 100 million years ago at a speed of 30 to 50 miles per hour, driven by carbon dioxide gas (Howard, 2008). Interpretations have been made of the crust below the Murfreesboro area using a deep recorded 2D seismic line by the Consortium for Continental Reflection Profiling (COCORP) (Lillie, 1983; Nelson, 1982; Mickus & Keller, 1992 and Calignano, 2017). Most deep crustal xenoliths recovered beneath the Prairie Creek province (COD) are likely derived from oceanic transition crust (**Figure 3**) (Dunn, 2009). Ascending from this depth, the magma gathered rock from all zones above, gathering speed as it passed. As it reached the upper crust, the speed grew to 150 miles per hour (Howard, 2008). As the magma came near the earth's surface, likely under a shallow ocean, the gas and water pressure overcame the sedimentary rock, causing a diatreme or maar-like explosion (Howard, 2008).

When it approached the earth's surface, about 850 feet below the ground, the gas' pressure overcame the weight of the overlying sedimentary rock, and an explosion occurred. The expanding gas rapidly cooled the mass near shallow depths, resulting in an explosive volcano or maar/diatreme.

Lamproite is the volcanic material that erupted from the park's diamond-bearing pipe. Many people assume that diamonds are found in Kimberlites, mainly because of the publicity of the South African Kimberlite diamond district. The prolific kimberlite pipes in South Africa were named after the proximity of the town of Kimberley. Kimberlite is an ultrabasic rock with olivine greater than 35% and other minerals like mica, serpentine, and calcite but no quartz or feldspar. Kimberlites are not always diamond-bearing. Interestingly, your average kimberlite is more likely not to have diamonds and even fewer with commercial quality. Four types of lamproite can be found at the park today, but not all are diamond-bearing.

The Lamproite maar/diatreme volcano of the Crater of Diamonds (aka Prairie Creek) consists of four rock types; magmatic lamproite (with mantle and crust-derived xenoliths); marr epiclastics (primarily sandstone); lamproite lapilli tuff (phlogopite-rich); and lamproite breccia tuff.

Breccia tuff is the most common type of lamproite found throughout the search area. This material appeared during the first explosive eruption and brought up diamonds. The dark brown to black rock has abundant yellowish concentrations of weathered olivine. Lamproite breccia tuff erodes quickly and is responsible for most diamonds found at the park.

Lapilli tuff is a second type of lamproite. Lamproite lapilli tuff formed from fused volcanic ash and dust during the first eruption.

Rockhounds and Treasure Seekers continued on page 19

 continued from page 18

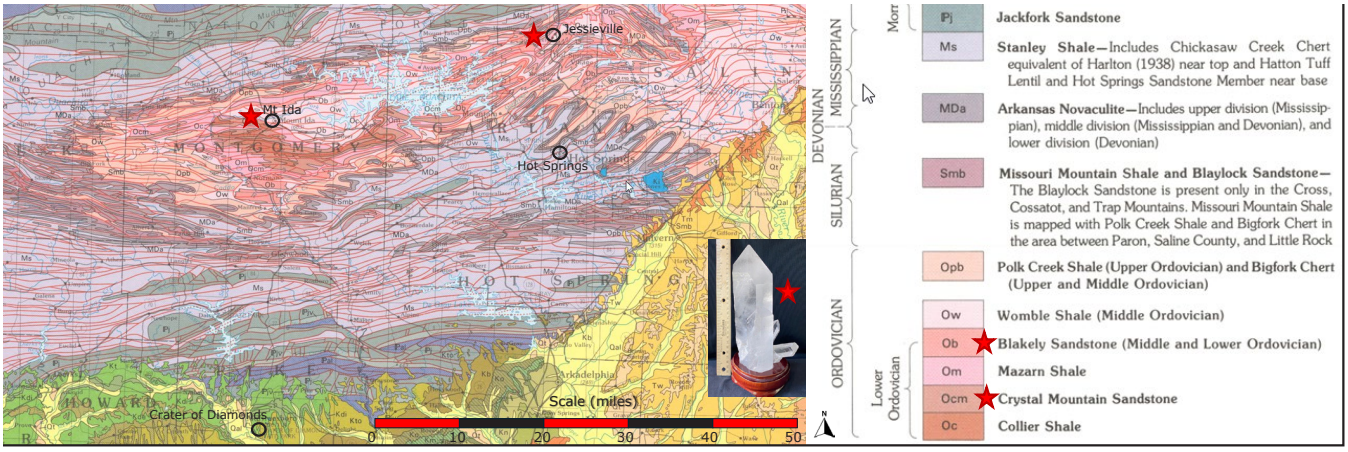

Figure 4 *Surface Geologic Map of a portion of the Arkansas Ouachita Mountains. Highlighted cities are circled. Red stars indicate the formations with quartz crystal shops and mines.*

It has a golden metallic luster due to the phlogopite (magnesium-rich) mica. This type of lamproite is also diamond-bearing, though somewhat less common than breccia tuff.

Magmatic lamproite, with mantle and crust-derived xenoliths. Magmatic lamproite is not believed to contain diamonds. This material erupted slower than breccia tuff, vaporizing most of the diamonds within it. Mantle xenoliths include approximately 40 polymineralic mantle xenoliths consisting of eclogite, garnet websterite, wehrlite, harzburgite, spinel lherzolite, garnet/spinel lherzolite and garnet lherzolite (Dunn, 2002). Crustal xenoliths (shallow derived) are comprised of sedimentary rocks from the Cretaceous and Paleozoic. Deeper derived crustal xenoliths are igneous and metamorphic, with most of their composition being amphibolite.

What about trying something other than sifting dirt in an open field looking for diamonds? The Ouachita Mountains start north of the Crater of Diamonds (COD) after only a 20-minute drive. Mt Ida is further north in the heart of the famous quartz crystal area (about an hour's drive from the COD) (**Figure 4**). Geologists say Arkansas and Brazil have the best quality quartz crystals on Earth. Whether you are interested in "digging for your own" crystals in the many open pit mines or buying perfectly cleaned crystals in rock shops, visit the area between Jessieville and Mount Ida, Arkansas. At least ten mines in the area charge $10 to $20 to find your crystals. You can even find Arkansas quartz crystals on display in the Smithsonian. The Berns Quartz is a 2016 addition. The Berns Quartz is a stunning slab of quartz crystal weighing over 8,000 pounds and is seven feet tall. It was found in the Coleman Mine in Jessieville, Arkansas. The mine offers public digging in the fresh tailing from the mine, where you can find your crystals. They also provide open pit mine tours that involve riding down on old Army transport trucks. Most of the collectible quartz crystals are found in the Ordovician-aged Blakley and Crystal Mountain Sandstones.

Arkansas quartz crystals were greatly needed during WWII, as electronic-grade quartz was critical in radios, radar, chronometers, and other instruments. Electronic-grade quartz was designated a strategic material. At that time, Brazil was the only source of electronic-grade quartz, but when German U-boats threatened Brazil's maritime supply, the US found that the Arkansas quartz crystals were of the same quality. Mineralogically speaking, most of the quartz crystals are twinned. Twinning can be described as defects in the atomic lattice of the quartz, but more descriptively, it is when two or more crystals of the same mineral grow together symmetrically. Quartz vibrates at a specific frequency when electricity is introduced, so the rarer, untwinned quartz crystals are cut into thin wafers to make electronic components.

What geologic conditions existed to create such a rich concentration of quartz crystal? To fully answer this question is beyond the scope of this feature article. I can summarize a few things as someone who worked in the Ouachita's for five years and drilled my first three dry holes for Shell Oil. The Ouachita Mountains in Oklahoma and Arkansas are a small outcropping exposure of the compressional belt forming the Appalachians and extending to the West Texas Marathon Mountains. This compression resulted from the closing of the Iapetus Ocean in the Permian time. The central core uplifted area of the Ouachita Mountains exposes the oldest Paleozoic rocks from the Cambrian (Collier limestone) to the Devonian/Mississippian (Arkansas Novaculite formation). This core area is deformed by folding and faulting and has open fractures up to 60 feet wide, lined and filled with quartz crystals. Silica-rich hydrothermal waters circulated upward into the open fractures and deposited the quartz. Thermal maturities are very high, and contours of equal maturity cut obliquely across structural grain and strata on opposite sides of faults. (**Figure 5**). This suggests a second pulse of thermal maturity after structural emplacement (Denison, 1977; Houseknecht, 1985; Keller, 1985; Godo, 2011a,b, 2014a,b).

Rockhounds and Treasure Seekers continued on page 20

Rockhounds and Treasure Seekers continued from page 19

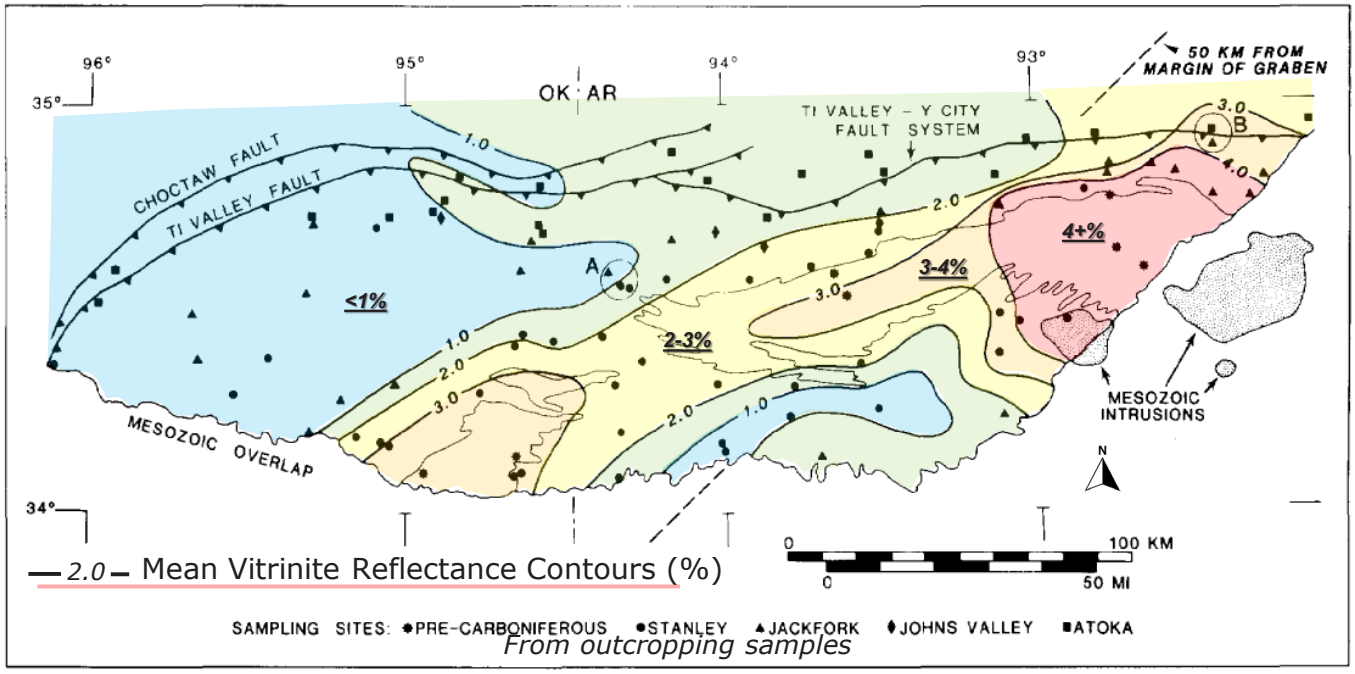

Figure 5 *Map of thermal maturity of the exposed strat, Ouchita Mountains (after Houseknecht 1985)*

The third rock type, unique to Arkansas and easily found, is the Devonian /Mississippian-aged Arkansas Novaculite. Novaculite is a metamorphic rock initially chert (Spry, 1969). The equivalent "shelf formation" in the Arkoma basin to the north is the Boone/ Penters chert/Chattanooga shale. Chert is an amorphous silica with no crystal definition, but with increasing thermal maturity, the silica recrystallizes into polygonal triple-point, euhedral quartz 100 microns or more in diameter (Keller, 1985). The greater the heating, the larger the crystal sizes. Novaculite in Latin means "razor stone". Novaculite is used commercially for whetstones and has different grades depending on the sharpness or crystal size.

This formation is named for quarries produced under the trade name "Arkansas Novaculite" (McFarland, 2004). This formation has no official type locality, but Scholes (1977) provides probably the most referenced section of Arkansas Novaculite as it is exposed along a road cut on Highway 27 adjacent to the Caddo River near Caddo, Arkansas (Zimmerman, 1984). Two wells have penetrated the Arkansas Novaculite in the subsurface. The stratigraphic test well Shell #1 International Paper in Hot Springs County and Prospect Rattler (Shell #1 Arivett) located in Pike County (Godo, 2011a, b, 2014a,b). In prospect, Rattler, the objective, was the upper member of the formation, which has a tripolite chert/novaculite member. The upper member of the Arkansas formation is unsuitable for its whetstone characteristic because it was deposited as chert but also had an influx of carbonate debris eroded from the coeval shelf margin. Carbonate is commonly leached out, leaving a porous silica member. The lower member is much thicker and has whetstone characteristics. The middle member of the formation is black shale, rich in organic matter. It is the equivalent of the Woodford shale source rock on the coeval shelf (**Figure 6**).

Finding your collectible showpiece(s) of Arkansas Novaculite can be an excellent addition to your display. Colors are generally white to cream and gray, but there are also shades of pink to red and tan to brown. Also somewhat common are terrigenous and calcareous varves with aeolian grains in the novaculite (Lowe, 1976, 1977), making these samples even more interesting when cutting a slabbed face. Make sure you read the other feature in this article on how you might use the Houston Gem and Mineral Society lab to make this happen.

Finally, over 300 collectible minerals are in the Arkansas Ouachita Mountains. Ten of these minerals were first found there and detailed in their type sections. Some of these minerals are associated with several small igneous rocks; there are intrusive igneous rocks such as Magnet Cove (Hot Spring County), Granite Mountain (its syenite) in Pulaski County, Potash Sulfur Springs in Garland County, and the Prairie Creek pipe (Crater of Diamonds) in Pike County. Cinnabar and manganese are other minerals with tailing piles outside the mine shafts. Several good rock and mineral collecting books provide detailed maps of specific sites. The home page of the Arkansas Office of the State Geologist gives an additional overview of the rocks and minerals. Happy Hunting! ■

Rockhounds and Treasure Seekers *continued on page 21*

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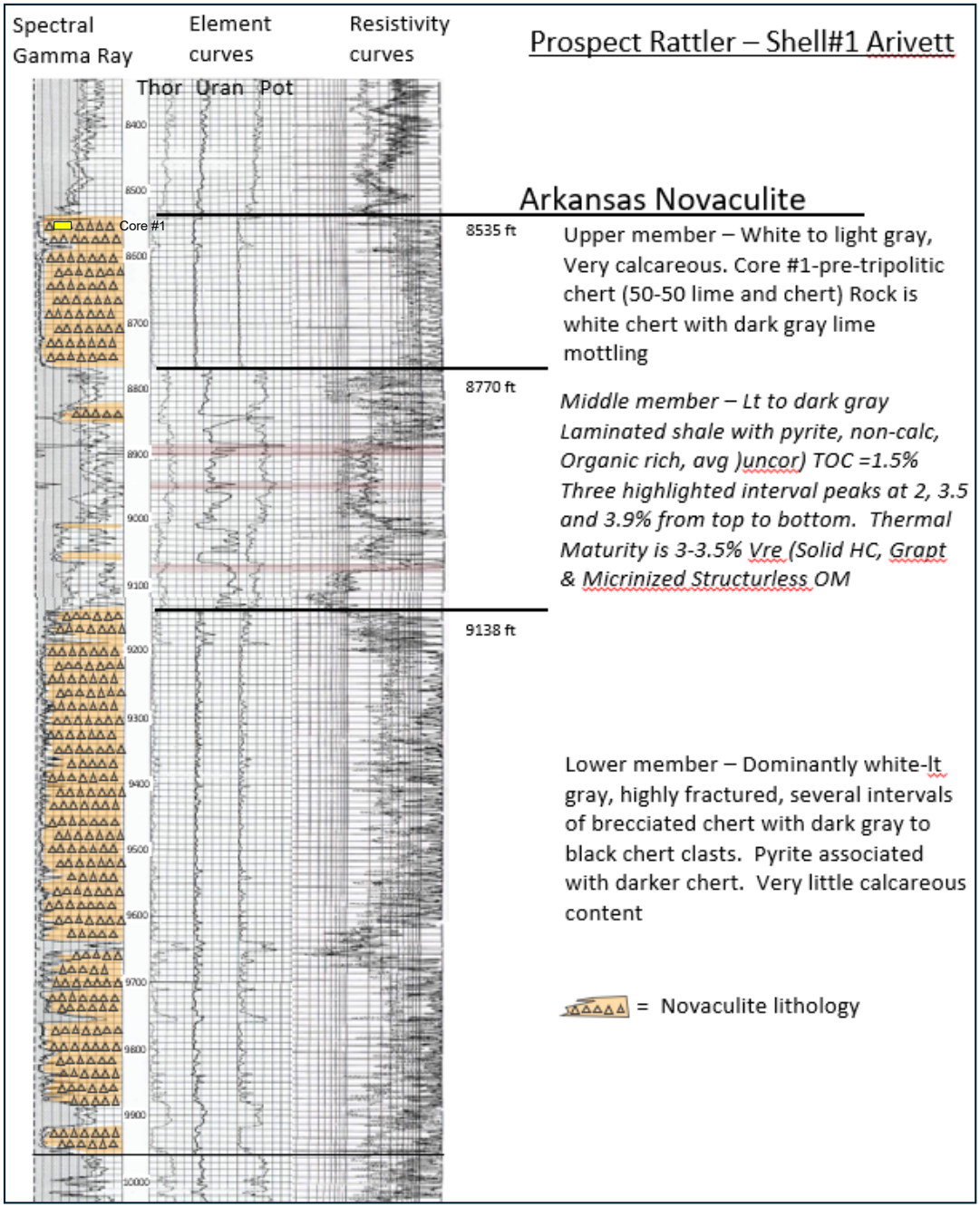

Figure 6 *Subsurface well log of the Arkansas Novaculite from the Shell-#1Arivett well (Prospect Rattler). The upper member found tripolotic novaculite, the organic-rich middle shale, and the thicker lower member of dense and fracture-filled novaculite.*

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Good video on Diamonds

https://www.google.com/search?q=crater+of+diamonds+creen+washing&rlz=1C1CHBF_enUS964US964&oq=crater+of+diamonds+creen+washing&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRifBdIBCTkwMTJqMGoxNagCCLACAQ&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:ba87ef58,vid:y3-Fnqt2_4M,st:0

Houston Gem and Mineral Society

By Ted Godo

Do you know about the Houston Gem and Mineral Society (HGMS)? It is an incredible organization for adults and children to learn about geology, paleontology, and mineralogy (https://hgms.org). It offers many "hands-on" experiences, such as silversmithing/lapidary craft making, faceting gemstones, and beading to make jewelry, even rings and other items. Of course, as geologists, we also can't resist collecting rocks on family vacation trips (Arkansas Ouachita's?-see this issue) or other opportunities to be "in the field." But what do we do with these treasures after bringing them home? Do we put them in a box in the garage and try to display them on a nice shelf or stand, only to discover that the ragged edges scratch the furniture? Why not slice, cut, and polish the rock or mineral to make it "pop" on your display? You can use any rock saws and polishers to make it happen at the HGMS facility near the intersection of Beltway 8 and the Southwest Freeway. The newly renovated rock shop/lab was completed in September 2023. But suppose you would instead want to donate your treasures of rocks and minerals or used rock tools and other lapidary materials. In that case, you can bring them to the shop and receive a tax donation credit while helping others find a home for your material. The society also periodically "auctions off" rocks and minerals. HGMS is a tax-exempt educational organization [501(c)3].

The Houston Gem and Mineral Society has a rich history that dates back to late 1948 when it was founded as the Houston Rock and Lapidary Club. Over the years, the club has evolved and expanded its membership and mission, always staying true to its objectives. In the late 1960s, the club began publishing its "Backbenders Gazette" bulletin, a tradition that continues today. Its objectives are clear: "to promote the advancement of the knowledge and practice of the arts and sciences associated with the collecting of rocks, minerals, fossils, artifacts, and their identification and classification; the general lapidary art; the collecting and identification of gemstones; the designing and execution of jewelry or metalcraft; and to provide the opportunity to obtain, exchange, and exhibit specimens and rough or finished materials." This sense of community involvement makes HGMS more than just a society; it is a family of like-minded individuals.

At HGMS, your children can get excited about rocks, but it's not just fun; it's also an excellent chance to expose them to nature and outdoor activities. They can even help your child earn their scout geology merit badge. And for those interested in higher education, HGMS offers college scholarships. This year, the $2500 award went to three deserving students in the Houston region. In addition, this year, HGMS received a generous donation that enabled the society to assist two more students with a supplemental $1000 award. One of the things the club is most proud of in its educational goals is making and providing earth science teaching sets for schools. HGMS members give talks at schools and can leave a collection of rocks, minerals, or fossils with the teacher to use in the classroom.

The premier event for HGMS is the Annual Gem, Mineral, Jewelry, and Fossil Show, the largest of its type in Texas. This three-day show is held each year on the second weekend of November at the Humble Civic Center, 8233 Will Clayton Parkway, Humble, Texas 77338. The annual show has 140 slots that need staffing over the three days. This month, the dates are November 8th, 9th, and 10th. At the show, there are things like the Youth Education booth, where educational games are played, such as teaching rock identification for K-12. Also featured is a Dino Dig, where kids sift sand for fossil treasures. The merit badge session is coached for scouts, and a fluorescent booth shows rocks glowing in all their glory. Another feature is a free Kids Field Trip Day for teachers and homeschool groups of 20+ children.

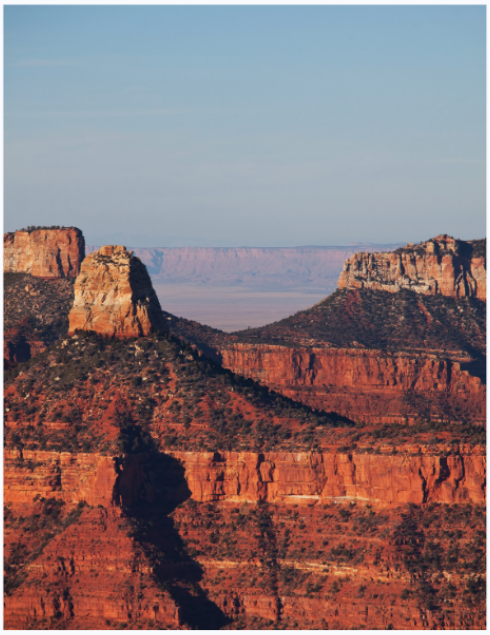
On a national scale, the HGMS is also involved in the Science Olympiad (http//soinc.org). This is an annual event featuring a variety of science-related challenges for competing students. The Olympiad is the premier STEM team competition in the nation. In 2025, the event will be held on May 23-24 at the University of Nebraska-Lincoln. There are three divisions in the Science Olympiad: Division A for elementary school, Division B for middle school, and Division C for high school. The involvement of the HGMS has assisted in coaching area schools competing in Division B and Division C. In the past five years in the fields of paleontology and mineralogy, they have won the national championships twice. Contact the HGMS if you would like to help.

What about field trips, you might ask? HGMS offers multiple trips around Texas. For example, field trips that HGMS has run include a chance to see and collect Middle Eocene marine fossils at Whisky Bridge at the Brazos River and at Brownwood, Texas, to find Pennsylvanian fossils. If petrified wood excites you, go on a trip to see the Fort Kerr House made of petrified wood in Columbus, Texas, and have a chance to find some petrified wood pieces on the property. How about collecting fossils from the Cretaceous Cenomanian age? At the Waco Lake Research Pit, one can observe pyritized fossils of ammonites and gastropods while also finding shark teeth, brachiopods, and echinoids, to name some others. HGMS also has quite a few publications on Texas fossils for sale. These publications describe the fossil's physical attributes in detail and provide the locations to collect them.

Why not get involved in helping students get excited about entering the geoscience field? In addition, why not slab and polish your rocks and create geologic art for you and others? Please check them out. ■

GRAND CANYON FIELD TRIP

June 1-8, 2025



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Houston Geological Society

Exploring the Grand Canyon Down the Colorado River

By Penny Patterson (HGS President) and Steve Earle (HGS Past President)
Photos courtesy of Steve Earle and past trip participants

This is why it's called the Grand Canyon! Morning on the River.

Running the Colorado River through the Grand Canyon is a "must-do" adventure of a lifetime. For geologists, it is the penultimate opportunity to examine the Paleozoic through the Precambrian geology of the Colorado Plateau region while concurrently witnessing the dynamic processes of the river as it carves its way through the Colorado Plateau region.

Loading the boats at Lee's Ferry with Triassic Moenkopi outcrops.

WAIT NO LONGER TO EXPERIENCE THE WONDERS OF THE GRAND CANYON!

The Houston Geological Society is organizing a river-rafting geologic field trip in conjunction with Hatch River Expeditions to explore the Grand Canyon from June 1 to 8, 2025. This week-long river trip takes adventurers through geologic time and encompasses truly spectacular scenery. And while we will see and talk about all the fabulous geology, the trip is also tremendous fun for non-geologists if you want to bring friends or family members along!

The rafting trip begins at Lee's Ferry, situated in the beautiful red beds of the Triassic Chinle and Moenkopi Formations, with the Permian Kaibab Limestone capping the rim of the Grand Canyon. Lee's Ferry is also a historic location as one of the few natural sites for crossing the Colorado River for ~450 miles. Once on the boats, adventurers will begin their 187-mile journey down the river. On that first day, we'll have the opportunity to see fossilized tracks

Exploring the Grand Canyon *continued on page 26*

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Joints in the Wolfcampian Esplanade Sandstone of North Canyon.

Fossil tracks in the Permian Coconino Sandstone.

in the Permian Coconino Sandstone and discuss an interesting joint pattern in the Esplanade Sandstone. Hint: the jointing may be related to the same phenomena as the recent theory about why Mount Everest is growing as fast as it is. See if you agree.

THAT'S JUST THE FIRST DAY!

On this trip, we'll eat like kings and get to run so many exciting rapids as we descend downward through the rest of this classic Paleozoic section and into one of the few places on Earth where early Proterozoic sedimentary rocks are still preserved, then finally into the older Inner Gorge. During our river trip, we will have the chance to visit numerous historical and classic geologic sites. These include a cavern carved into the Mississippian Redwall Limestone by the turbulent flows of the mighty Colorado River. The next stop is the Nankoweap Granaries, which early Puebloan People constructed around 1100 AD. Continuing down the river, additional stopping sites include the Little **Exploring the Grand Canyon** *continued on page 27*

The food is fantastic! Here the river crew is preparing a breakfast feast.

HGS members running a rapid.

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Travertine deposits in the Little Colorado River.

Colorado River for a delightful swim, Elves Chasm with its stunning waterfalls, Blacktail Canyon with its vertical cliffs of the Cambrian Tapeats Sandstone sitting directly on the Precambrian Vishnu Schist, Deer Creek where we discuss why there's a waterfall here, and Havasu Creek with its warm waters traversing down the creek and depositing intricate travertine deposits along the creek bed. The rafting part of the trip concludes at Whitmore Canyon after our exciting run of Lava Rapids. On the last day, we'll bid a fond farewell to our Hatch River crew, who have taken such great care of us the entire week, and board helicopters to fly back to civilization (and a real shower).

Please join Penny and fellow HGS adventurers on this trip of a lifetime, rafting and exploring the Colorado River through the Grand Canyon. ■

Steve Earle at the Anasazi Indian granaries.

Photo looking down river from the Nankoweap Granaries.

Elves Chasm.

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The Houston Geological Society Continuing Education Committee Presents

Prospect Evaluation Methods for Seismic DHIs

Henry Pettingill and Rocky Roden
January 23, 2025, 8:00am – 5:00pm
Core Lab, Building 2, 6323 Windfern, Houston, TX 77040
Attendees will receive a Certificate of Continuing Education for 8 PDH and digital course notes

COURSE DESCRIPTION

One-day survey class covering all aspects of evaluating exploration prospects supported by seismic anomalies known as Direct Hydrocarbon Indicators (DHIs). The class is shortened from a longer version taught to Members of the Consortium and has the proprietary Consortium content removed.

- The class has a strong practical orientation and uses actual prospects and realistic exercises to illustrate the applications of the various concepts and analytical procedures used in the technical evaluation and investment decision process of DHI-supported prospects.
- The course leverages over 20 years of learnings and workflow developments that have emerged from the Rose and Associates' DHI Interpretation and Risk Analysis Consortium.
- The course also gives the participants a global context of DHI-driven exploration, including analog learnings from the Consortium's 390-well calibration database.
- After taking this course, participants will have familiarity with all concepts and techniques in the risk and resource evaluation of DHI prospects.

PRICING

$280 for HGS Members
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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.

WHO SHOULD ATTEND

Geoscientists, engineers, and managers involved with evaluating exploration opportunities in seismic DHIs.
The course work assumes the participant has a basic working knowledge of subsurface Exploration concepts.

For more information on the Rose and Associates DHI Consortium, visit https://www.roseassoc.com/dhi-consortium.

BIOGRAPHICAL SKETCHES

Henry S. Pettingill (Principal Consultant and DHI Consortium Chairman) is a Petroleum Geologist and Exploration Manager who has been in the oil and gas industry since 1983. He joined Rose and Associates in 2018 after 16 years with Noble Energy Inc., where he finished his career as Chief Geoscientist. Prior to that, he served as Director of Business Innovation from 2013-2015, and as Director of Exploration Technology from 2002-2013. His responsibilities included overseeing the Global Exploration Portfolio, Risk Analysis, Geoscience Technology, and Staff Development. Prior to joining Noble, he held various technical and managerial positions within Repsol and Shell. His assignments have focused on Deepwater Exploration and Appraisal, International Exploration/ New Ventures, Exploration Risk Analysis, and Portfolio Management. Henry has authored over 100 conference presentations and technical papers, and has taught classes in Exploration Risk Analysis, Creativity and Innovation for E&P Organizations, and a Deep Water Clastics field trip in the Spanish Pyrenees. In 2017, he was recognized by AAPG as one of the industry's "100 Explorationists Who Made a Difference."

Mr. Pettingill holds a BA degree from the University of Rochester and an MSc degree from Virginia Tech (USA). He is an AAPG Certified Petroleum Geologist and an active member of AAPG, SEG, and SPE. He is a Trustee Associate of the SEG and AAPG Foundations. Pettingill is chairman of Rose & Associates' DHI Consortium. **Continuing Education** *continued on page 30*

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Continuing Education continued from page 29

He serves on the Advisory Board of Virginia Tech Department of Geosciences.

Rocky Roden has owned his own consulting company, Rocky Ridge Resources, Inc., for the last eighteen years and works with numerous oil companies around the world on interpretation technical issues, prospect generation, risk analysis evaluations, and reserve/resource calculations. He has authored or co-authored over 40 technical publications on various aspects of seismic interpretation, AVO analysis, amplitude risk assessment, and geoscience machine learning. He has over 45 years in the industry as a Geophysicist, Exploration/Development Manager, Director of Applied Technology, and Chief Geophysicist.

He has been a principal in the Rose and Associates DHI Risk Analysis Consortium since 2001. He works with Geophysical Insights on the integration of advanced geophysical technology in machine learning software applications. He is a proven oil finder with extensive knowledge of modern geoscience technical approaches (past Chairman, The Leading Edge Editorial Board). As Chief Geophysicist and Director of Applied Technology for Repsol-YPF (retired 2001), his role comprised advising corporate officers, geoscientists, and managers on interpretation, strategy and technical analysis for exploration and development in offices in U.S., Argentina, Spain, Egypt, Bolivia, Ecuador, Peru, Brazil, Venezuela, Malaysia, and Indonesia.

He has been involved in the technical and economic evaluation of Gulf of Mexico lease sales, farmouts worldwide, and bid rounds in South America, Europe, and the Far East. Previous work experience includes exploration and development at Maxus Energy, Pogo Producing, Decca Survey, and Texaco. He holds a BS in Oceanographic Technology-Geology from Lamar University and a MS in Geological and Geophysical Oceanography from Texas A&M University.

Is There an Undeveloped Kimmeridgian-aged Carbonate Oolite Play in the Offshore US Gulf of Mexico?

By Ted Godo and Joe Landry

Mesozoic oil and gas fields dominate the US Gulf Coast. Many formation and member names used in these wells are often based on lithostratigraphy. These formations and members used onshore have been projected along the geologic "trends" into the Eastern Deep-Water Gulf of Mexico. This article focuses on the Kimmeridgian age as defined by the 2022 updated GSA Geologic Timescale, lasting from 157.3 to 152 million years before the present (GSA, 2022). The article will also reference the common formation names used onshore.

In 2013, Anadarko drilled a US deep-water well and sidetrack hole. The original hole encountered nice carbonate oolite porosity in the Kimmeridgian section charged with Smackover sourced oil. The sidetrack found the same porous carbonate but has high water saturation. This drilled prospect was named Raptor. Both wells were plugged and abandoned, and the two leases in which both wells were drilled have expired (Desoto Canyon (DC), blocks 535 and 491). The question this article poses is, is there a play to be made offsetting these wells in the Eastern Gulf of Mexico? There is widespread production of analogs of the same age carbonate oolite facies on the northern and southern parts of the Gulf of Mexico. As background, a brief discussion of this production will be presented first before the Raptor well results and implications are shown.

SOUTHERN GULF OF MEXICO

Kimmeridgian oolitic carbonate reservoirs are oil-productive in many fields. Initially discovered in the greater Tabasco state area, these fields were extended offshore into the Sureste Basin in the 1990s (Shann, 2022). The Kimmeridgian Akimpech Formation, as it is locally called, has been subdivided into four informal units designated as B, C, D, and E (Angeles-Aquino & Cantu-Chapa,2001). The oolitic member is unit E and lies directly below the Tithonian source rock. Offshore in the Sureste Basin, this reservoir is productive in at least 33 oil fields. The Akimpech oolite reservoirs' field sizes range from 16mmbo to 129mmbo. Other fields also produce from the Akimpech oolites but include up to three additional reservoir ages in the Cretaceous. In oil fields that have multiple producing zones, the volume from each reservoir was not attempted to be broken out. Shann (2020, figure 14) shows a map of Kimmeridgian paleogeography and named oil fields.

West of the Sureste basin lies the Tampico-Misantla basin. In this basin, oil is also produced from the Kimmeridgian-aged oolite reservoirs. San Andres is the name for this carbonate lithologic unit in this basin (Guzman, 2022-figure 6). He describes the traps of the San Andres reservoir as "mostly stratigraphic and not easily identified from seismic data." The stratigraphic traps onlap basement highs. Andy Horbury states in chapter four, "It is possible to envisage this reservoir system as similar to an archipelago of oolite banks around positive elements that may or may not be emergent " (Sandrea et al., 2018, p. 71). A Kimmeridgian paleogeography map of this area is shown in Guzman, 2022-fig 7). The four largest oil fields have cumulative production ranging from 91mmbo to 394 mmbo (Guzman, 2022). Arenque field is the only shallow water offshore field (Horbury, 1996, 2003).

NORTHERN GULF OF MEXICO

Kimmeridgian age rocks in the U.S. onshore gulf states have been placed in the Haynesville-Buckner Supersequence (HVB) (Olson, 2015; Cunningham et al., 2016- Figure 4; Snedden, 2019). This sequence has four formation names: Haynesville Limestone, Gilmer Limestone, Haynesville Shale, and Buckner evaporites. Olson and Cunningham both use the same stratigraphic chart that Hammes (2012) originally used. However, Hammes more narrowly defines the Gilmer limestone as the sequence between a maximum flooding surface beginning with the initial basal Smackover and ending with a high stand system tract associated with the advancement of the Buckner anhydrite. Names such as the Cotton Valley Lime and Haynesville Lime are listed in older literature. The Haynesville Lime porosity occurs on carbonate ramps and pinnacle reefs (Goldhammer, 1998; Norwood & Brinton, 2001). The Gilmer Limestone was initially proposed by Forgotson (1976) and found to be productive near the town of Gilmer. This Gilmer oolitic limestone is also oil-productive around the Sabine uplift in East Texas (Ewing, 2009). Around the Sabine paleo high, the Gilmer reservoir is described as an oolitic submarine bar with festoon cross-bedding that thins onto the paleo high (Ahr (1981) . The porous submarine oolitic bars are laterally sealed by fine-grain carbonate mud (Ahr, 1981). This facies belt is a relatively narrow belt developed along the Sabine uplift's western margin. These oolite bars also contain other grain components, such as broken skeletal fragments of coral, algae, and echinoderm fragments. This stratigraphic trap sounds like the same stratigraphic traps in Mexico described by Guzman (2022) and Sandrea (2018). In discussing the Raptor well (this paper),

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Undeveloped Kimmeridgian-aged Carbonate Oolite Play continued from page 31

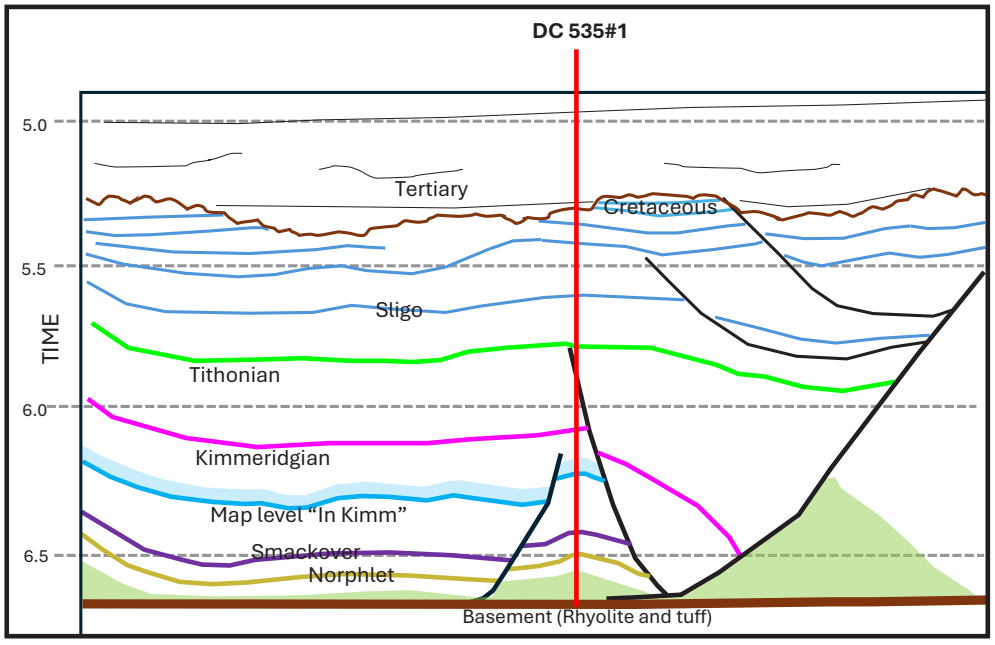

Figure 1. *A dip-oriented cross-section (seismic "time" tracing) of Anadarko's Raptor prospect targeting the Norphlet section. While drilling through the Kimmeridgian section, the well encountered oil pay in good porosity oolitic carbonate grainstones shown in the light blue band, which is also the map level.*

the oil-bearing oolitic limestone, sealed by shale, is recommended to be called Gilmer. The Gilmer appears in the lower part of the Kimmeridgian based on the paleo described in the well.

PROSPECT RAPTOR (US DEEP-WATER)

Prospect Raptor was drilled by Anadarko in 2013 in over 8,000 feet of water to a total depth of 22,135 feet, tagging a subsalt extrusive trachyte basement rock dated at 509 Ma (Mallis, 2024) (**Figure 1**). The primary objective was the Norphlet aeolian sand, which has had several discoveries by Shell Oil, including the giant Appomattox field. Raptor penetrated the Norphlet section but has a thin interval of 125ft of fluvially deposited sediments comprised of low porosity and permeability siltstones and sandstones (Godo, 2020, YouTube video).

In drilling wells, the operational top Jurassic is placed at the base of the lowest Cretaceous-aged clean carbonate, commonly referred to as the Knowles Limestone (**Figure 2**). The primary source rock for the Gulf of Mexico is characteristically seen on logs by the presence of high gamma ray representing organically rich shale found at the base of the Knowles Limestone. This source rock is then "referred" to as the "top Tithonian" (Jurassic) source rock. At Shell, detailed palaeontologic examinations from many wells often show that this shale source rock straddles the boundary between fossils of Jurassic Tithonian and the Lower Cretaceous Berriasian (see also: Weber, 2016). Onshore in the East Texas/Western Louisiana area (ET/WLA), the top Jurassic (top Tithonian) has also been somewhat problematic as key fossils thought to be Berriasian have been reported both above and below fossils thought to be Tithonian (Staeker, 2013). Staeker (2013) goes on to say that in the ET/WLA area, the traditionally reported top Tithonian (Rein A) should now be considered Berriasian, but the "Rein A" might also be diachronous across the basin.

The formation name Haynesville has also been misused in the EGOM Deep-Water area since Shell drilled the first well, Shiloh, in DC 269 (Godo, 2006). When Shiloh was drilled, the seismically soft event below the hard-kicking seismic loop of Base Knowles Limestone was called top Tithonian. The next deeper hard-kicking seismic event occurred in what we now know as "within" Kimmeridgian" but at the time called the top Haynesville. Finally, the Smackover was the deepest hard-kicking seismic reflector just above the top salt. These easily mapped hard-kicking events correlated across the basin became somewhat dogmatically entrenched in the local vernacular. More accurate "timelines" or palaeontologic extinction events have been better defined with subsequent wells drilled. This would illustrate how correlation of lithologic facies do not follow time transgressive units and do not use the principle of "Walters law" (Walter, 1894; Middleton, 1973).

At Raptor, the Kimmeridgian section begins in a predominantly shale sequence (**Figure 2**). A widespread condensed zone marks the "near top" Kimmeridgian with the extinction of the calcareous nannofossil Calcivascularis Cassidyi. Bergen (2013) suggests that C. Cassidyi is near the top Kimmeridgian but could also effectively "mark the terminal Kimmeridgian." If C. Cassidyi is not the top Kimmeridgian as Bergen (2013) and Ryan (2016) might suggest, then it is the closest paleo pick to the actual top Kimmeridgian. It is not vertically far above the C. Cassidyi pick where Tithonian fossils start appearing, thus indicating the uppermost Kimmeridgian, although undefined, is very thin in the EGOM. The C. Cassidyi palaeontologic pick is not identified in all wells, but interpreters often use a "log correlation" based on other C. Cassidyi picks in the area. At Raptor, below the shale with the C. Cassidyi pick, a limestone sequence is developed as the dominant lithology with marly interbeds. This limestone and marly lithology continued from the lower Kimmeridgian into the Oxfordian section marked by the Globuligerina oxfordiana fossil. (**Figure 3**).

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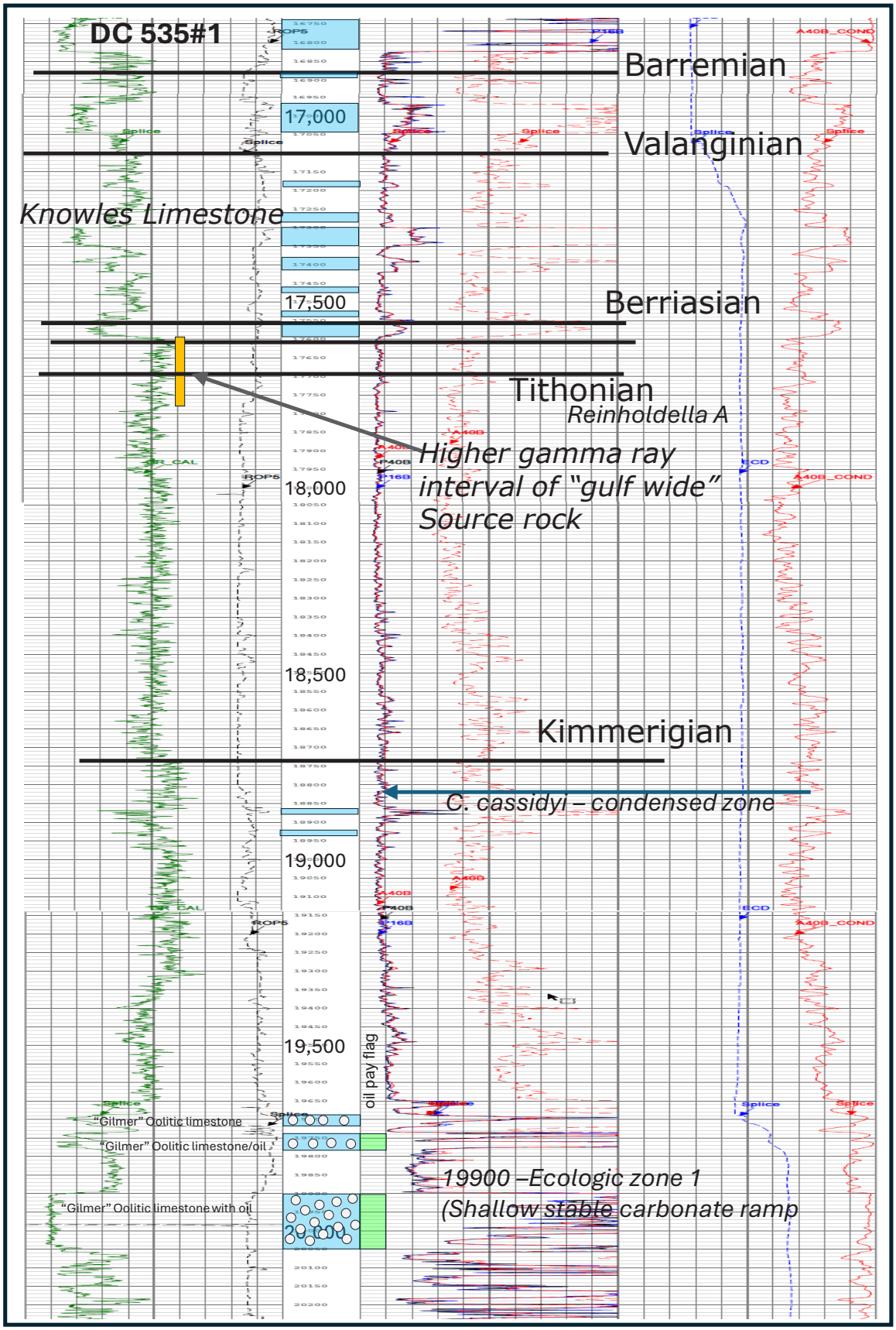

Figure 2. *The gamma-ray/resistivity log of the Raptor#1 well showing the top Jurassic section and the Kimmeridgian oolitic grainstone oil pay interval.*

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Undeveloped Kimmeridgian-aged Carbonate Oolite Play continued from page 33

The Raptor #1 original well drilled a thick oolitic oil filled Gilmer limestone at 19,900 ft (tvd). The porosity ranges from 15% to 29% (25% avg), water saturations range from 20% to 50% (27% avg). Permeabilities range from hundreds of millidarcies to a darcy or more over the 128 feet of thick oolitic grainstone (**Figures 4** and **5**). An oil sample was obtained at 19,911 feet. The reservoir pressure is 12,539 psi with a temperature of 2200 F. The oil API gravity is 24.7 with a viscosity of 6.79 cP, and GORs ranging from 178 Scf/Bbl to 254 Scf/Bbl. After reaching the basement, the well was plugged back to the top Cretaceous. A window was milled from 15,247-15,269 feet and sidetracked northeast into DC 491 (**Figure 6** and **7**).

As the sidetrack well (491-1st1) was nearing the oolitic limestone objective, it drilled through some thinner non-oolitic limestones like the same limestones drilled in the original well. (**Figure 8**). This time, however, there were reported oil shows at 19,720 to 19,768 ft (tvd). The mudlogger describes a "moderate" show with a fast-streaming bright, yellow-cut fluorescence suggesting a 17API gravity. No oil sample was taken. The primary objective was next encountered. The well found the same objective: oolitic limestone, which was again thick and porous. Now, however, the limestone has an elevated water saturation. The petrophysical properties of this interval are like the original hole. Porosity ranges from 15% - 28% (19% Avg) with permeabilities ranging again

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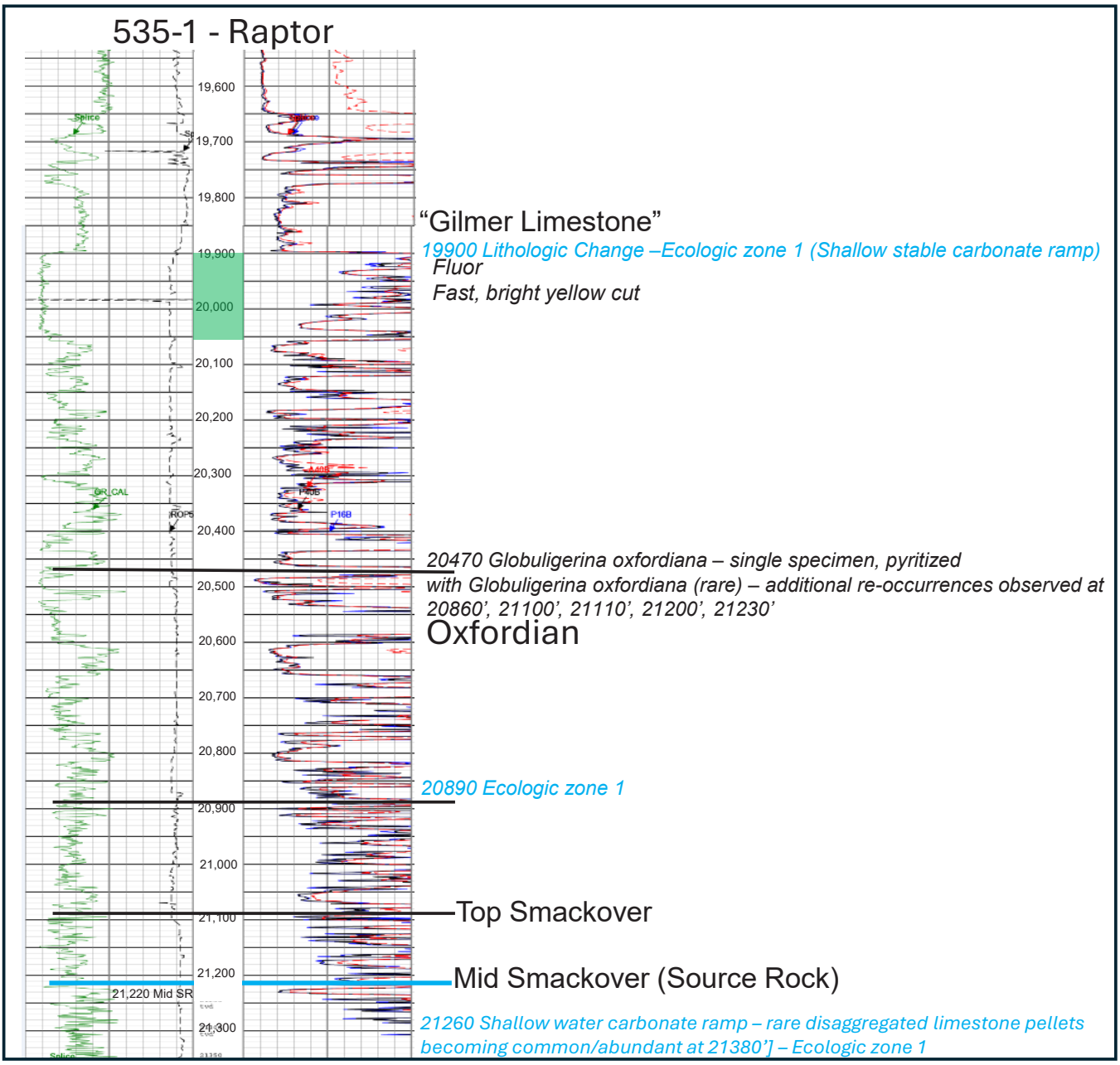

Figure 3. *TThe gamma-ray and resistivity log in Raptor showing the oil pay horizons (green) and the top of the Smackover source rock (middle member)*

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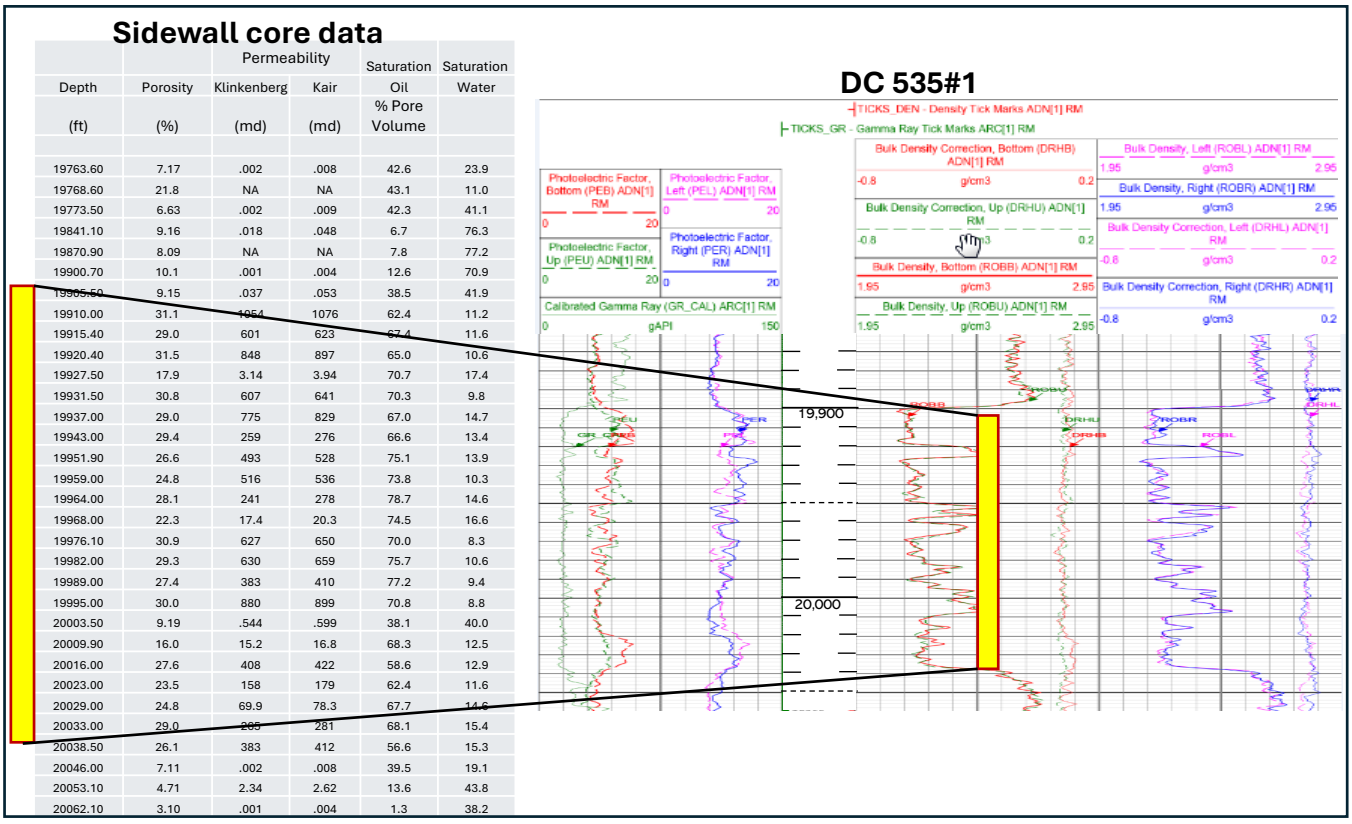

Depth	Porosity	Permeability Klinkenberg	Permeability Kair	Saturation Oil	Saturation Water
(ft)	(%)	(md)	(md)	% Pore Volume	
19763.60	7.17	.002	.008	42.6	23.9
19768.60	21.8	NA	NA	43.1	11.0
19773.50	6.63	.002	.009	42.3	41.1
19841.10	9.16	.018	.048	6.7	76.3
19870.90	8.09	NA	NA	7.8	77.2
19900.70	10.1	.001	.004	12.6	70.9
19905.50	9.15	.037	.053	38.5	41.9
19910.00	31.1	1054	1076	62.4	11.2
19915.40	29.0	601	623	67.4	11.6
19920.40	31.5	848	897	65.0	10.6
19927.50	17.9	3.14	3.94	70.7	17.4
19931.50	30.8	607	641	70.3	9.8
19937.00	29.0	775	829	67.0	14.7
19943.00	29.4	259	276	66.6	13.4
19951.90	26.6	493	528	75.1	13.9
19959.00	24.8	516	536	73.8	10.3
19964.00	28.1	241	278	78.7	14.6
19968.00	22.3	17.4	20.3	74.5	16.6
19976.10	30.9	627	650	70.0	8.3
19982.00	29.3	630	659	75.7	10.6
19989.00	27.4	383	410	77.2	9.4
19995.00	30.0	880	899	70.8	8.8
20003.50	9.19	.544	.599	38.1	40.0
20009.90	16.0	15.2	16.8	68.3	12.5
20016.00	27.6	408	422	58.6	12.9
20023.00	23.5	158	179	62.4	11.6
20029.00	24.8	69.9	78.3	67.7	14.6
20033.00	29.0	265	281	68.1	15.4
20038.50	26.1	383	412	56.6	15.3
20046.00	7.11	.002	.008	39.5	19.1
20053.10	4.71	2.34	2.62	13.6	43.8
20062.10	3.10	.001	.004	1.3	38.2

Figure 4. *The gamma ray and density log over the "Gilmer" pay zone. Also shown are the sidewall core data with porosity permeability and oil and water saturations.*

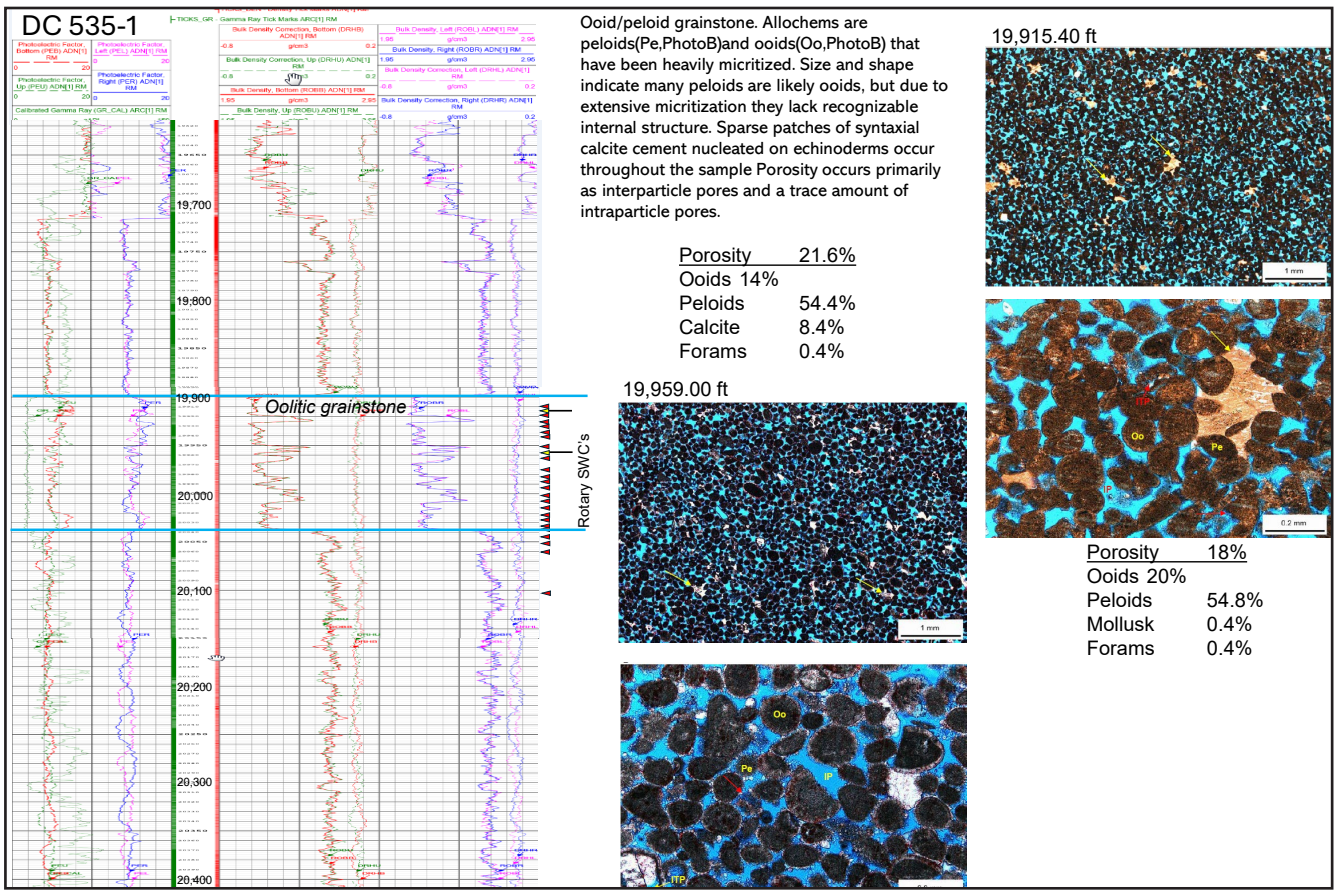

Figure 5. *Two example RSWC examples of the oolitic fabric along with point counts of porosity and grain types.*

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from hundreds of millidarcies to a darcy or more. The mudlog reports no oil shows, and the resistivity log has low readings (.5 to .7 Ohmm). In addition, the MDT tests indicate water over the interval. Anadarko then took closely spaced rotary sidewall cores as they did in the original well, and the cores had oil saturations ranging from 20% to 80% (Avg 64%) and water saturations from 20% to 65% (Avg 27.5%). While it is uncertain what exactly is the cause for the core measurements to have low Sw and high

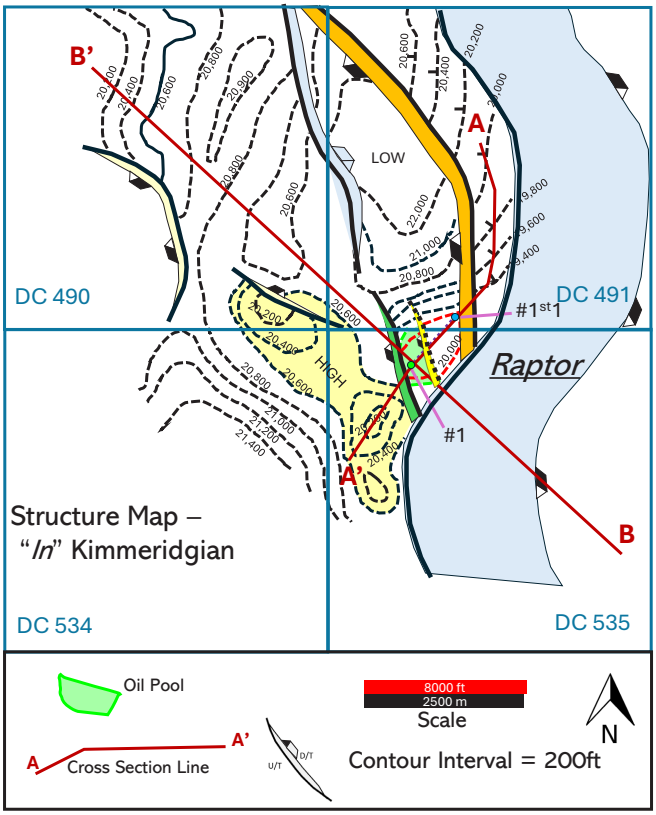

Figure 6. *The structure map of the Kimmeridigian-aged "Gilmer" pay zone. The locations of cross sections A –A' and B-B' are also shown.*

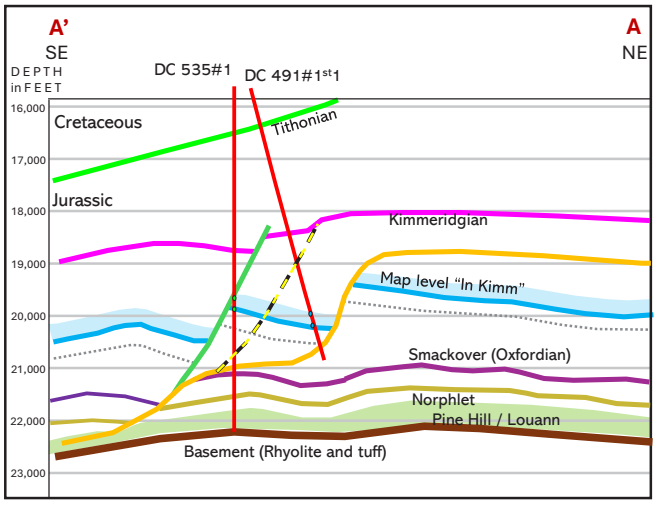

Figure 7. *The cross-section shows both Raptor wells, with the 535-1 well reaching a total depth in the igneous basement.*

So (sample contamination, wettability, fluid type, etc?) based on petrophysical and mudlog evaluations the hydrocarbons in this penetration are predominantly residual and this is confirmed by MDT formation test recovering water.

The structural map of the Gilmer pay interval is shown in **Figure 6**. The oil pool is shown as a small, green-filled area on the map. The red dashed contour line is the 20,000 ft level. The original well (green dot) and sidetrack well (blue dot) are shown on either side of a dashed yellow fault. The map was made years ago with low frequency and relatively poor data quality at the edge of the 3D survey. The yellow dashed fault was drawn after both Raptor penetrations. The fault is rather a "fault of convenience" rather than seismically resolved. This fault is placed to explain a sealing element between the two penetrations. A sealing element is needed to explain how the original hole found oil "pay to base," while the sidetrack hole tested water (**Figures 6** and **8**). The porous oolitic limestone in the sidetrack hole is only about 50 feet deeper than in the original straight hole.

The source rock that charged the Gilmer limestone in Raptor was typed to the Smackover source rock (Fausto Mosca, personal communication). When Anadarko sampled the Smackover for source rock potential, the sidewall cores they took concentrated on the basal carbonate member and missed much of the richer middle Smackover member (**Figure 9**) (Godo, 2017, 2019). Based on the pyrolysis Tmax data from the sidewalls that Anadarko took, the thermal maturity would equate to a vitrinite reflectance (%Ro) of 0.78.

Reviewing the question this article originally asked, is there a play to be made offsetting these wells in the Eastern Gulf of Mexico? If so, one could begin by making a play map that would hopefully produce potential sweet spot(s) where critical elements could come together. One key map would show the limits of the Smackover source rock as it onlaps the middle ground paleo high (Godo, 2017, Figure1). With shallow maps also made, what would the basin model suggest for maturity? Regarding oolitic reservoir development, remember the analog of the oolite trend caused by the "Gilmer ocean waves" that broke around the Sabine paleo high (Ahr, 1981) or the stratigraphic traps in Tampico-Misantla basin (Sandrea, 2018)? In the case of the EGOM area, the middle ground arch would also serve as an arcuate paleo high, creating higher wave energy and making an oolite trend maker. Seismic image-related issues occurring over the prospective trend would also have to be resolved. Imaging issues are caused primarily by the wedging of sediments across the younger Cretaceous shelf margin and a significant water wedge (Godo, 2019, Figure 2). The Sake well (DC 726-2) was drilled by BHP is another key control point to incorporate. In the Sake well, Kimmeridgian aged sample descriptions indicate an equivalent evaporitic tidal flat margin

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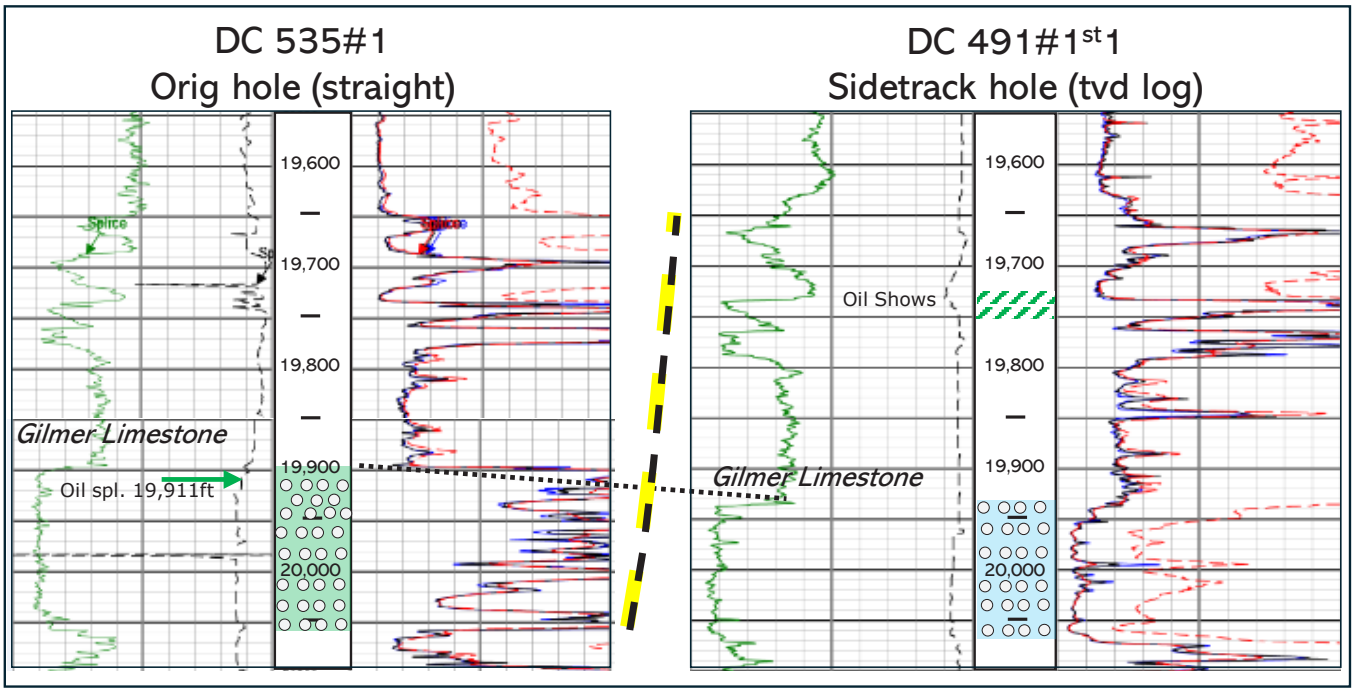

Figure 8. *The two Raptor wells illustrate the oil-filled and the "wet" oolitic limestone. The dashed yellow line between the wells represents a fault or otherwise a sealing element needed to separate the oil versus water in the oolitic limestone at nearly the same depths*

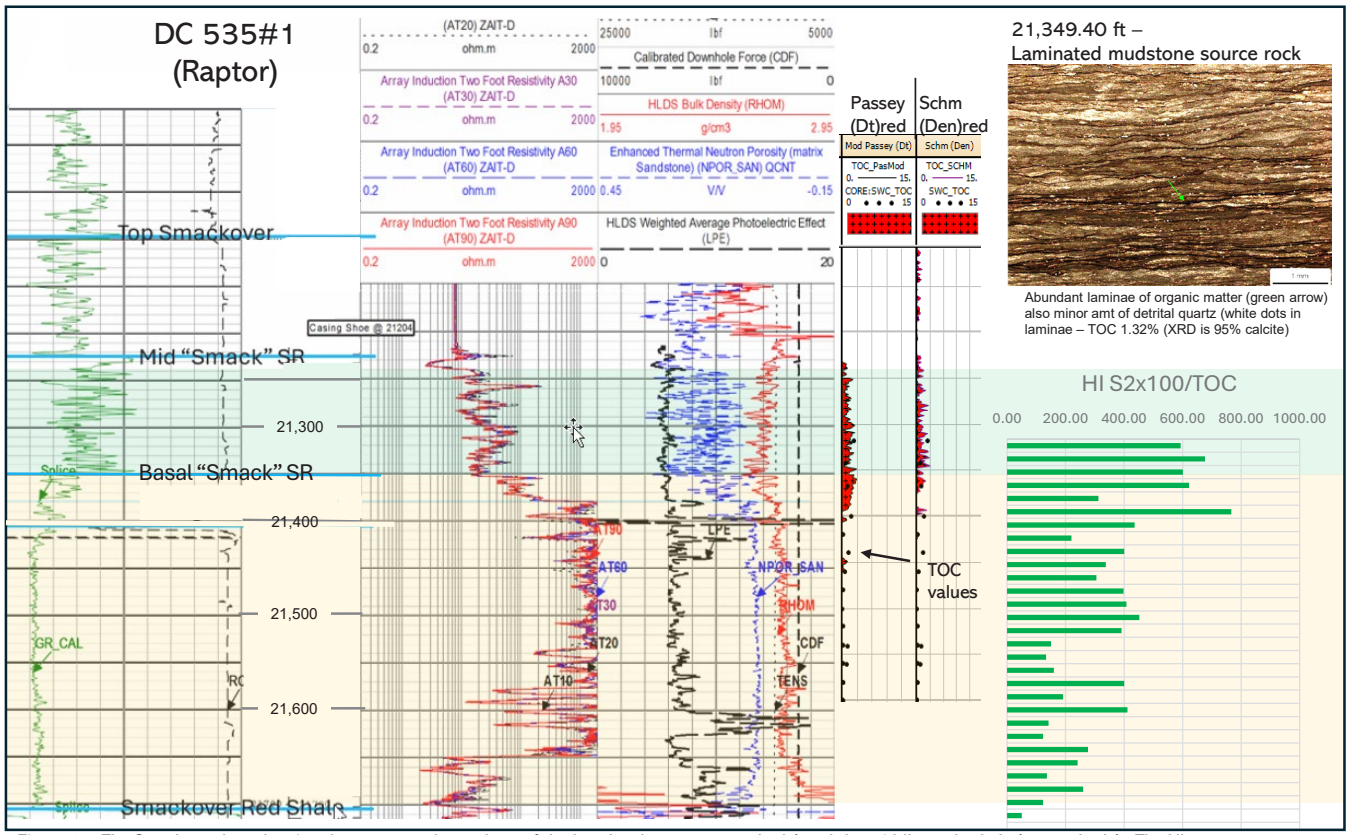

Figure 9. *The Smackover log, showing the source rock members of the basal carbonate cream shade) and the middle marly shale (green shade). The HI measurements are plotted on the histogram. The TOC values are black dots on the red curve. Thermal maturity in the early oil window. Also shown in the top right is a thin section of the source rock.*

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updip to the oolitic grainstone found in the Raptor wells. This could represent the needed updip stratigraphic seal. Hopefully, the oil found in the carbonate reservoirs at Raptor might generate some enthusiasm for explorationists to take on the challenge of evaluating whether or not this play might work for them and their companies. ■

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Wednesday November 13, 2024

Social 5:30 p.m., Dinner 6:30 p.m., Presentation 7:30- 9:00 p.m.

Pre-registered HGS Members $35
Non-Members & ALL Walkups $40
To guarantee a seat, pre-register on the HGS website and pay with a credit card. You may walk up and pay at the door if extra seats are available. Please cancel by phone or email within 24 hours before the event for a refund. Online & pre-registration closes Wednesday, at 5:00 a.m.
Los Tios • 9527 Westheimer Rd • Houston, TX 77063
https://www.hgs.org/civicrm/event/info?id=2597
Event Contact: Troy Meinen • troymeinen@gmail.com

Grey Areas: Interactive Application of Business Ethics in the Geoscience Profession

John E Jordan, Jr.

Most large oil companies require their employees to have yearly ethics training which is often broad and dry. State licensees are also required to have one hour of ethics training every year; this talk will fulfill that requirement. Although I do not have a degree in philosophy or jurisprudence, I have been an international explorationist for more than 35 years. Therefore I am aware of many situations where individual or business ethics are tested. I have been giving ethics lectures for last ten years. In the beginning, I gave a lecture introducing the theory of philosophical ethics and explored the difference between moral compass and ethics and how this relates to business ethics. The following year, I reviewed this model and then applied it to our industry with LIVE feedback from the audience via polling technology.

This year there will be a brief review of the Business Ethics Model, a review of the SIPES/AAPG code of ethics/conduct and how it fits with the TBPG code of ethics. I will focus heavily on examples where our business ethics are tested. I need to hear from YOU to make this experience more meaningful! Please submit ethics examples you have encountered in your career to me at (John.Jordan.062255@gmail.com) to be considered for use in the lecture. Examples will be anonymous, and the situation will be modified, but the issue will be the same as submitted. Using the examples, the audience will provide immediate, anonymous digital feedback while we discuss Business Ethics, focusing on making sound, consistent and ethical decisions. Come and join this entertaining and spirited discussion about the "grey areas" and bring a phone capable of texting. I will provide all participants with an Education certificate upon request. ■

BIOGRAPHICAL SKETCH

John E Jordan, Jr. is a Past President of the AAPG Division of Professional Affaires (DPA), Past President of the Houston Geological Society (HGS) and a licensed geoscientist in Texas. He is a retired Project Geophysical Advisor who has worked for several Fortune 500 oil companies in California and Texas. Prior to joining Anadarko in 2007, he worked at Kerr McGee, Noble

Energy, Arco, and Chevron. During 35+ years in the oil industry, he has worked deep-water and onshore projects from Alaska and the Gulf of Mexico to the Middle East, Asia, Africa, and South America. John is a graduate of Wright State University where he received both a BSc and an MSc from the College of Science and Mathematics majoring in geology and geophysics. He does not hold degrees in philosophy or jurisprudence but enjoys lively debate on most any subject.

Monday, November 11, 2024

5:30 – 9:00 p.m.

HGS Members/Emeritus/Honorary Life $65
Students $25 • 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=2570
Event Contact: Catie Donohue

HGS General and North American Dinner Meeting

Dr. Lesli Wood
Robert J. Weimer Chair, Dept of Geology and Geological Engineering, Colorado School of Mines

The 26th Anniversary Lecture

The Robert E. Sheriff Lecture Series

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

Learn about University of Houston geoscience program with Dr. Tom Lapen, Department Chair, Dr. Robert Stewart and Dr. Paul Mann. As well as the departmental Outstanding Alumni Award. There will be a poster session early in the evening on current thesis and dissertation research of the U.H. students.

Join the meeting early to meet the next generation of geoscientists from the University of Houston!

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

The Sheriff Lecture mission is to

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

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

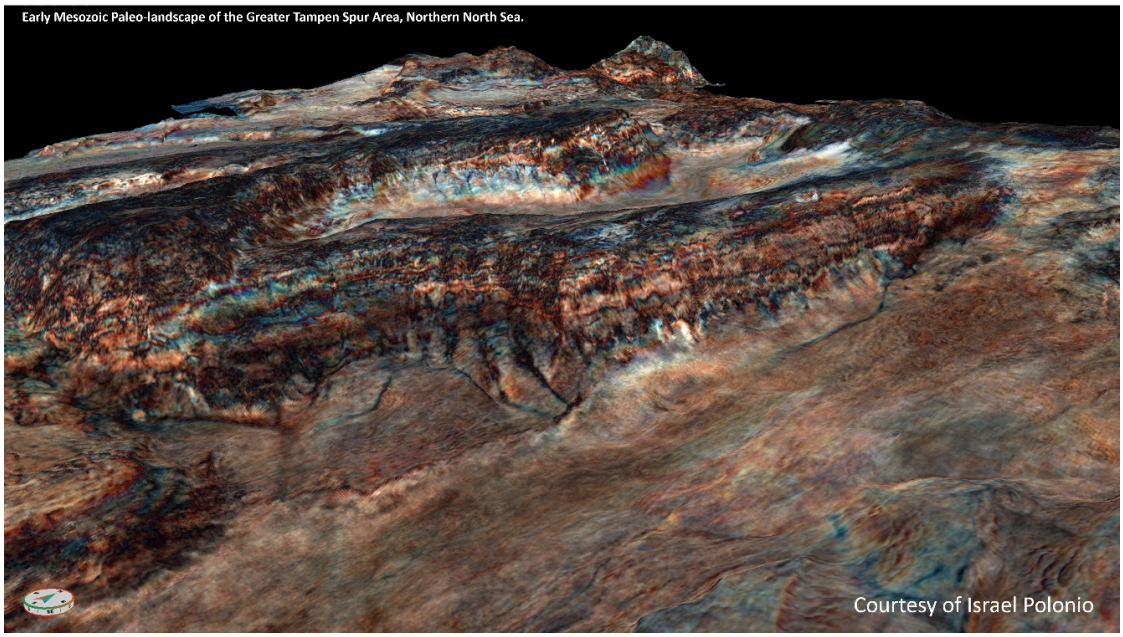
R.E. Sheriff Lecture

Seismic Geomorphology of Ancient Earthscapes — Strengthening our Perspectives of Deep Time and Clarifying Our Role in the World's Future

Fathoming deep time is arguably geology's single greatest contribution to humanity. …geology provides a lens through which we can witness time in a way that transcends the limits of our human experiences. This quote from Marcia Bjornerud's book *Timefulness* captures our role as geoscientists, to bring a knowledge of the deep-time past to bear on the present. If geology is the lens through which we witness, then seismic data is the muse under the scope. Advances in seismic imaging of ancient rocks and in our ability to display and render visual, past landscapes and seascapes provides a window through which to view the history of the Earth. These insights bring a responsibility to facilitate conversations on not just the geomorphology of the past, but on how those Earthscapes have been impacted by natural and

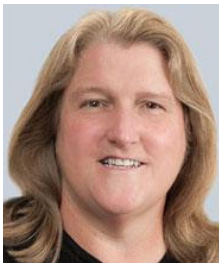
HGS Joint General and North American Dinner *continued on page 42*

HGS General and North American continued from page 41



anthropogenic forces. This talk will look at our amazing ability to see the ancient geomorphology of the Earth. We will examine ancient landscapes from the Mesozoic of Australia and the North Sea, Cretaceous canyons of northeastern South America, submarine mountains of mud and deep ocean canyons in offshore Trinidad and Tobago, carbonates systems of the West Texas Permian Basin, and paralic systems of the Guyana/Suriname regions. We will discuss how to integrate those seismic observations with learnings from modern systems study and modeling to quantify processes active in the past. This talk will also discuss the role of geoscientists in conversations of society's impact on the Earth and Earth's processes, and geoscientists' unique perspective on the role of human society in the evolution of the planet. ■

BIOGRAPHICAL SKETCH



BS, Geology, Arkansas Tech University, 1985
MS, Geology, University of Arkansas, 1988
PhD, Earth Resources, Colorado State University, 1992

RESEARCH INTERESTS

- Quantitative Seismic Geomorphology of clastic depositional systems
- Clastic reservoir characterization and modeling through research in outcrop and modern systems
- Tectonic and sedimentologic interaction in continental margins around the world
- Neogene development of the world's large deltas
- Martian deltas and shoreline processes
- Shale tectonics and mud volcanoes

TEACHING

- GEGN 204 Geologic Processes and Deposits
- GEGN 503/504 Integrated Exploration and Development
- GEGN 585 Seismic Geomorphology

SELECTED PUBLICATIONS

- Salazar, M., Moscardelli, L., and Wood, L., 2018, Reconstructing sediment infill and high-relief clinoform architectures using forward-modeling: A case study from the Taranaki Basin. AAPG Bulletin.
- Moscardelli, L. and Wood, L., 2015, Morphometry of mass transport deposits as a predictive tool. GSA Bulletin, June, j2015.
- Dunlap, D. B. and Wood, L., 2013, Seismic Geomorphology of Early North Atlantic Sediment Waves, Offshore North West Africa: Interpretation, v. 1, no. 1 (2013), SA75-SA91.
- Burton, D. and Wood, L., 2013, Quantitative shale bed characterization of the tidally-influenced Sego Sandstone, Petroleum Geology.
- Wood, L. J., Editor., 2011, Shale Tectonics: AAPG Memoir 93, p. 157.
- Moscardelli, Lorena, and Wood, L. J., 2006, Seismic geomorphology of mass transport deposits and controls on formation and character, eastern offshore Trinidad (abs.): American Association of Petroleum Geologists Annual Convention, v. 15, p. 76.
- Wood, L. J., 2006, Quantitative geomorphology of the Mars Eberswalde Delta: Geological Society of America Bulletin, v. 118, no. 5/6, p. 557–566.
- Wood, L. J., 2000, Chronostratigraphy and tectonostratigraphy of the Columbus Basin, eastern offshore Trinidad: American Association of Petroleum Geologists Bulletin, v. 84, no. 12, p. 1905–1921.

November 2024

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

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.**

Make your reservations online at hgs.org

HGS Short Course
Mastering the Modern Job Search: From CV to Social Media
https://www.hgs.org/civicrm/event/info?id=2618

GSH-HGS One Day Seminar
Integrated GeoScience Case Studies
Page 8
https://www.hgs.org/civicrm/event/info?id=2574

HGS NeoGeos Happy Hour
Page 44
https://www.hgs.org/civicrm/event/info?id=2589

HGS New Energies Luncheon Meeting
TBD
https://www.hgs.org/civicrm/event/info?id=2597

SPE 15th Annual Energy Professionals Hiring Event
https://www.hgs.org/civicrm/event/info?id=2617

HGS University of Houston Sheriff Lecture
Seismic Geomorphology of Ancient Earthscapes
Page 41
https://www.hgs.org/civicrm/event/info?id=2570

HGS E&E Dinner Meeting
Grey Areas Ethics Lecture
Page 40
https://www.hgs.org/civicrm/event/info?id=2609

HGS Sporting Clays Tournament 2024
Page 48
https://www.hgs.org/civicrm/event/info?id=2583

Thanksgiving
HGS office closed

HGS office closed

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).

RohmTek

HAPPY HOUR

HOUSTON GEOLOGICAL SOCIETY 1923

ST. ARNOLDS

2000 LYONS AVE
HOUSTON TX 77020

6:00 - 9:00 PM

MEMBERS	NON-MEMBERS
$5	$10

THURSDAY NOV 14TH 2024

October Neo-Geo Event – Pickleball Tournament

In October, NeoGeos Committee Chairs Austin Bruner and Alexandra Staub hosted a pickleball tournament and happy hour at PKL Social sponsored by GeoMark Research and Diversified. A total of 35 people attended the event, and 10 teams competed in the tournament. Prizes were awarded to the 1st, 2nd, and 3rd place teams. The prizes were provided by the sponsoring companies and the NeoGeos and included a pickle trophy, a pickleball tote and paddle set, and assorted fossils. The competitive spirit was high at this event, and we are excited to host similar events in the near future. NeoGeos would personally like to thank Angel Perez and Magly Cabrera for helping plan and organize the event. ■

Earth Science Week Review – October 2024
Earth Science Everywhere

By Barbara Hill

Earth Science Everywhere was the theme of Earth Science Week 2024, and the Houston Geological Society sponsored a special event at the Houston Museum of Natural Science on Saturday, 12 October 2024. The successful event brought smiles, questions, puzzles, and challenges to youngsters of all ages as they enjoyed four stations honing in on the theme.

Texas has two State Fossils, one of which is petrified palmwood, and volunteer Scott Singleton displayed large slabs of this beautiful fossil and very large slabs of other types of petrified wood. Scott, new HGS student member volunteers Rose Campos, and Anahi Reyes explained the petrification process. Visitors could also enjoy viewing the spotted appearance of petrified palmwood under a microscope with explanations of the significance of the original wood's vascular structure represented by the spots. Children were given a piece of petrified wood as a souvenir.

Four Stations: 1–Fossil Wood, 2–Everyday Uses of Common Rocks and Mineral, 3–Texas Geology and Take Your Family on a Geology Field Trip, 4–Rocks and Minerals. At the tables from nearest to far are Kelly McNair, Michelle Warner, Neal Immega, Husna Nabila, Sharon Choens and Inda Immega.

Volunteer and HGS Earth Science Week chair Barbara Hill and new HGS student member volunteer Kelly McNair led children and adults in a matching game between raw materials and end products at the Everyday Uses of Common Rocks and Minerals station. Participants were asked to match large pieces of halite (Hockley Salt Dome, Texas), sphalerite (Balmat Mine, New York), magnetite (Star Lake

Earth Science Week Review *continued on page 47*

New student member Kelly McNair guides visitors on matching raw materials with end products.

Tables begin to fill with guests. Shown at the Fossil Wood Station are new student members Rose Campos (left) and Anahi Reves (right).

Museum and HGS volunteers Inda Immega (left) and Sharon Choens (center) give out fossils, rocks and minerals while new student member Husna Nabila (right) talks about diamonds.

Earth Science Week Review continued from page 46

Museum and HGS volunteer Janet Combs explains how the Hockley Salt Dome formed.

HGS and Museum volunteer Neil Immega discusses geology fieldtrips with visitors.

New student members Rose Campos (left) and Anahi Reyes (right) explain wood petrification to families

New student member Husna Labila illustrates how to form a diamond octahedron from a template. Each side of the octahedron contained fun facts about diamonds.

Mine, New York), garnet (Gore Mountain Mine, New York), pyrite (location unknown), chrysocolla (Resolution Copper Mine, Arizona), graphite (location unknown), marble (location unknown), and the Woodford Shale (McAllister Pit, Oklahoma) with end products such as a box of Cheerios, a piece of white copy paper, brass fittings, a copper pipe, copper wiring encased in a plastic coating, #2 pencils, Tums®, Morton® salt, galvanized screws, sulfur, crayons, a plastic bottle, and a sheet of sandpaper. Pencils, small sample bags of garnet, and a very well-formed pyritohedron were given as souvenirs.

Texas Geology and Take your Family on a Fieldtrip was presented by volunteers Janet Combes, Michelle Warner, and Neal Immega, who discussed the importance of the Hockley Salt Dome, geology applications in new energy (including a sparkling piece of lepidolite to illustrate a geologic occurrence of lithium and field trip information to Whiskey Bridge and High Island. Neal's lead-in question was 'have you ever been told to get lost?" He then gave guests information about the field trips to keep them from getting lost while learning about geology near Houston. Souvenirs were handouts on the field trips, a Texas geology map postcard, and halite from the Hockley Salt Mine. Educators were also given the Earth Science Educators' toolkit from the American Geosciences Institute (AGI).

The fourth station was about starting or adding to a child's fossil, rock, and mineral collection. Volunteers Inda Immeda enthusiastically gave each child their choice of a fossil, a rock, and a mineral while explaining each. Volunteer Sharon Choens and new HGS student member volunteer Husna Lambila also showed students how to fold paper into a diamond octahedron using a paper cutout distributed in the AGI Earth Science Week toolkit by the Gemological Institute of America.

Approximately 200 Houston Geological Society bags were distributed to the visitors to give them a way to hold onto their Earth Science Week souvenirs. This event could not have happened without the support of the Houston Geological Society and the numerous volunteers who made it happen. Many thanks go to the Houston Museum of Natural Sciences for allowing the Houston Geological Society to host an Earth Science Week event at the museum, to the museum staff who helped facilitate this annual event as we worked through the logistics in person and over emails, and to the museum facility staff over who set up tables and chairs early in the morning of the event, then waited patiently while we tried to close down the very popular fossil wood table at the end of the event. Special thanks go to the HGS Museum committee members Lynn Travis, who has been the past chair of this event for the last four years and helped ease new chair Barbara Hill into the role over the previous year, Inda Immega, Neal Immega, Janet Combes, Sharon Choens, and Michelle Warner, and to new HGS student members Anahi Reyes, Kelly McNair, Rose Campos, and Husna Lambila, as well as Scott Singleton who proudly represents both HGS and the Geophysical Society of Houston and is a past museum volunteer. ■

HGS
SPORTING CLAY SHOOT

November 22, 2024 | 7:30AM - 1:30PM

Gun Raffles, Door Prizes, Lunch, Drinks & Mulligans for purchase

Westside Sporting Grounds
10120 Pattison Rd., Katy, TX 77493

Registration & Sponsorship Info: www.hgs.org or call 713-463-9476

Second Annual HGS Sporting Clays SHOOT

Friday, November 22, 2024
Westside Sporting Grounds
10120 Pattison Rd., Katy, TX 77493

Individual and Team Entry Form

This is a 100-target event, a 4-man cart per team and ammo are provided, **participants must provide eye and ear protection.** Westside Sporting Grounds and National Sporting Clay Association safety rules will be in effect. Each attendee will receive one door prize ticket. $10 raffle tickets will also be available for purchase. Prizes will be awarded by blind drawing after the conclusion of shooting. You must be present at the time of the drawing to win. Breakfast is 7:30am to 9:00am. Lunch will be provided from 11:30am until 1:30pm. Refreshments will be available throughout the day. **Non-shooting guests are welcome to enjoy lunch and refreshments at a cost of $35 per guest.**

We are limited to 120 shooters on 1 course. Entry fee is $225.00 per shooter or $900 per team for registrations received by MONDAY, NOVEMBER 18TH. After 11/18/24 REGISTRATION IS CLOSED. Individual shooters will be squadded with a team. ***Register early, it will fill up fast!!***

Team $900.00, Individual $225.00, Mulligans: 3 for $25.00
For more information, contact: Andrea Peoples at (713)463-9476 or office@hgs.org
For directions to the club, visit www.wsgclays.com

To Register online please go to https://www.hgs.org/civicrm/event/info?id=2583

To pay by check, mail this form with a check made out to HGS to:
Houston Geological Society, 14811 St. Mary's Lane, Ste. 250, Houston, TX 77079

To pay by credit card, please call the HGS office: (713) 463-9476.

Name: _____ Company: _____

Email: _____ Phone: _____

CC#: _____ Exp:_____ CVC: _____

Ammo: (circle one) 12 gauge 20 gauge

Entry Fees: $_____ + Guest Fees: $_____ + Mulligan Fees: $_____ + Raffle Fees: $_____
+ Sponsor Contribution: $_____ = Total: $_____

If you wish to register as a squad, please return forms for all squad members together.

ALL SHOOTERS WILL BE REQUIRED TO SIGN A WAIVER OF RESPONSIBILTY BEFORE THEY WILL BE ALLOWED TO SHOOT!

Team Member Name	Email Address	Phone	Ammo Guage
1._____	_____	_____	_____
2._____	_____	_____	_____
3._____	_____	_____	_____
4._____	_____	_____	_____

Second Annual HGS Sporting Clays SHOOT

Available Sponsorships

SOLD - Ammo Corporate Sponsor - $3,000

This will include one 4-man shooting team with team mulligans, cart and ammo. Your company logo will be recognized as a corporate sponsor and be displayed on the website, printed advertisements, HGS newsletter and sponsor board.

Hat Sponsor - $2,500

This will include 4-man shooting team, cart and ammo. Your company logo will be recognized as the Hat sponsor and be displayed on the hat, website, newsletter and sponsor board. **(Need logo by Oct. 10th, 2024 for this sponsorship) No Mulligans included.**

SOLD - Lunch Sponsor - $2,000

This will include 2 shooter registrations, cart and ammo. Your company logo will be recognized as a Lunch sponsor and be displayed on the website, printed advertisement and sponsor Board.

SOLD - Breakfast Sponsor - $1,000

This will include one team member registration with ammo. Pay for three more team registrations and get the cart with your package. Your company logo will be recognized as a breakfast sponsor and will be displayed on the website, printed advertisements.

SOLD - Beverage Sponsor - $750

Your company logo will be recognized as a beverage sponsor and will be displayed on the website, printed advertisement.

Door Prize / Raffle Sponsor - $500

Company Logo will be displayed on website and printed advertisement.

Station Sponsor - $250

Company will be able to set up on a hole and provide give away items, food, and drinks (non-Alcoholic on the course).

Individual Sponsor - $250

Company Logo will be displayed on website and printed advertisement.

To pay by credit card, please complete the form and return to office@hgs.org or call 713-463-9476
To pay by check, mail this form with a check made out to HGS to:
Houston Geological Society, 14811 St. Mary's Lane, Ste. 250, Houston, TX 77079

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

Consulting, Evaluate Prospects:
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Seeking Prospects: Coastal Texas

Victor H. Abadie III
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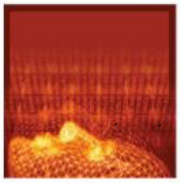

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Professional Directory

Snow Covered Table Mountain near Wolf Creek Pass, Colorado. Photo courtesy of Ted Godo