HGS Bulletin

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In Every Issue

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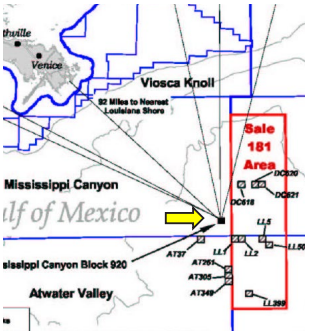
About the Cover: The photograph was taken from inside a helicopter en route to the Cheyenne Rig (out window). The rig is the "Nautilus", the identical "sister" rig to the "Deepwater Horizon". The photo is part of the technical article "Journey to the Cheyenne well". Photo taken in 2005 by Ted Godo.

Technical Meetings

Features



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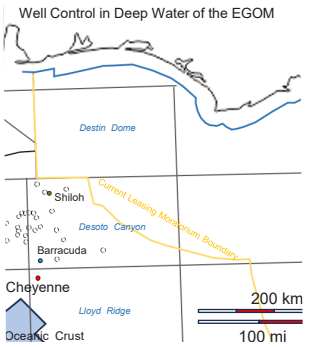

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Penny Patterson, HGS President 2024-25
pennyp70@att.net

Elect Your Next Board Members

April has arrived in Houston, Texas, with beautiful arrays of flowers blooming in our gardens and bright green leaflets sprouting from our trees. This is a delightful time of year for Houstonians to sit outdoors and enjoy the bounties of South Texas spring. But now is not the time to sit back and relax! This month, we have much to do with the beginning period for HGS's Board of Director elections and ongoing HGS's informative networking Dinner and Luncheon meetings, HGS's social gatherings, and affiliate conferences.

HGS BOARD NOMINATIONS

Like the emergence of new leaves on our live oak trees, we must also elect new members to our HGS Board. Our 2024 – 2025 HGS Board has been working diligently and steadfastly on advancing HGS's mission statement of increasing membership, promoting innovative technologies and research through HGS's meetings, conferences, short courses, networking events, etc., all of which are organized and hosted within a financially sound business plan. Hence, thanks to our founders, we have the ability and obligation to elect new members onto the board to allow them to continue advancing HGS's mission.

"Elections remind us not only of the rights but the responsibilities of citizenship in a democracy."

Per HGS's bylaws, there are seven HGS Board of Director positions open for election for the 2025 - 2026 HGS Board; they include President-Elect, Vice President, Secretary, Treasurer-Elect, Editor-Elect, and two Director positions. The HGS Nominations Committee has assembled an outstanding slate of candidates for these seven Director positions. Before voting for HGS Directors, I encourage all HGS members to download and read HGS's Bylaws to familiarize themselves with the roles and responsibilities of each of these Director positions. Then, I encourage all HGS members to read each candidate's short biography and their statement of interest to serve on HGS's Board, both of which are published in this April 2025 issue of the HGS *Bulletin*. Voting will begin on April 10, 2025 and extends through midnight May 10, 2025. Finally, I urge everyone to meet the candidates at upcoming HGS events.

UPCOMING TECHNICAL EVENTS

On April 6 – 8, 2025, the GeoGulf2025 Conference will be held at Stephen F. Austin University in Nacogdoches, Texas. Technical sessions will cover a wide range of topics including, Regional Gulf Coast Geological Studies and Facies Analyses, Critical Mineral Explorations, CCUS, Water Resources and Environmental Geology, and Unconventional Plays.

On April 14, 2025, Michael Young, Ph.D., Associate Dean for Research, Jackson School of Geosciences at University of Texas, will present "Comparing Life-Cycle Environmental Impacts and Cost of Electricity" at HGS's Dinner Meeting in the Norris Conference Center. This insightful and timely presentation will discuss the environmental impacts of global supply chains that support the electricity sector growth and development over their lifespans.

On April 24, 2025, HGS will host a continuing education course on "Geomechanics for CCS". This course is a half day class that will be held by Zoom and will provide an overview of essential elements of geomechanical modeling, data analyses, and impact of geomechanics on CCS projects.

UPCOMING SOCIAL EVENTS

The ever popular Shrimp Peel and Crawfish Boil will be held on April 4, 2025 at Pavilion 6 in Bear Creek Pioneers Park. In addition to delicious shrimp and crawfish, there will be live entertainment and fun games, such corn hole and tug-of-war, to challenge your friends and enjoy the lovely spring weather.

Please visit the HGS website for more information on these and additional upcoming events.

I close my letter with a quote from Robert F. Kennedy, "Elections remind us not only of the rights but the responsibilities of citizenship in a democracy." Similarly, our HGS elections should remind us of our responsibilities as HGS members to cast our votes for the candidates that will best serve HGS and our geoscience community. ■

I look forward to seeing you at our April HGS events!

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

Celebrating the Entrepreneurial Spirit and Ingenuity of our Industry

Greetings, fellow HGS members. As we enter the "fourth quarter" of our term, I want to take some time to acknowledge and appreciate our industry's entrepreneurial spirit and ingenuity. This month's feature article provides a great example. It is a story of how several different oil companies worked together to solve a problem for themselves and to supply a significant amount of gas to our country. Five oil companies made several small gas discoveries that were significant in terms of total reserves but were laterally spread out in deep water, none of which justified the building of a Hub. Working together for a solution, the Independence Hub (IHub) facility was designed, constructed, and installed in a central portion between these discovered reserves. Next, a pipeline to market was also needed, and it was designed and named the "Independence Trail." Both were likely named after the independent producers who conceived the project. The IHub was the world's deepest water platform, at over 8,000 feet, located in Mississippi Canyon Block 920 at the border of the central and eastern GOM planning areas. The life of the project began in 2007 with its first production and was decommissioned in 2015. But guess what? That wasn't the end of the story. LLOG purchased and retrofitted the IHub platform for a new project discovery in deep waters at the Leon/Castile discoveries. Recycling massive amounts of metal to reduce costs and save time from engineering a new facility is another testament to our industry drive and ingenuity.

This event caused me some embarrassment, but that's where learning often comes most, sometimes a little painfully.

I'd also like to take time in each issue to share how we think and share. I'll share a personal story from the 2006 paper I was honored to present in an oral report in late 2004 at the prestigious British Geological Survey in London. This event caused me some embarrassment, but that's where learning often comes most, sometimes a little painfully. The paper I was assigned to present focused on the newly producing turbidite fields developed by Shell in the Viosca Knoll area (refer to Figure 6 of the feature article). Channel Levee systems and low-resistivity thin beds were then just at the forefront of global awareness. Also, my work was focused on the US Gulf, with the Mississippi River system supplying most of the sediment. The Mississippi River is a vast interior drainage system that delivers much mud (soil) from the plains to the gulf. After all, it's known colloquially as the "muddy Mississippi" for obvious reasons. Other rivers with shorter drainage areas or deeply eroded highlands will produce coarser grain sediments, which had been more commonly explored then. The audience was very polite and respectful. Their common knowledge was that turbidites were often coarse-grained sands with pronounced resistivity and commonly had blocky-shaped gamma-ray signatures. I was embarrassed because I focused on the thin-bedded signatures and muddy channel fills, not realizing my audience had different knowledge and experience. I completed the 30-minute presentation, and several questions from the audience included, "Are the reservoirs the thin-bedded low resistivity beds?" Where are

From the Editor *continued on page 8*

WELCOME TO NEW MEMBERS, EFFECTIVE MARCH 2025

ACTIVE MEMBERS

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Raghd Gadrbouh
Umesh Prasad
Raul Huerta
Shailee Bhattacharya
Dylan Cobb
Terry Daigle

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From the Editor

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the coarse-grained sands? I thought to myself, I just rambled on for 30 minutes, thinking I was doing a good job, and these are the questions? Could I have better understood my audience's experiences? Should I have improved the lead sentences or even changed the title?

That experience taught me a couple of things. First, I needed to expand my knowledge of worldwide turbidites and not be so "GOM-focused"; also, maybe other global ideas could aid in my understanding of turbidites. Second, I needed to know my audience to tailor the talk to better their understanding. These learnings stayed with me even though I sometimes stray from them.

Finally, I would ask our readers to submit their technical articles for the May and June issues of the *Bulletin*. I'm running low on technical articles to write and could really use your help. Plus, getting contributions from other authors with different experiences and competencies would help the *Bulletin* appeal to a wider audience.

Thank you for reading the *Bulletin* articles. We strive to bring you interesting topics. See you next month. ■

We Are The HGS

Ye-Hong, HGS member since October 2024

Ye-Hong, originally from Taiwan, developed a strong affinity for math during his school years, which naturally led him toward a career in engineering. His passion for problem-solving steered him towards hydrology and groundwater modeling, particularly as computational tools evolved. As he explains, "I've always enjoyed math and problem-solving, so engineering felt like a natural path for me." His expertise in groundwater modeling is driven by his desire to address real-world water resource challenges, combining technical skills with effective problem-solving strategies.

Through this membership, Ye-Hong aims to deepen his understanding of regional geology and hydrogeology

His journey through academia, particularly while pursuing his PhD at LSU, was both challenging and fulfilling. Ye-Hong worked on a significant research project, developing a groundwater model for the Coastal Lowland Aquifer System in Louisiana's capital. He notes, "It was incredibly motivating to know that my research had real-world applications and could provide valuable insights for analysis." Ye-Hong's biggest accomplishment so far has been leading multiple projects, where he developed and calibrated groundwater model and writing scripts to streamline workflows or solve technical difficulties. These projects have helped him gain significant experience in decision support for groundwater resource management.

Outside of his professional life, Ye-Hong is an avid baseball fan, enjoying both playing with friends and watching the Houston Astros. He also finds joy in sightseeing, particularly in places with stunning natural landscapes or unique city views, offering him a refreshing break from his demanding work. Ye-Hong joined the Houston Geological Society (HGS) to expand his geological knowledge, allowing him to approach problems from both engineering and geological perspectives, while continuing to evolve as a professional in his field. ■

Adam Haecker, HGS member since December 2024

Adam, originally from San Antonio, Texas, has built a diverse career in the energy sector, with a focus on petrophysics. After graduating from college, he found himself stepping into the field almost by accident, taking a job with Halliburton and Weatherford as an openhole wireline engineer. However, it was at Chesapeake (now Expand Energy) where Adam truly refined his expertise, particularly through hands-on experience in their core lab. He emphasizes, "There is no substitute for getting your hands dirty in the lab and learning how things are actually measured," a sentiment that shaped his approach to the field. During this time, he learned invaluable skills in lab measurements and basin-wide interpretations, which have proved critical throughout his career.

Adam joined HGS to increase his network

Adam's career spans both service companies and operator roles, giving him a unique perspective on the energy industry. While working as an engineer for a service company, he experienced the fast-paced, transient nature of the job, where the focus was solely on the end result. "Working for a service company you are always on the move, going to different rig sites and sleeping when you can," he recalls. In contrast, Adam's time as a petrophysicist with an operator allowed him to influence both mature and emerging plays, where his work involved optimizing existing strategies or working on exploration projects that could be rewarding yet uncertain.

Now, in his role in Carbon Capture and Storage (CCS), Adam is tackling the challenges of this new frontier. He compares it to early exploration plays, noting that CCS is still in its infancy. Unlike traditional oil and gas projects, CCS involves long cycle times for building infrastructure such as pipelines and compression equipment, and complex regulatory hurdles. Despite facing skepticism from both political sides, Adam remains optimistic, recognizing the scale of the environmental challenge. "The scale of the problem is enormous, at 40 billion tons annually, but we are doing our best to chip away at it," he says, underscoring his commitment to reducing greenhouse gas emissions. When not immersed in his professional work, Adam enjoys studying Japanese, where he has reached a conversational proficiency level, and values his membership in the Houston Geological Society (HGS) for networking and professional growth. ■

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.

Congratulations

to Penny Patterson and Caroline Wachtman, Recipients of *Houston's 50 Most Influential Women of 2024 Awards*

Penny Patterson, HGS President and Mayor John Whitmire

Caroline Wachtman, Past HGS Editor and Mayor John Whitmire

The Houston Geological Society proudly recognizes Penny Patterson, HGS President, and Caroline Wachtman, Past HGS Editor, who are the recipients of "Houston's 50 Most Influential Women of 2024". One highlight of Penny Patterson is that in 2024, she was honored for her contributions to the University of Colorado Boulder (CU) and received the Alumni of the Year Award. Caroline Wachtman, among her many other accomplishments, is co-hosting a mentoring circle for the Women's Energy Network and has previously served on the board of the Global Energy Transition, an organization that mentors energy workers.

Every year new candidates are nominated from the public for individuals to receive this yearly honor. The magazine staff then selects 50 women to receive the honor. The honorees are recognized for their expertise in their field, knowledge, credibility, trustworthiness, and the influence of their thoughts and actions on others. Beverly Denver, publisher of Houston Woman Magazine, has remarked, "Those selected as Houston's 50 Most Influential Women of 2024 have earned an enviable reputation for their expertise in a particular field or arena. They are knowledgeable and trustworthy. These women's thoughts and actions influence others' thoughts and actions."

Houston Woman magazine held a dinner honoring the recipients on March 20, 2025, at the Junior League. Over 350 people attended the awards ceremony. Beverly Denver, Editor and publisher of Houston Woman magazine, provided the welcoming remarks. Houston Mayor John Whitmire delivered an inspirational speech and presented the awards to each of the 50 honorees and thanked them for their contributions to the Houston community. ■

The Independence Hub – Record-breaking Tiebacks of 10 Deepwater Gas Fields and the Analysis of that Production May Suggest a New Jurassic Source Rock in the EGOM

By Ted Godo

This feature article will be a historical account of the entrepreneurial spirit of a collection of five oil companies. In about 2004-05, the companies Anadarko, Dominion, Kerr-McGee, Spinnaker, and Devon Energy, having made recent gas discoveries, had a significant problem getting them to market. The discovery volumes of each field were too small to justify individual hubs anywhere to tie back these volumes. These recent discoveries were Merganser (AT-37), Vortex (AT262), Spiderman (DC 620-621), San Jacinto (DC 618), Mondo NW (LL 1), Cheyenne (LL 399), Atlas NW (LL5), Atlas (LL50), Jubilee (AT 349,305) and "Q" fields (MMS, 2005). The problem they all had in common was that these discoveries were in a remote area of the Eastern Gulf and located in very deep water. They joined forces and came together to solve this problem.

Interestingly, the fluids produced from several tieback fields are located over the unpenetrated SAKARN section (Jurassic?). This data suggests an internal source rock presence. If accurate, a new source rock would provide positive information to reduce the risk of exploring for a new play in a new petroleum system in the eastern Gulf of America.

BACKGROUND

These five companies formed a single entity, the Atwater Valley Producers Group, for the project in search of a solution. The Atwater Valley Producing Group sought the help of GulfTerra Energy Partners LP (predecessor to Enterprise) for outside "eyes" and experience. The proposed solution was a new concept design for a hub and collection method with a single hub for the project, naming it the Independence Hub (IHub). The IHub would be placed in a central area of the fields, collecting gas through tiebacks (**Figures 1&2**). The IHub would also need a pipeline to market.

The Independence Hub *continued on page 12*

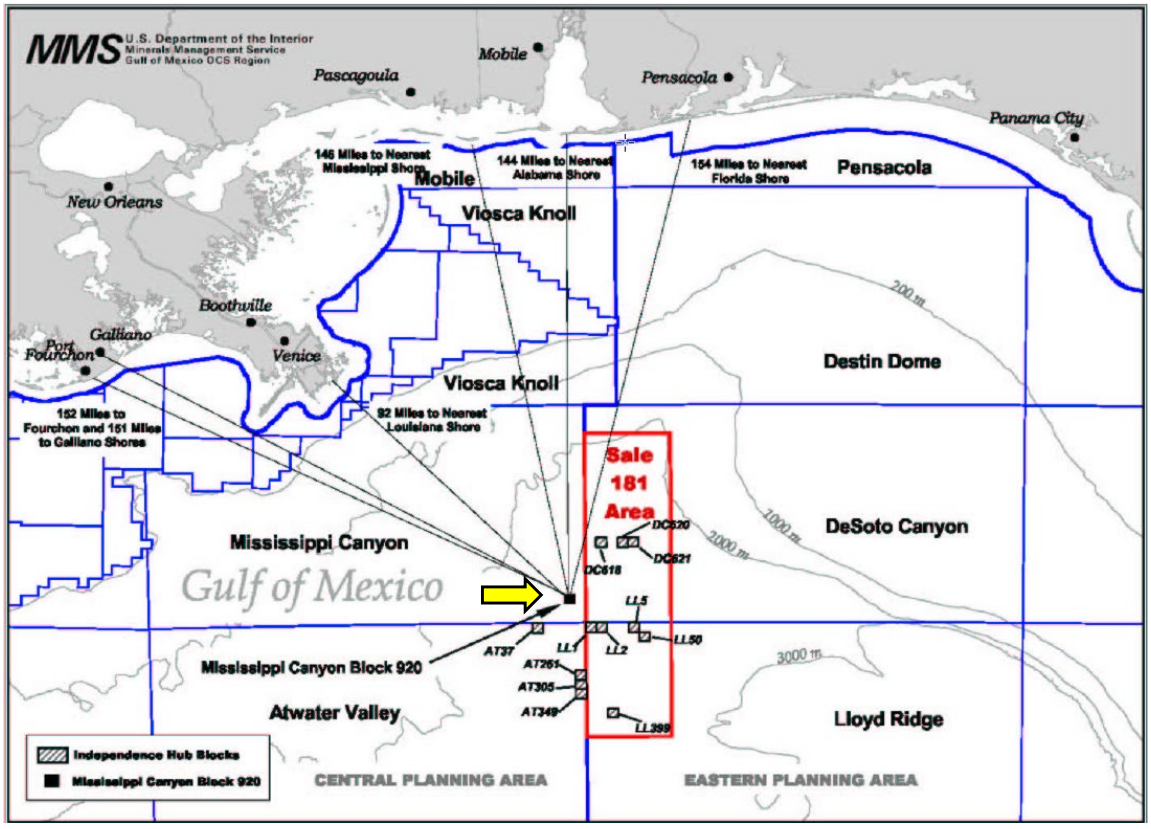

Figure 1. *Location map for the Independence Hub (Ihub) gathering hub platform showing the gas fields tied back in the Eastern Gulf of America. Many of these fields were discovered through leasing in the 2001 lease sale (red box—#181).*

The Independence Hub continued from page 11

A new export trunk line named the "Independence Trail" was designed to move the gas to an established terminal or junction platform and then tie it into the Tennessee Gas Pipeline in Plaquemines Parish, Louisiana (MMS, 2005). Enterprise owns and operates 100% of the Independence Trail and became the majority owner of the IHub (80%), with 20% owned by Helix Energy Solutions Group. The IHub and discovery fields' "footprint" covered an area equivalent to the distance from The Woodlands, Texas, to Galveston, Texas (**Figure 3**).

The Independence Hub platform was built for $385 million (Offshore Technology, 2022). It was placed in Mississippi Canyon Block 920, with a water depth of 8,000 feet. The facility's designed capacity was 1 billion cubic feet of gas per day (bcf/d). Anadarko continued to seek annual production to push the IHub's throughput to its designed capacity. In 2009, they successfully acquired and hooked up the Calisto gas field. Otherwise, Calisto was a stranded gas discovery made by Elf in late 2000. Calisto's addition now totaled eleven fields tied back to the IHub (**Figure 2**). IHub averaged about 890 MMcf/d in the second quarter of 2009 (Paganie, 2009).

Initial fields began production in 2007, and by December 2015, all eleven fields were depleted after extracting approximately 1.3 trillion cubic feet of gas. Over its lifespan, the platform exceeded initial production estimates by about 30% (Offshore Technology, 2022). The facility hit a payout within 1.5 years of the first production. At some points, the Independence Hub system nearly reached the designed daily capacity of one BCF/d. This amount represented 12 percent of U.S. offshore natural gas production in the Gulf of Mexico (Reuters, 2008).

For additional information on the individual discovery histories and how the independent oil companies came together to find a solution, see the article by Susan Holley and Robert Abendschein (2007). Joshi (2008) is another good reference on mitigating flow assurance challenges for the Independence hub.

In recent news this year, LLOG also took on a new challenge: to recycle a previously used oil and gas hub and retrofit it in a new oil field in the central gulf. Guess what platform LLOG decided to retrofit? Yes, the IHub. LLOG will install the previously named IHub platform on its Leon/Castile project in the deepwater Gulf of Mexico. The reborn platform will be renamed Salamanca and host oil and gas production from the Leon discovery in Keathley Canyon Blocks 642, 643, 686, and 687 and the Castile discovery

The Independence Hub *continued on page 13*

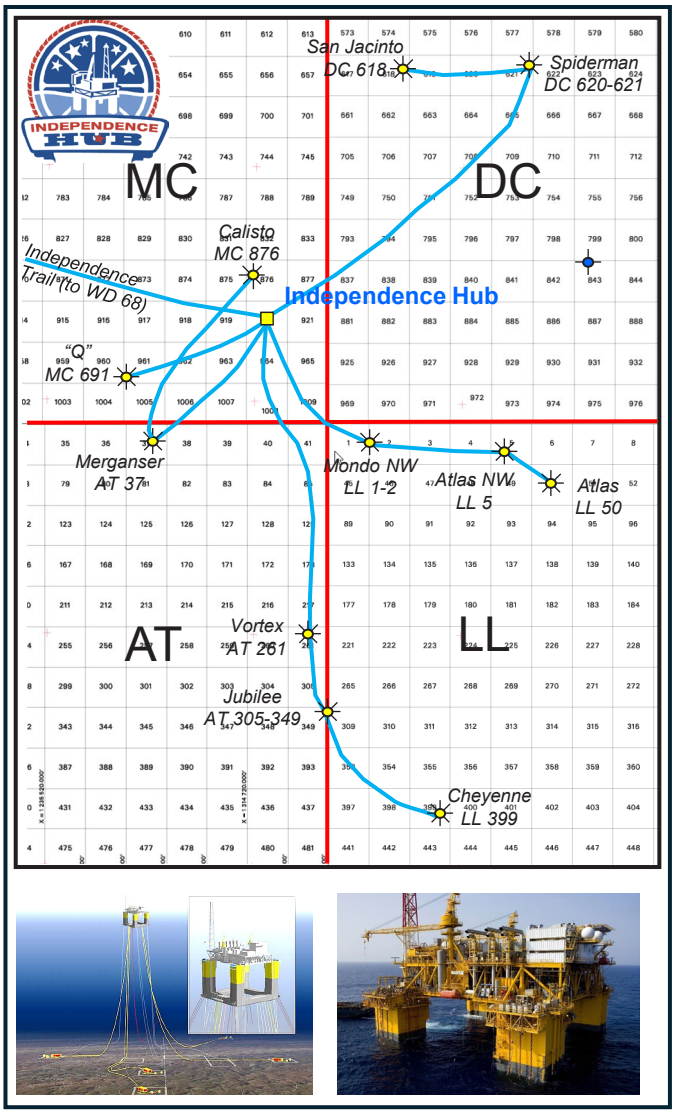

Figure 2. *A more detailed look at the names of the eleven gas fields, tied back to the IHub along with a conceptual drawing and photograph of the IHub.*

Figure 3. *Superimposed on a map of the Houston metropolitan area with the Independence Hub positioned over downtown Houston, the project area would reach from The Woodlands on the north to Galveston on the south*

The Independence Hub continued from page 12

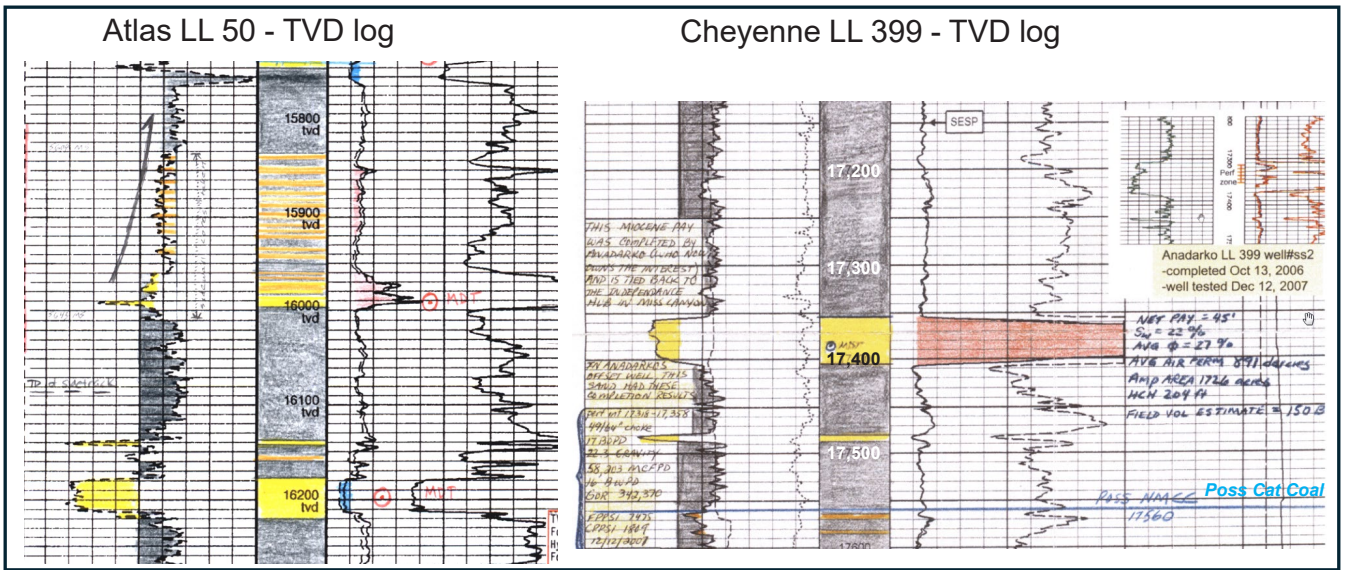

Figure 4. *Examples of the two main turbidite facies, channel levee facies, and channel-filled (blocky) sandstone.*

(formerly Moccasin) in Block 736. Initial production from joint development is expected in mid-2025. IHub will be refurbished to have a capacity of 60,000 barrel per day of oil and 40 million cubic feet of gas per day of natural gas (Offshore, 2025). Initially, IHub had a two-level production deck capable of processing 5,000 B/D of condensate and 1 Bcf/D of natural gas. The build-out to include oil processing on the previous dominantly gas system will require extensive work on the topsides of the unit. However, LLOG maintains that by modifying a previously built production unit, the time and cost to refurbish the unit are significantly reduced compared with the construction of a new facility (Offshore, 2025).

DEPOSITIONAL MODELS

The reservoirs of the IHub fields are middle and upper Miocene. In part, this is due to a thin Early Miocene section. During the Early Miocene, the eastern Gulf of Mexico was relatively sediment starved. Sediment starvation occurred mainly because the depositional delivery system was directed more into the central Gulf. Also, less subsidence in the eastern Gulf meant less chance for thicker accumulations. Less subsidence was due in part because this area was nearer to the basin margin that was sub-parallel to the Cretaceous Shelf edge. This lack of Early Miocene is seen in the wells, and the middle Miocene is often found directly above the preserved erosional unconformity on Tertiary chalks. In areas without much erosion of the Tertiary section, there is a highly condensed section of Early Miocene, especially in wells located further westward of the Cretaceous shelf edge. The age range of the fields collected by the Independence hub extends from mid-Miocene Burdigalian (~17.8my) to Late Miocene Tortonian (~9.0my).

Beginning in the middle Miocene and extending through the Late Miocene, there was a merger by the Tennessee River with the long-established Mississippi River drainage system. The Tennessee River system entered the coastal plain east of the Mississippi River. The Tennessee River system became a conduit for large volumes of quartz-rich sand and mud from the Appalachian highlands (Snedden, 2019). The sediment from this delivery system constructed a deepwater turbidite fan known as the McAVLU fan for its location within Mississippi Canyon, Atwater Valley, and Lund OCS protraction areas (Galloway, 2000). The McAVLU fan extends eastward into Desoto Canyon and Lloyd Ridge, but in 2000, when defining this fan, there were no wells in the Eastern Gulf areas.

The McAVLU fan emerged southeastward from the northwestern proximal entry point beneath shallow salt canopies in the central Gulf. The system can be easily identified and mapped into the Desoto Canyon, Eastern Atwater Valley, and Lloyd Ridge areas. The depositional system has an unconfined flow out onto the paleo seafloor, contrasting with typical salt mini basin "fill and spill" models (see Fernandez, 2024, with extensive references). An unconfined flow here refers to a turbidite or debris flow that moved downslope, unimpeded by local salt dome highs or ponding by subsidence from underlying salt. Most turbidite flows meandered down a gentle slope, building leveed systems. Turbidites deposited nearer to the sediment entry point are mainly stratigraphic traps. These traps are made by the interaction of penecontemporaneous constructional and destructional processes, leaving monadnock or erosional remnants to be hydrocarbon charged (Godo, 2006). The further the turbidite delivery system is deposited in the basin, the fewer subsequent flows erode the original facies, requiring structural traps for an up-dip seal or folding above a deeper structure. The fields produced by the IHub are mostly a combination of stratigraphic and structural traps and have a

The Independence Hub *continued on page 14*

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downdip fit caused by the gas-filled sandstone reservoirs (see also, Bouroullec, 2017 & Weimer, 2017).

EXAMPLES OF SAND FACIES, SIDEWALL CORES, AMPLITUDE MAP

The producing reservoirs include two main turbidite facies: channel levee sandstone and channel fill sandstone (**Figure 4**). Channel-fill sandstone has excellent porosities, commonly ranging from 25 to 30 percent. Corresponding permeabilities in these high net-to-gross channel fill sandstones range up to two darcies. However, laminated fine-grained silt to coarse silt of levee sandstone have much poorer permeabilities, commonly in the low single digits (**Figure 5**). The thin beds, however, have a large lateral extent and are deposited as the turbid sediment cloud that laterally spreads over the forming levee facies. Individual beds exhibit good lateral continuity. Reservoir connectivity appears to be in the thousands of acres without faulting (Clemenceau, 1999). For example, at Ram-Powell field in eastern Mississippi Canyon, the Late Miocene (early Tortonian), single wells in the levee facies have drained hydrocarbons over 4000 acres (Bramlett, 2002; Godo, 2006) (**Figure 6**). In many fields, the leveed reservoir facies are often the only type in the field, as the central channel separating both levee sides is shale-filled. Some sand 'lag' may be deposited at the bottom of the channel, but it is not enough vertically or laterally to seal the flow from one levee flank to the other. Both levee flanks produce hydrocarbons but do not always communicate hydraulically across the channel. Hydrocarbons in each levee on either side of the channel often show differing hydrocarbon geochemistry and possess different fluid contacts (Kendrick, 2000) (also notice the different gas-water contacts in Vortex B sand -**Figure 7**).

Producible permeabilities in thin-bedded levee facies, such as those reservoirs produced at the IHub, have cut-off depth limits. Based on the heat flow of the Eastern Gulf of Mexico, an empirical study of these reservoirs indicates that the cut-off depth is below approximately 10,000 feet.

The Independence Hub *continued on page 15*

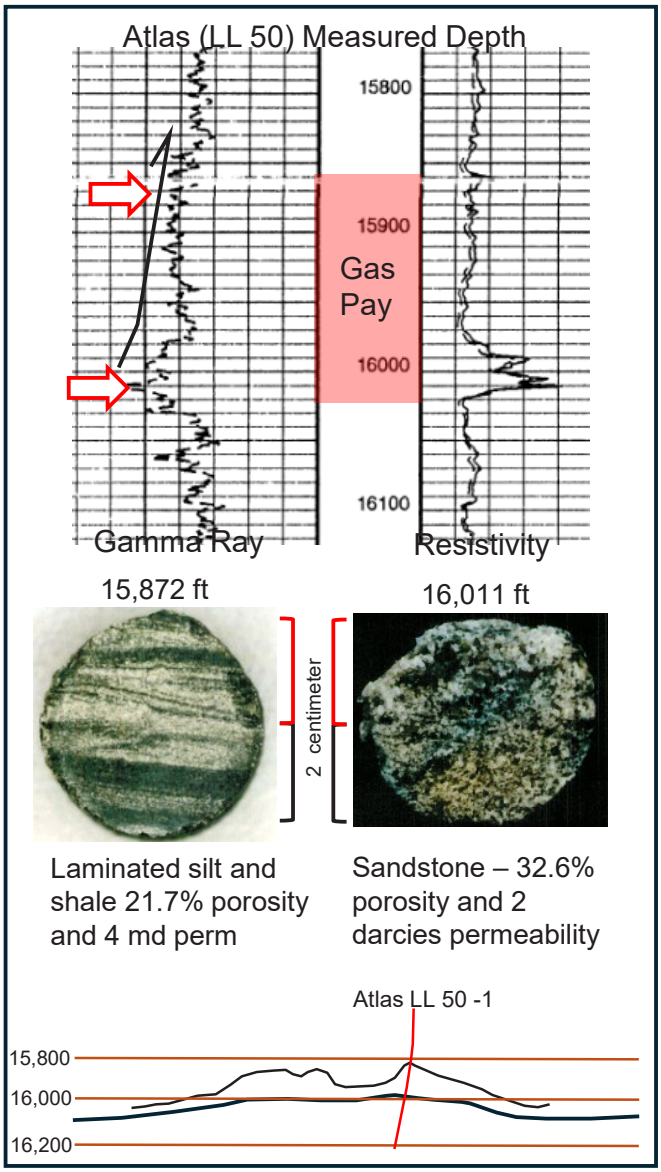

Figure 5. *Log of the channel levee facies showing the area in red of Gas saturation. Also shown are two sidewall core photos, at the positions of the red arrows, a laminated reservoir of silt and shale, and one of sandstone. There is also a seismic tracing Seismic tracing of upper and lower sand boundary displaying the typical gall-wing geometry of a leveed system at the bottom*

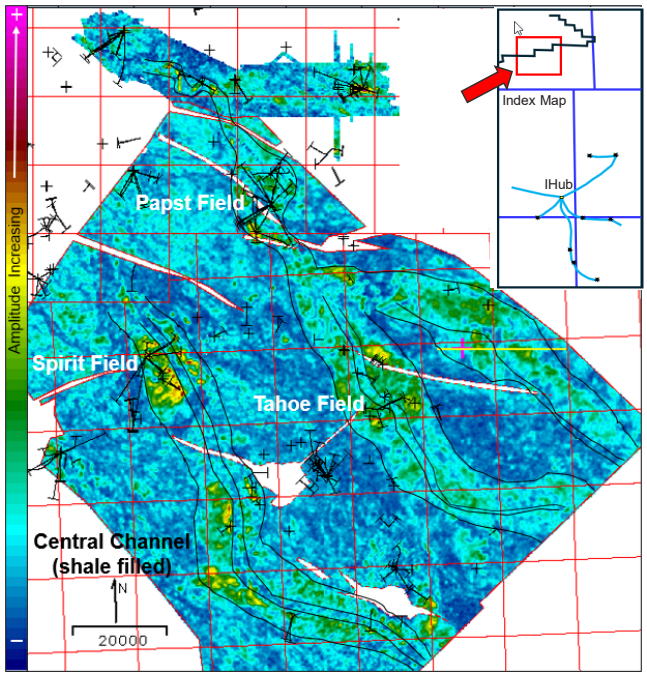

Figure 6. *Modified after Godo (2006) An amplitude extraction along the UVIG 3 sand horizon (Tortonian – Late Miocene). The stronger amplitude (in yellow) represents gas saturation. The black boundary lines outline the extent of the leveed sand system, with the narrower bands inside the wider black band representing the shale-filled (low amplitude)*

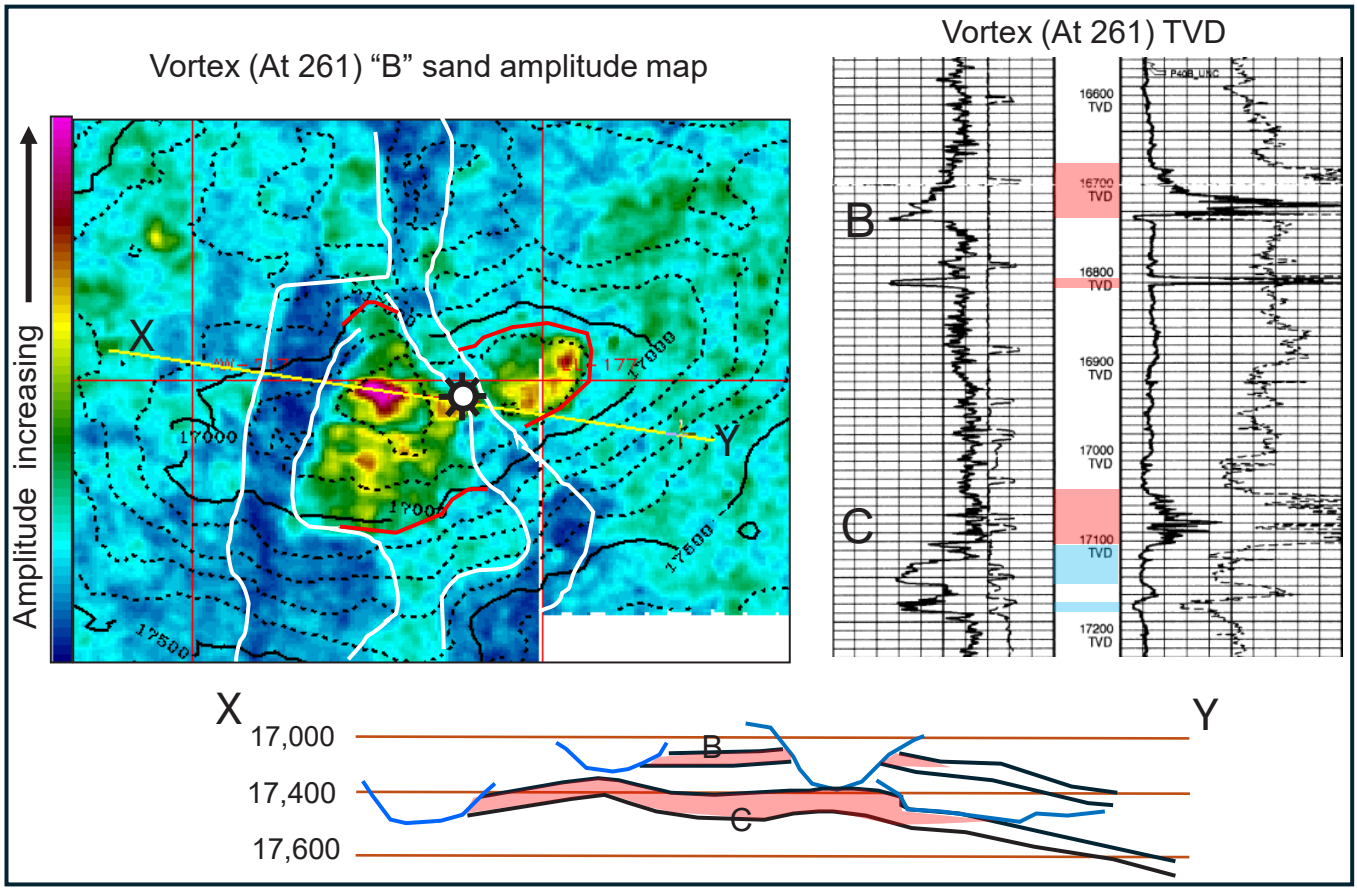

Figure 7. *An amplitude extraction and structure map on the "B" sand pay level (see log of the "B" and "C" gas pay sandstones. The cross-section X-Y shown on the map is also shown as a seismic drawing at the bottom of the figure. Note the erosional channels that cannibalize early sandstone deposits.*

HYDROCARBON COMPOSITION AND POSSIBLE EVIDENCE FOR A NEW JURASSIC SOURCE ROCK

Previous literature reports and the February and current HGS Bulletin have described the unpenetrated, pre-Oxfordian section as the SAKARN series (Rivas, 2019; Moore, 2024; Godo, 2025). Rivas (2019) chose the name SAKARN as an acronym for the favored concept of the lithologic sequence: salt -anhydrite – carbonate + Norphlet. The index map showing the location of four cross-sections based on seismic drawings is shown in **Figure 8**. The SAKARN series is confined to polygon-shaped basins containing pre-Oxfordian sediment. A portion of the area is shown as a tan-colored region in Figure 8. The first cross-section (**Figure 9**) shows that the Swordfish (dryhole) has fully penetrated the known stratigraphic section. In Swordfish, we can calibrate the maturity of the C/T (Cenomanian/Turonian) Eagleford, the Tithonian, and the Oxfordian (Smackover) source rocks. The objective Norphlet at Swordfish had no hydrocarbons. The Smackover source rock just above the Norphlet at about 15,000 ft BML, had just entered the oil window and had oil within pores and fractures still contained in the source rock. Oil saturation in the source rock was rising, but it hadn't reached sufficient thermal maturity to generate and expel more oil. The top of the oil window is shown as a green line on the cross-section (**Figure 9**), and a vertical green bar shows the subsurface depth of the top oil window. Moving south from Swordfish on the cross-section, we see the interpreted SAKARN section expanded in a thicker section compared to the known Upper Jurassic stratigraphy of Swordfish that thins and overlies the SAKARN. *Before we move on, I want to pause for a moment and clarify, especially for the structural experts reading this, that this cross-section looks a bit odd. It also did to us back in the day until we could see seismic lines that covered the entire area out to the oceanic basement. What do I mean by looking "odd"? Most structural geologists will view a "regional structural gradient" as a dip extending deeper into the basin. Here we see that the known Upper Jurassic thins and remains structurally high for quite a distance. In fact, the known Upper Jurassic maps as a single structural bulge and then lowers to the regional structural gradient nearer the oceanic edge. That "bulge" suggests a structural inversion of the sedimentary package and then would make sense in Figure 9, which shows only the structural bulge's northern edge. I say all this to say that there is a more integrated stratigraphic and structural picture of the southern EGOM basin that will not be focused on in this article.* Returning to the IHub discussion, we will continue with the description of the cross-section in **Figure 9**.

The Independence Hub *continued on page 16*

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The interpreted three Upper Jurassic source rocks are well above the oil window established at Swordfish. Atlas (LL50) reached a total depth in the Oligocene carbonates atop a salt dome. The Miocene red-colored anomaly, bound by parenthesis marks, is the Late Miocene (DHI-supported) hydrocarbon accumulation. Notice that I referred this time to hydrocarbon fields instead of "gas" fields, which is by far the dominant hydrocarbon type. As a sampling snapshot a year or two after coming online, oil and gas production from five wells is seen in **Table 1** below, and on cross-sections of this report. I do not have current access to GOM cubed or OWL to update the production. The examples provided were from screen captures taken between 2006 and 2008.

The second cross-section (**Figure 10**) shows that the Cheyenne wildcat well penetrated the entire known Upper Jurassic section through the Oxfordian Smackover. Based on a thermal maturity profile at Cheyenne (see technical article this issue), the three source rocks are either immature or just entering the oil window, as evidenced by the oil recovered from fractures in the Smackover source rock. The green horizontal line represents the top oil window 15,000 ft below the mudline. The cross-section over Cheyenne does show the drilled Upper Jurassic source rocks are slightly deeper around the flanks of the Cheyenne dome but not significantly deeper to be mature enough to expel hydrocarbons (especially with migration losses) up into the late Miocene reservoir. Therefore, it might suggest there is a source rock in the SAKARN series. The cross-section in **Figure 11** across Mondo NW (LL2) and Mondo (LL47) (dry hole) might also suggest a possible source rock in the SAKARN section. The final cross-section (**Figure 12**) is located over the Spiderman gas field. Spiderman field sits outside the area of the SAKARN graben (**Figure 8**). The seismic markers correlate easily with the known Upper Jurassic sequence. Yet, the Spiderman Miocene reservoirs also produce similar amounts of oil in the gas reservoir. This oil must have come from the known source rocks of the Upper Jurassic.

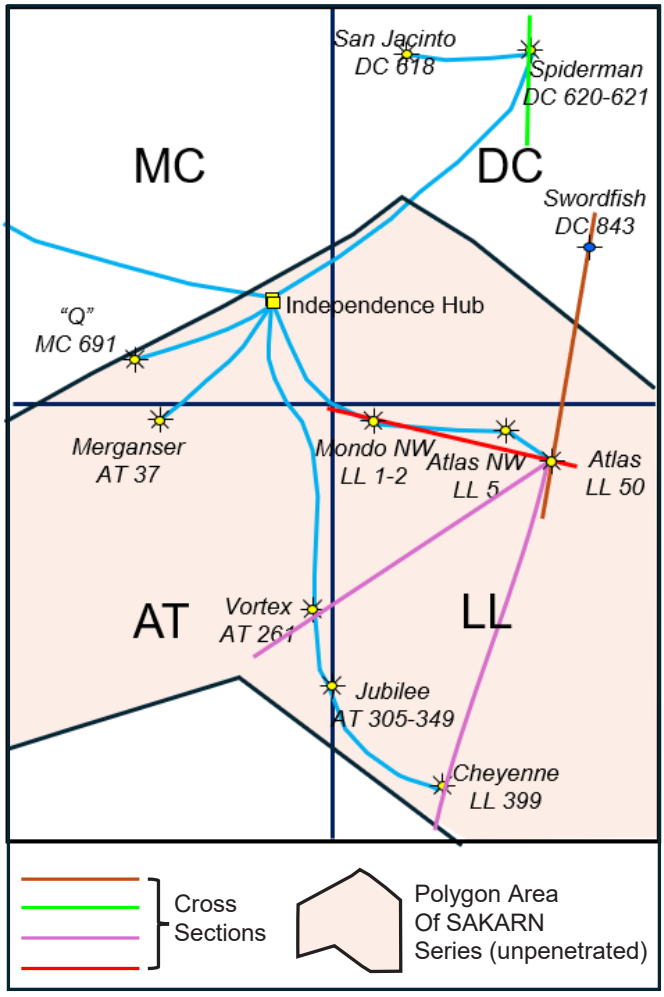

Figure 8. *Index map showing the extent of the SAKARN (pre-Oxfordian) stratigraphy shaded in the tan-shaded polygon area representing the SAKARN "graben fill". Four cross-section lines (see legend) show seismic interpretations over five gas fields with the differences between the underlying SAKARN and the underlying known upper Jurassic sequence.*

DISCUSSION

So, what does the oil and gas mixture suggest about a petroleum system in IHub area fields that overlie the SAKARN series? The oil is likely degraded, as evidenced by several of the API gravities reported as 20.6°, with the highest at 31° API. Given the cooler temperatures in the Miocene, oil degradation has likely been a continuous process since the accumulation started so that biogenic gas would have been present from the beginning (Catie Donahue, personal communication March 2025). Microbial activity may have consumed oil even during migration, and some liquids still migrated into the trap. It is clear that there is a mixed system of biogenic fluids and a thermal component. The premise of suggesting that there might be a source rock in the SAKARN series is predicated on the fact that the known Upper Jurassic source rocks are never buried much below the top of the oil window, and the SAKARN series is buried deeper into the windows of oil and gas generation. Could the present 20 to 30° API degraded oil have once had a higher API gravity generated below the Upper Jurassic known source rocks? Also, could there be a thermogenic gas component generated from deeper in the SAKARN that is only now masked by biogenic activity? Isotopic analysis might further assess its maturity, and there might be a difference between the "almost mature" and gas window samples (Catie Donahue, personal communication).

SUMMARY

This feature article aims to highlight the innovative collaboration among several oil companies and suggest based on the fluid, a new Jurassic source rock. These companies had initially found gas reserves that were too small to justify building a platform

The Independence Hub *continued on page 17*

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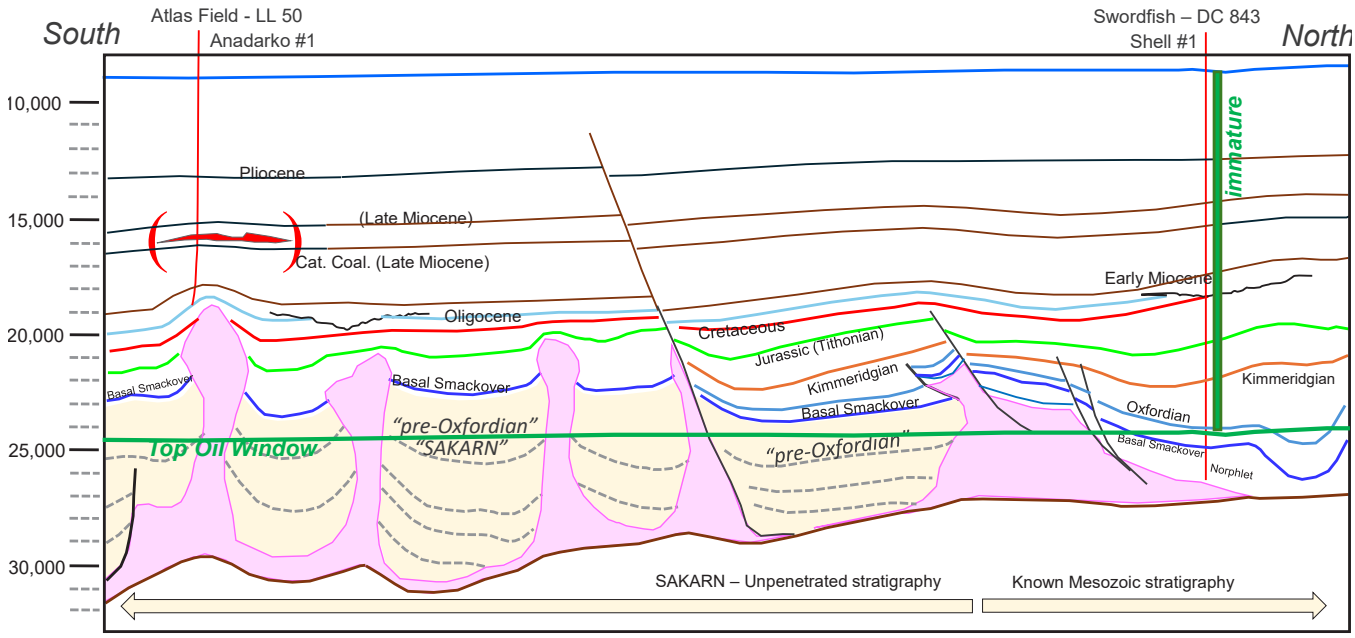

Figure 9. *The cross-section begins on the right with the dry hole "Swordfish" penetrating the Norphlet and reaching TD at the Louann salt just above the basal detachment. Moving southward from Swordfish, the known Mesozoic sequence from Oxfordian to top Cretaceous structurally rises and stays relatively flat around various salt domes while the deeper section, shown in dull yellow, is present with great thickness around these same salt domes. This dull yellow section is interpreted to be a pre-Oxfordian SAKARN unpenetrated sequence. The top of the oil window is established by the maturity profile at Swordfish and extended southward an equidistance below the mudline. Note the Atlas gas field in red of the Late Miocene.*

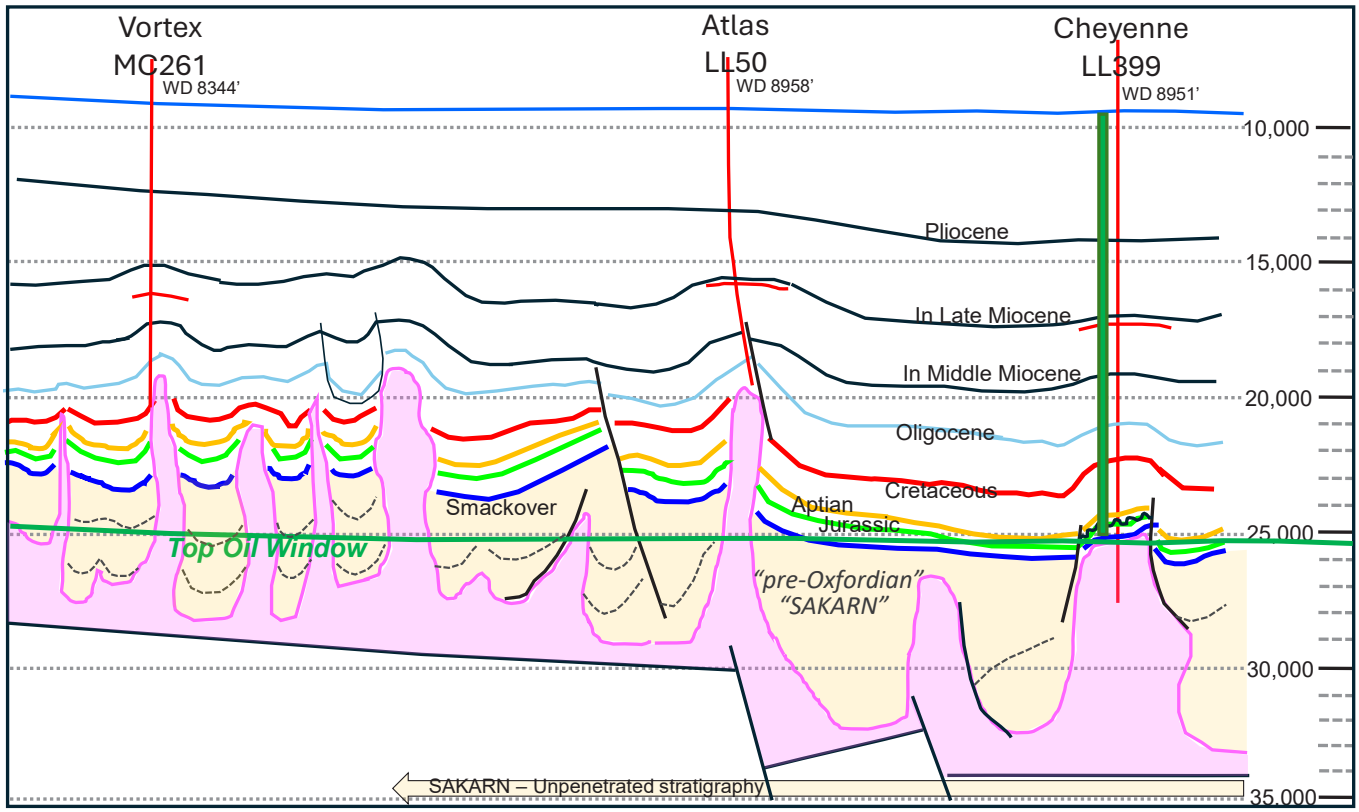

Figure 10. *This cross-section at the right shows the Cheyenne well that penetrated the known Mesozoic section, reaching the Oxfordian and drilling well into salt. The top of the oil window is established by the maturity profile at Cheyenne and extended the top oil window as a marker, northward to Atlas and then southwest to Vortex, an equidistance below the mudline. The known Mesozoic source rocks are less buried and structurally shallower beneath the gas field of Atlas and Vortex. Where do the liquid (thermal) components of the produced gas originate?*

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TABLE 1 – PARTIAL SAMPLING OF FIELD WELLS	
Atlas (LL50)	SS1 well – 12/2006- from perfs 15,984-16,004 produced a cumulative (cum) total of 9,941,986 MCF and 3,070 barrels of oil with 18.2 API gravity
Atlas NW (LL5)	SS1 well – 1/2007-from perfs 15,932-15,952 produced a cum total of 18,337,433MCF and 5,996 Barrels of oil with 18.2 AP gravity
Vortex (AT 261)	SS1 well – 6/2006 from perfs 18,314-18,354 produced a cum total of 58,313,811 MCF and 19,443 Barrels of oil with 20.6 API gravity
Cheyenne (LL399)	SS2 well 10/2006 from perfs 17,318-17,358 produced a cum total of 70,353,185 with 22,973 Barrels of oil with 20.6 API gravity
	SS3 well – 3/2008 from perfs 18,509-18,544 produced a cum total of 69,795,712 MCF and 19,842 Barrels of oil with 20.6 API gravity
Mondo NW (LL1&2)	SS1 well – 2007 – from perfs 16,322-16,380ft produced a cum total of 27,627,909MCF with 8,993 barrels of oil
	SS 1 well - 2010 – from perfs 16,170-16,200 was producing 48,628 MCFPD with 9 Barrels of oil per day having a 30.1 API gravity, and then in 2011, the production rate was down to 41,364MCFPD with 5 Barrels of oil having a 20.6 API gravity.
Spiderman (DC 620&621)	SS1 well – 9/2006 -from perfs 16,890-16,940 produced 77,423,666 MCF and 25,917 Barrels of oil with 20.6 API gravity
	SS2 well – 3/2007 – from perfs 19,838-19,870 produced 5,467,266 MCF and 1,934 Barrels of oil with 22.3 API gravity.

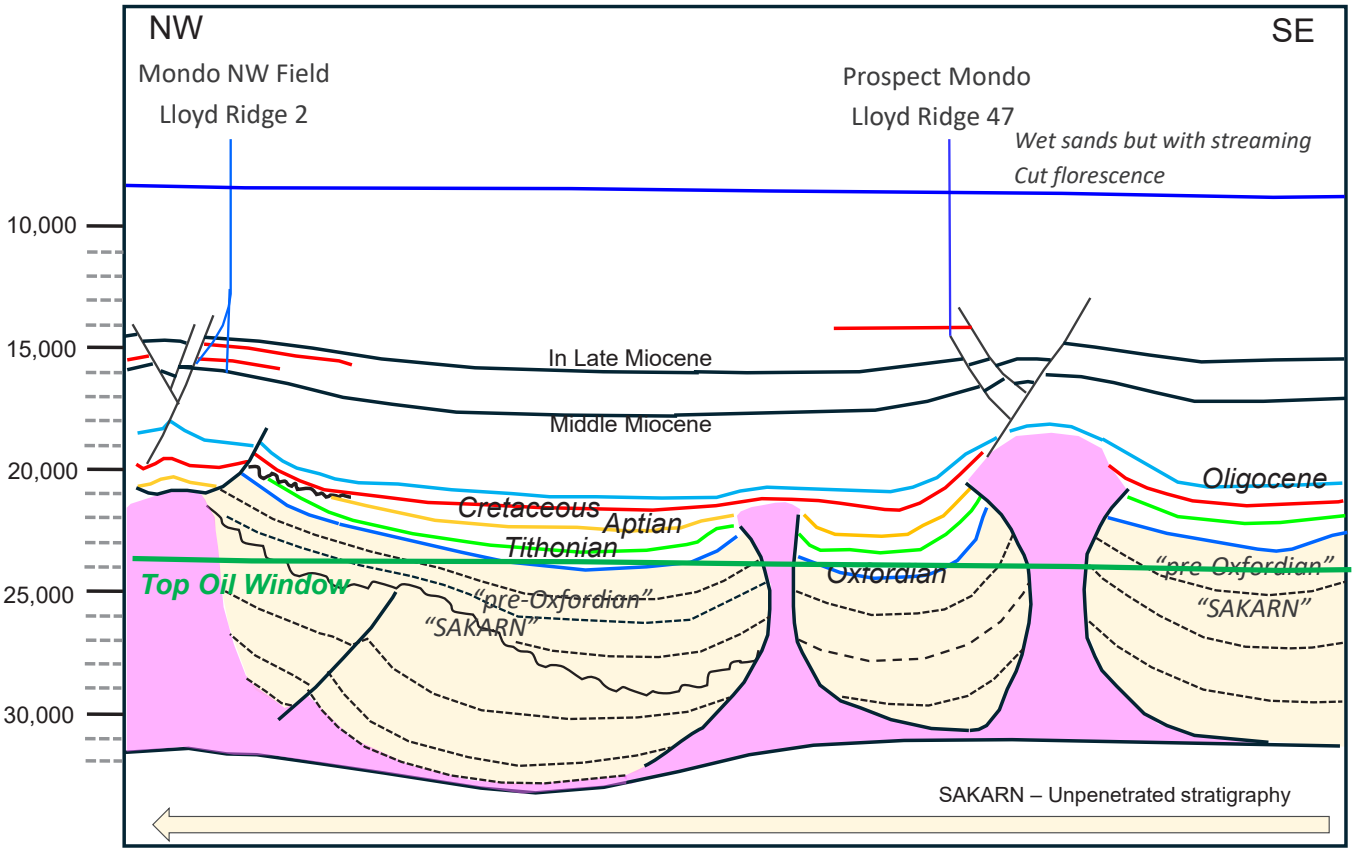

Figure 11. *This cross-section traverses the gas field of Mondo NW (LL2) from left to right, tied to the IHub produced from Late Miocene reservoirs. Also shown is Prospect Mondo (LL 47), which drilled a DHI-supported anomaly and found wet sands with a streaming cut fluorescence. The oil window established at Cheyenne is shown as a green line across the cross-section. The known Tithonian and Oxfordian source rocks barely reach the top oil window. However, oil was recovered with the gas at Mondo NW, and a streamlining oil cut was found in Mondo. Is this evidence of a deeper SAKARN source rock, or did it come from barely mature known Jurassic source rocks?*

The Independence Hub *continued on page 19*

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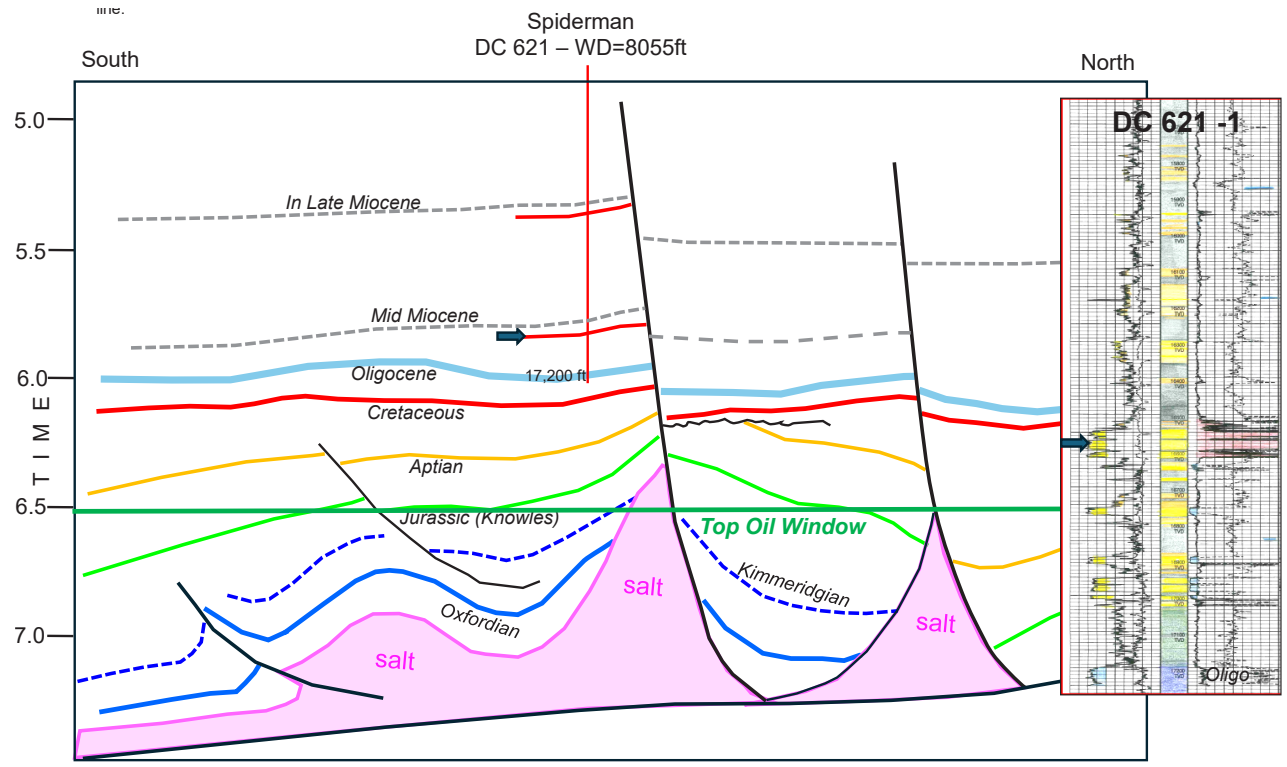

Figure 12. *This cross-section is over the Spiderman's middle and Late Miocene gas reservoirs that did produce some oil. Spiderman is located beyond the area of the SAKARN series. Deep well penetration nearby such as Petersburg (DC529) provide easy correlations of the Upper Jurassic horizons including the Oxfordian. There is no evidence of a thick SAKARN sequence below Spiderman. The Jurassic and especially the Oxfordian source rocks are well below the oil window as seen as the green "horizontal" line.*

and pipeline for market access. The IHub was designed and built by these companies and located in a central position to collect the gas via subsea flowlines from each of the eleven gas fields. Interestingly, the fluids produced from these tieback fields located over the unpenetrated SAKARN section (Jurassic?) suggests an internal source rock presence. This would provide positive information to perhaps reduce the risk of exploring for a new play with a new petroleum system in the eastern Gulf of America. In alignment with the editors' theme for each issue this year, the objective is to equip readers with knowledge that inspires new inquiries for advancing exploration. ■

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Journey Through the Important Cheyenne Well in LL 399, Gulf of Mexico

By Ted Godo

Prospect Cheyenne, Lloyd Ridge 399 No. 1 BP3, penetrated the entire known Mesozoic section in the Gulf of Mexico. Cheyenne is the most basinward well positioned on continental crust but very near to oceanic transitional crust (Fig 1). Cheyenne was drilled in 2004 but is still used today by industry as the key well to tie seismic data for mapping onto the oceanic crust. Cheyenne is 111 nautical miles from the nearest Louisiana shore and 159 miles south of the Alabama coast. The well penetrates the Cretaceous and Upper Jurassic Smackover before drilling into anhydrite (caprock) and halite lithologies. An 8 5/8 inch casing liner was set at the top of the salt section, and drilling continued for an additional 1917 feet of entirely salt before reaching a total depth of 27,721 ft TVD. As the geologist who drilled Cheyenne, it's frankly past time for a full accounting of what was drilled.

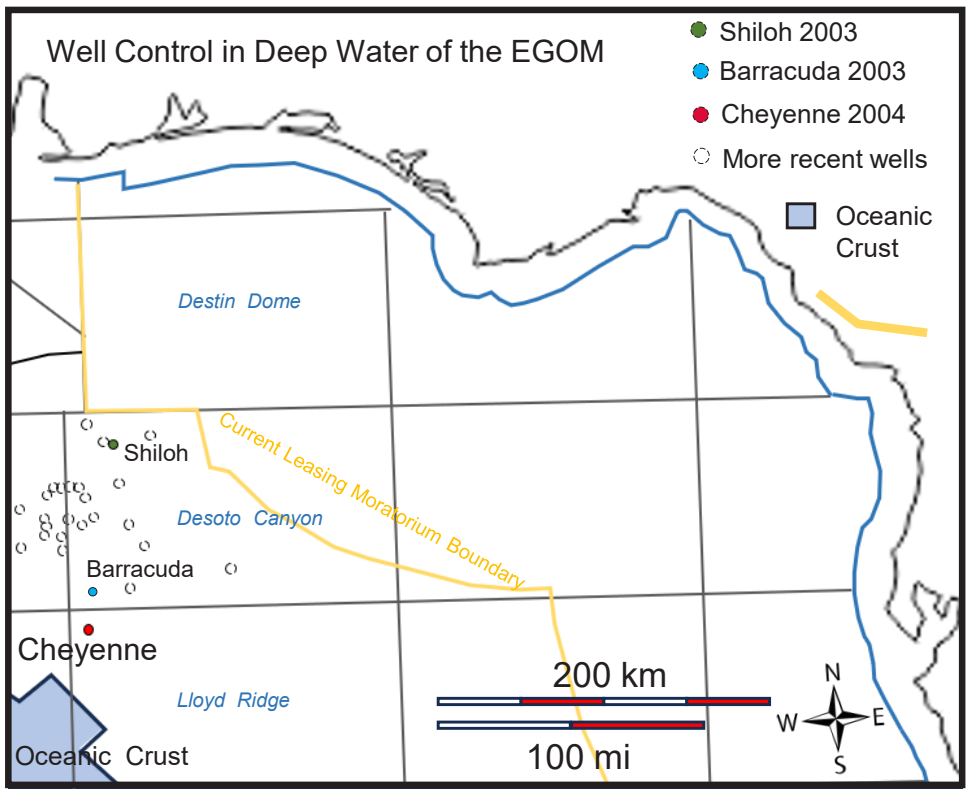

Figure 1. *Location map for the Cheyenne well (LL399-1bp3) and the Barracuda (DC 927-1). The shaded area in the far southwest portion of the index map shows that the Cheyenne well is closest to the oceanic crust*

Spudded May 22, 2004, Prospect Cheyenne was the second Shell well drilled in the eastern Gulf of Mexico (EGOM). Shell acquired a significant lease position which included Cheyenne leases, in the 2001 lease sale (#181). Shell's strategy in that sale was to target prospects having a Jurassic section as the primary target but included testing the entire Mesozoic section. Regional geological models suggested that the uncalibrated Jurassic clastic reservoirs would have the potential for economic hydrocarbon deliverability. Besides the Mesozoic section of interest, Cheyenne had a robust upper Miocene amplitude above the drill location for the Mesozoic section. Shell's strategy at the time did not prioritize the Miocene amplitude play for economically viable volumes in a deepwater outboard segment. However, Shell realized that other competitors were playing Miocene amplitudes. Therefore, bidding on the Cheyenne blocks would also need to be high to compete against likely multiple bids. Shell was right and placed a bid for $22.1 million for LL399. Anadarko came in second place, bidding $21 million, followed by four other competitors for a total of 6 competitive bids. The Mesozoic structure also included block LL400 (Fig. 2), which has a smaller Miocene amplitude at the same level. Shell bid $11.1 million, Anadarko bid second at $1 million, and two other companies placed much smaller bids. However, only Shell was playing the Mesozoic structures.

The primary objective at Cheyenne is the Jurassic section, with secondary objectives in the Cretaceous, all inside of four-way dip closure (Fig 3). Three AvO amplitude anomalies, named "A," "B," and "C," were believed to correspond to sandstones from the Cotton Valley (Tithonian) and Haynesville (Kimmeridgian) formations. The deepest Jurassic-aged objective was thought to be possibly of the onshore Haynesville sand equivalent. The A, B, and C objectives were in the oil window at the crest, with the adjacent synclines more thermally mature. The potential A, B, and C targets were considered deltaic or turbidite sands sealed by intraformational shale. The Cretaceous-aged secondary objectives were considered equivalent to the onshore named Hosston/ Calvin sandstones. Hydrocarbon charge into potential sands or carbonates facies of this objective is by the underlying Jurassic source rocks with hydrocarbons that would migrate up the flank and through minor crestal faulting. The main risks were reservoir absence/quality.

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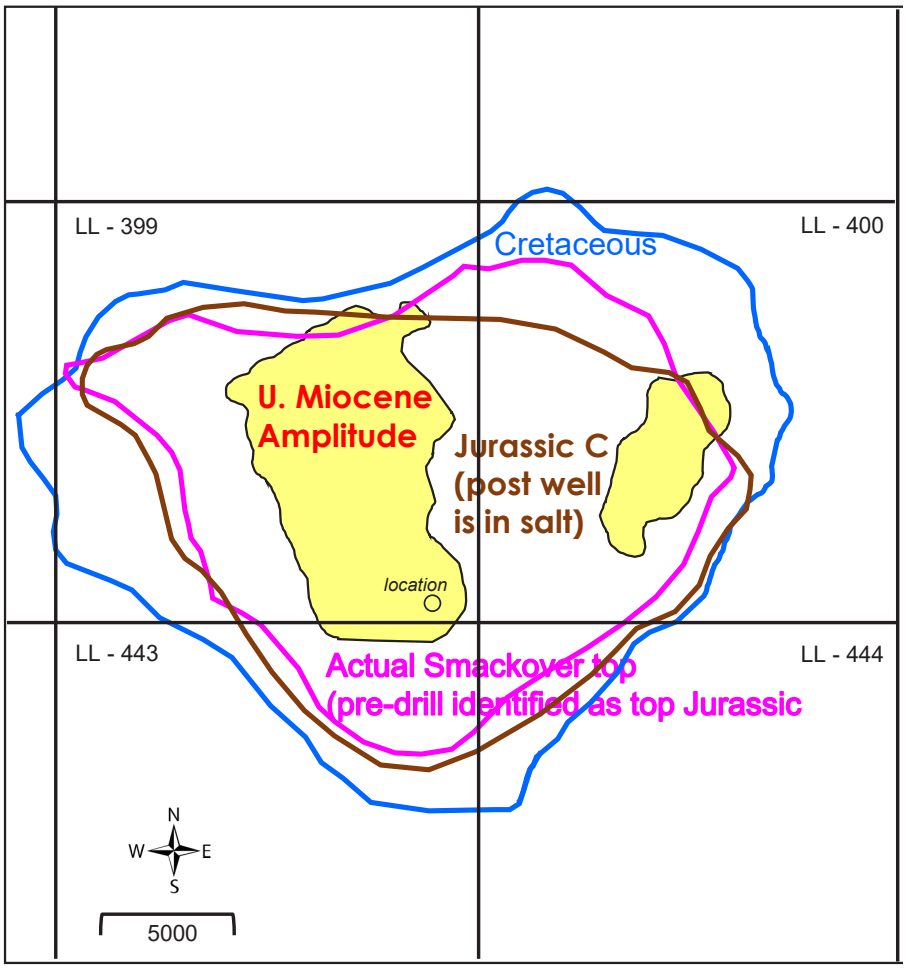

Figure 2 *Colored outlines of horizons that display four-way dip closures. The Cretaceous top (blue) and the top Smackover horizon (Pink) were interpreted as being near the top of the Jurassic. The brown horizon was mapped on converted shear wave events within salt. The yellow-filled polygons are proven DHI upper Miocene Amplitudes. The Cheyenne is located in the southeast corner of block 399.*

The results of the Cheyenne original and bypass holes confirmed some subsurface models and geologic formations such as the upper Miocene "gas" sandstone, top Cretaceous, and top Jurassic (Tithonian source rock). Drilling into the Smackover and anhydrite section was a completely unexpected surprise. The grossly inaccurate correlation of the Smackover provided support for a regional re-calibration of the ages of the thick sedimentary sequences located all around the flanks and basin fill surrounding the Cheyenne structure. In 2003-04, the idea of a new stratigraphy that was very thick and predated the Oxfordian (Smackover) was not considered. The two wells for correlation were Shiloh (DC 269) and Barracuda (DC 927). Seismic correlations that tied these wells were then interpreted southward to Cheyenne, but these had to deal with how to interpret across expanding or growth faults. At that time, the interpretation model was to pick low and use the known stratigraphic package to account for all reflections above the basal "salt" detachment. Cheyenne's surprise encounter with the Smackover required new criteria for choosing high-road or low-road correlations across expanding faults. This new "high-road" correlation of the Smackover required a new naming for the unpenetrated (pre-Smackover) seismic reflections. Within Shell, it was called the "mystery section," but it was formally named the SAKARN series by publication (Rivas, 2019; Moore, 2024) (see also HGS February *Bulletin*).

When the Cheyenne wildcat well first penetrated the Smackover and then drilled through thick anhydrite and then penetrated salt, drilling was paused. It was paused because the team was confronted with a decision that needed to be made quickly, as money for daily idle rig time was adding up. The decision was whether to stop further drilling and call TD or set casing and continue drilling deeper (**Figures 3 and 4**). Much vociferous discussion was happening among the team members as the rig awaited orders. Our "real-time" paleo calls were one piece of information that had to be considered. Both the Kimmeridgian and the Oxfordian paleo picks were not well established then in the deep water. Hence, considerable uncertainty made the decision difficult. These early "real-time" paleo calls, indicated the carbonate section was "no older than Kimmeridgian," but he also had something else to say, relying on his onshore personal experience. When he observed the carbonate section with a red shale base sitting directly on anhydrite, he said, "If it walks and quacks like a [Smackover] duck, then it is probably a duck." Now enter the geophysicist, who was also lobbying the geologist to find a model to incorporate the "walk like a duck" statement but still make the untested AvO-supported objectives still a viable target. These three objectives (A, B, and C) should occur in the next 1500 feet. Two examples of team statements were, "We are already on location and ready to drill; it will never be cheaper than to drill now rather than to come back and drill these anomalies," and "We need to learn with this wildcat well." So, the geologic model was adjusted to say we should continue drilling to the A, B, and C targets. The well might be at the top of a salt dome with a bulbous head and narrowing flanks so that we could drill out of salt, cross into a downthrown block, and encounter the three objectives. Orders were then made to the rig to set an 8 5/8 inch casing liner and drill approximately 1800 feet more to the final depth (**Figure 4**).

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Journey Through the Important Cheyenne Well continued from page 24

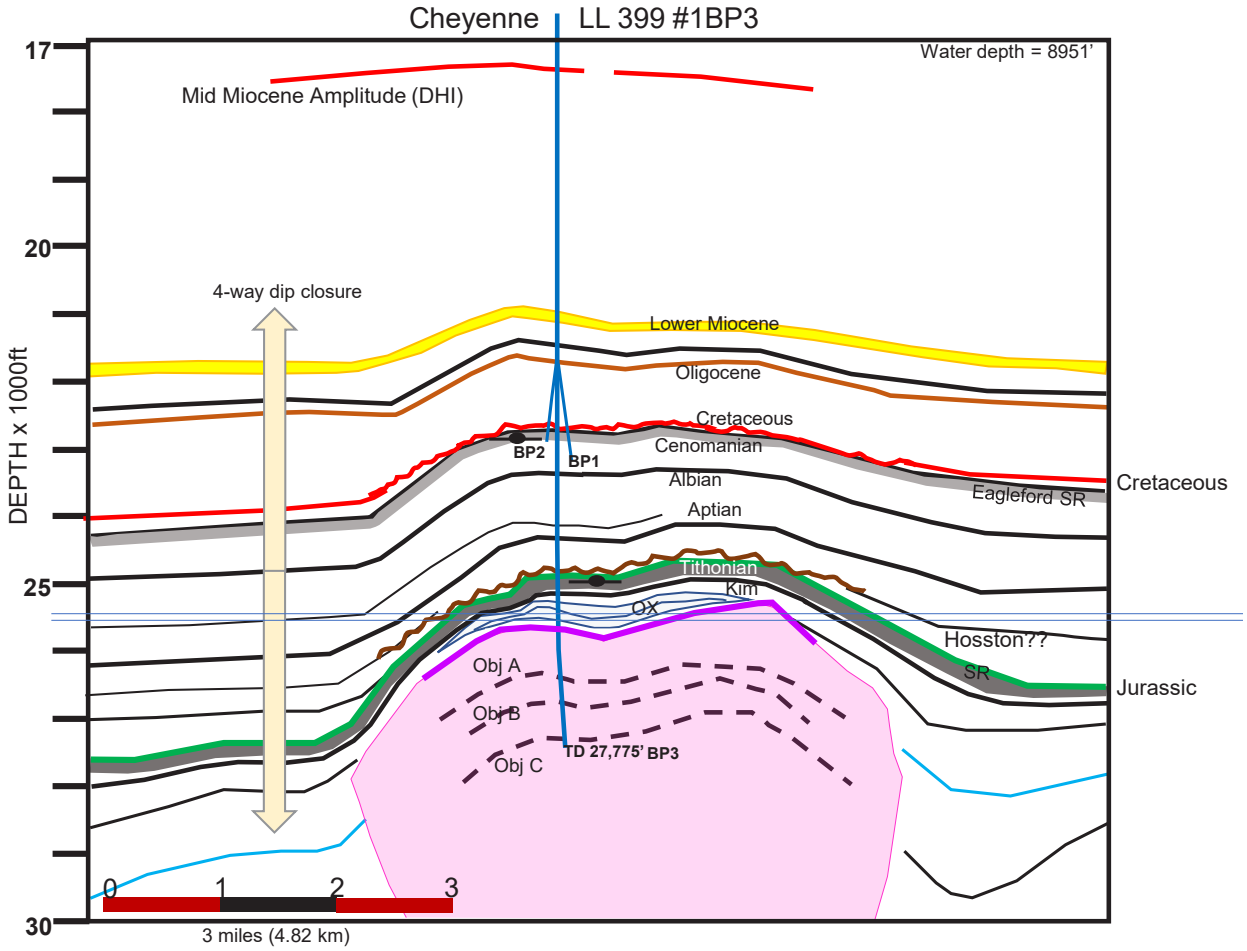

Figure 3 *The cross section is a seismic line interpretation incorporating the formation tops found in Cheyenne. The upper Miocene (red) event is a stratigraphic trap that found "dry gas". The Lower Miocene to TD of the well drilled simple four-way dip closure. Note the wells two bypass (bp) wells needed to successfully drill through and seal off the Eagleford with casing before drilling the bp3 well to total depth.*

The following four sections will highlight different learning intervals from Cheyenne.

- Upper Miocene Gas discovery with production going into the Independence Hub
- Eagleford source rock shale where two bypass holes were needed to continue drilling
- Missing ~10-12 million years of lower Cretaceous sediments above the Tithonian unconformity in Barracuda (DC 927) and Cheyenne (LL399)
- The Jurassic salt dome and caprock post-drill model
- Seismic artifacts for the Jurassic A, B, and C objectives

UPPER MIOCENE GAS DISCOVERY

The age of the upper Miocene gas sand is slightly older than the Discoaster bollii and younger than the Catinaster coalitus nannofossils, which correspond to about 9.3 to 9.4 mybp or late Miocene (in Tortonian stage). The top of the pay sand is at 17,355 feet, and the interval was drilled using a 10.3 ppg (pound per gallon) mud weight. The well found 45 feet of net pay in a sand with a 92 percent net-to-gross ratio. The average porosity is 27.4%, with an air permeability of 891 millidarcies. Anadarko later drilled two subsea wells for development. The first production occurred in July 2007, with Cheyenne's peak capacity at around 200mcf/day. The subsea unit required making a new world record for the deepest subsea production tree at 9,000 feet of water. For additional information on Cheyenne's Miocene production, see the "feature article" on the Independence Hub this month.

EAGLEFORD SHALE SOURCE ROCK

The Eagleford source rock shale was not an objective in Cheyenne. The seismic "soft loop" of the Eagleford was identified (correctly) and was used as a marker for a planned casing point a few hundred feet below. However, what was considered a standard casing point resulted in massive problems getting the casing point set as the hole continued to cave in from the overlying Eagleford shale (**Figure 5**). These problems added 47 days to the operation and cost some 24 million dollars. What caused the hole to collapse? First, we begin with a description of the Eagleford shale at Cheyenne. The Eagleford gross thickness in Cheyenne is 80 feet from 22,740 to 22,820 (Turonian to late-mid Cenomanian, aka C/T). Total organic carbon (TOC) averages about 3 percent (range 2-4) with a VRE of 0.55%. The Eagleford shale represents

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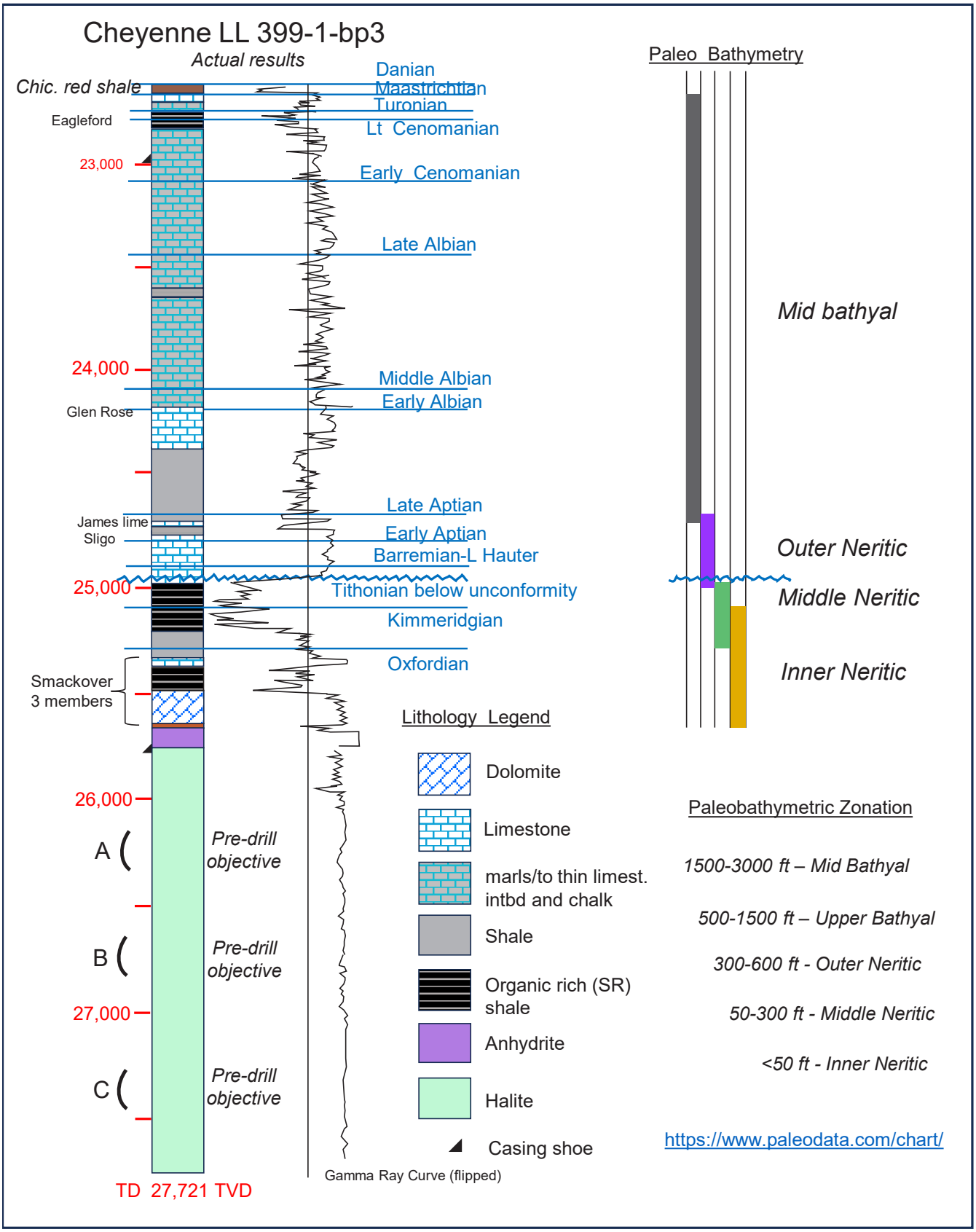

Figure 4 *The well log shows the actual results of Cheyenne and is annotated with the pre-drill objectives (A, B, and C), which are now known as seismic artifacts within a "clean" halite section. Note the lithologic descriptions, specifically the unique all-dolomite lower Smackover and the thick anhydrite (caprock). Also shown are the paleo bathymetries of ages, which show the signature gradual shallowing of Gulf waters through to the Upper Cretaceous.*

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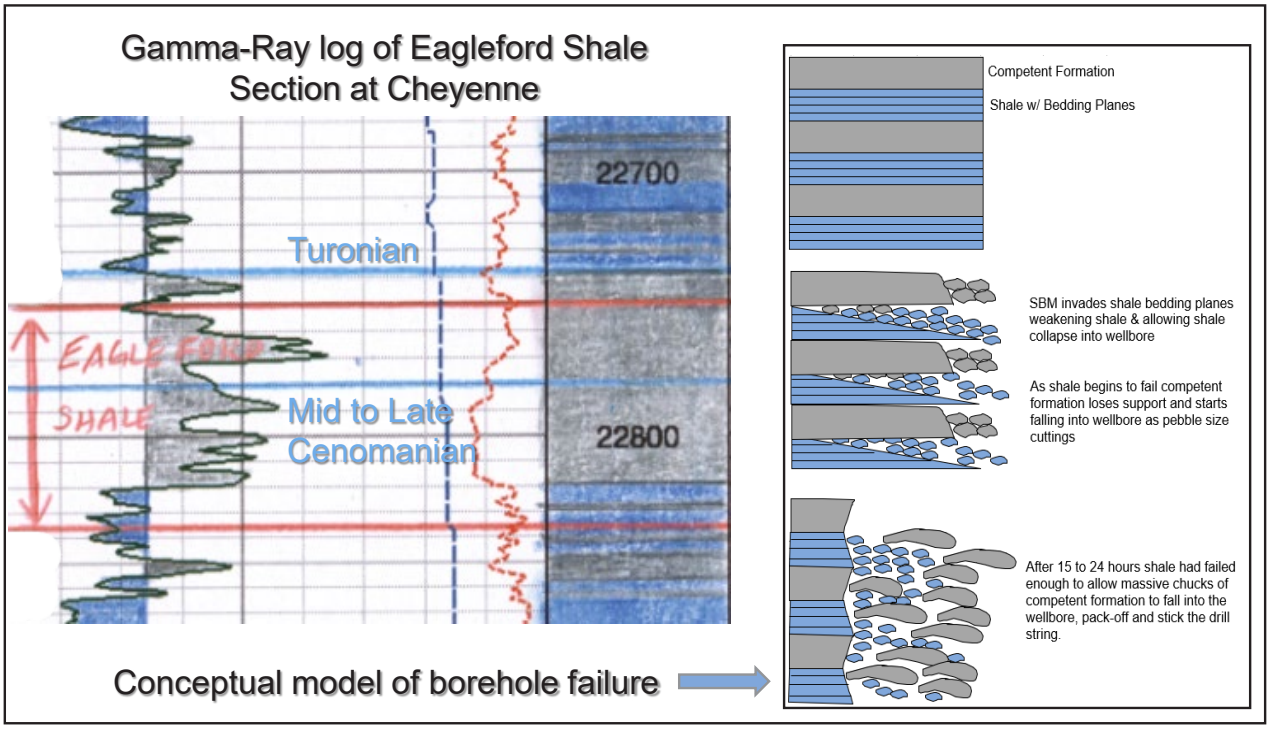

Figure 5 *A gamma-ray log showing the depth interval and ages of the Eagleford Shale in Cheyenne. The figure to the right shows a possible conceptual model of wellbore failure.*

the Oceanic Anoxic Event-2 (OAE-2) (Leckie, 2002; Erbacher, 2006). The descriptions from the DSDP cores (Leckie, 2002) of laminated chalk and shale match identically with the Eagleford at Cheyenne (**Figure 6**). The story continues.

True to the pre-drill plan, the Eagleford shale was penetrated, with drilling continuing to about 600 feet below the shale. The first problem is that drilling continued for nearly 24 hours while the Eagleford was exposed to the borehole and began collapsing. Secondly, the pumps were turned on in the middle of the Eagleford and left there while "cleaning" the hole of cuttings. The belief is that the wellbore failed due to synthetic base mud (SMB)invading the brittle, thin, laminated shale beds of the Eagleford. The "SMB" used at Cheyenne likely acted as a lubricant once it invaded the formation, which caused the laminated chalk and shales to fail along the tectonically stressed bedding planes and slough into the well bore. Differential permeability in the chalk versus the shale laminations would act as an initial collapse, causing larger sections above to eventually pack around the drill string and the drill bit to become stuck.

Experienced practice drilling the Eagleford onshore to minimize hole sloughing from the Eagleford is to reduce the time-dependent vulnerability of borehole exposure. But the closest offset well control that reached the Oxfordian is Prospect Barracuda, situated 32 miles north of Cheyenne in Desoto Canyon Block 927 (DC927-1) (**Figure 7**). In 2003, Kerr McGee drilled through the 60-foot thick Eagleford shale without any reported issues. Therefore, there was no concern before drilling Cheyenne that this formation could present a problem in drilling.

Three source rock intervals were found in Cheyenne that are common to all Mesozoic wells: (C/T) Eagleford Shale (**Figure 6**), Tithonian Shale, and (Oxfordian) Smackover (lower member limestone and middle member mudstone) (**Figure 8**). **Figure 4** summarizes the Mesozoic deposition environments. The Eagleford laminated chalk and shale were deposited in deep water, while the Tithonian and Oxfordian source rocks were deposited in shallower environments of middle and inner neritic water depths (typical of all wells in the EGOM).

MISSING ~10-12 MILLION YEARS OF LOWER CRETACEOUS SEDIMENTS IN BARRACUDA DC927 AND CHEYENNE LL399)

Similar time-gap unconformities in both the Cheyenne and the Barracuda well, are bounded by roughly the same time periods and formations. Both unconformities are found after drilling into the Sligo Formation (Aptian-Barremian age). At Barracuda, most of the Valanginian and part of the Berriasian are either missing or unrecognized and highly condensed intervals representing about 10 million years (~133-143mm). At Cheyenne, the unconformity separates the lower Sligo (Late Hauterivian) from the Jurassic Tithonian period, covering approximately 12 million years (134 to 146 mybp).

Comparing the Mesozoic thickness at Cheyenne and Barracuda, we find the Cretaceous at Barracuda is much thinner than at

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Cheyenne, but the Jurassic at Barracuda is about twice as thick (1,190ft to 620ft) (**Figure 9**).

Pre-drill horizons at Cheyenne were identified using seismic correlation from Barracuda. The correlation of the top Cretaceous was accurately made. The top Jurassic was within acceptable error limits. As geoscientists know, correlating off a "high skinny" (or thin section) into an expanded section of unknown thickness is challenging. That is what occurred by seismically correlating from Barracuda to Cheyenne.

In Barracuda, the same three source rock intervals found at Cheyenne are also present. No TOC data is available from Barracuda, and the samples, we were told, were flooded in a New Orleans storage area shortly after the well was drilled. However, using log data and the Passey method of evaluating source rock richness, Brian Lecompte, petrophysicist and my colleague at Murphy, used this method to assess the Tithonian and Smackover (**Figure 10**).

THE JURASSIC SALT DOME AND CAPROCK POST-DRILL MODEL

The discussion will now shift to the section below the Tithonian unconformity and include the thick (75 ft) anhydrite deposit. The anhydrite layer is often typical in a caprock sequence that developed during the initial stages of salt dome formation. Salt dome formation occurred in pulses or intervals from the Oxfordian through the Tithonian periods. What is the evidence that circulating fluids from early salt dome formation affected the anhydrite and Smackover through Tithonian at Cheyenne? The first item to consider is how the improbable presence of a depositional "Pine Hill" anhydrite occurred this far out in the basin. The Pine Hill anhydrite formation is a well-known lateral facies of the Louann salt. The Pine Hill anhydrite is found at the updip margin of the Louann Sea, where repeated minor water level fluctuations expose the halite-forming gypsum crystals, a precursor to anhydrite formation. For example, the Pine Hill anhydrite found in Mobile Bay wells and the protraction areas of Pensacola and Destin Dome range in thickness between 10 and 30 feet. These wells are drilled near the Pine Hill depositional limit near the Pensacola Arch. Other wells drilled in the current deepwater area located near the Middle Ground Arch highland also have Pine Hill anhydrite: Perseus (DC 231), Shiloh (DC 269), Madagascar (DC 757), and Sake (DC 726). By comparison, no Pine Hill is found in wells drilled more basinward wells like at Vicksburg, Appomattox, and Rydberg (Godo, 2017; p33-34). The anhydrite thickness in Cheyenne is 75 feet, over twice as thick as the thickest stratigraphically deposited Pine Hill in up-dip

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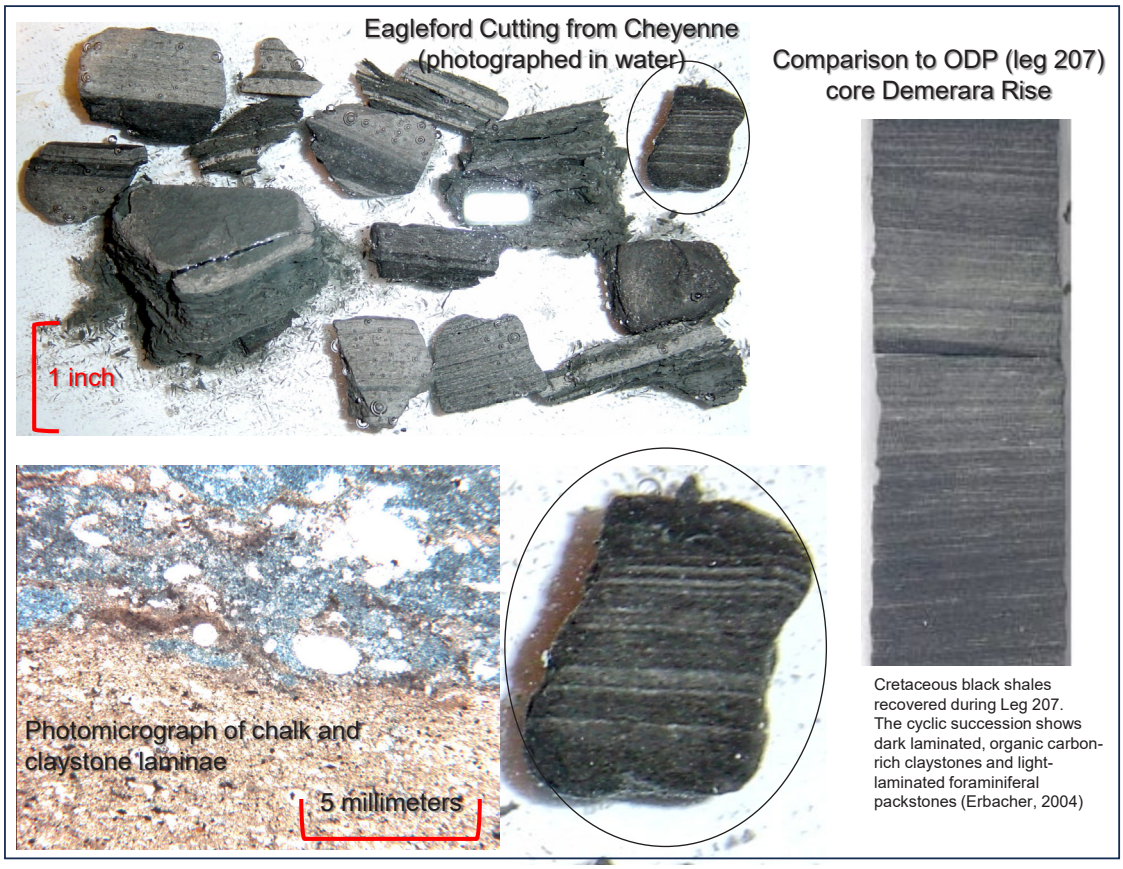

Figure 6 *Large cuttings circulated up from the "caved" zone of the Eagleford cuttings. The characteristic laminated chalk layers (lighter color) in a claystone matrix rock are shown in the cuttings submerged in water (upper left). The core at the right for comparison is taken from the Eagleford (C/T) laminated chalk claystone drilled OPD wells in leg 207 off the Demarara high in Brazil (Leckie, 2002; Erbacher, 2004)*

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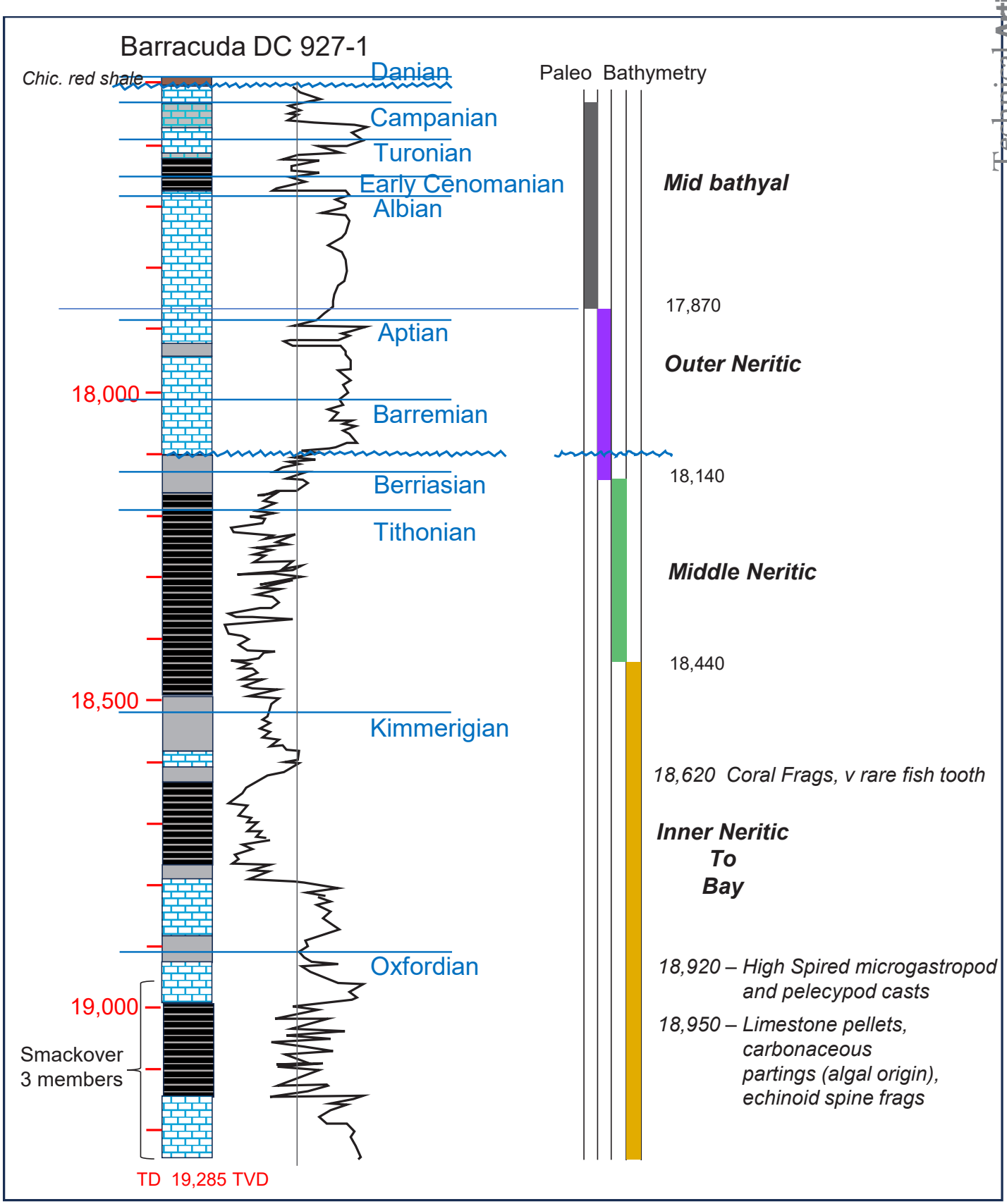

Figure 7 *Barracuda well log with the paleo-bathymetry shows the progression from inner Neritic-Bay water depth in the Oxfordian and gradually deepen through the Mesozoic and in the middle to late Cretaceous the water depths are Bathyal. Also in text are descriptions of coral, algal and other fossil fragments supporting the water depths.*

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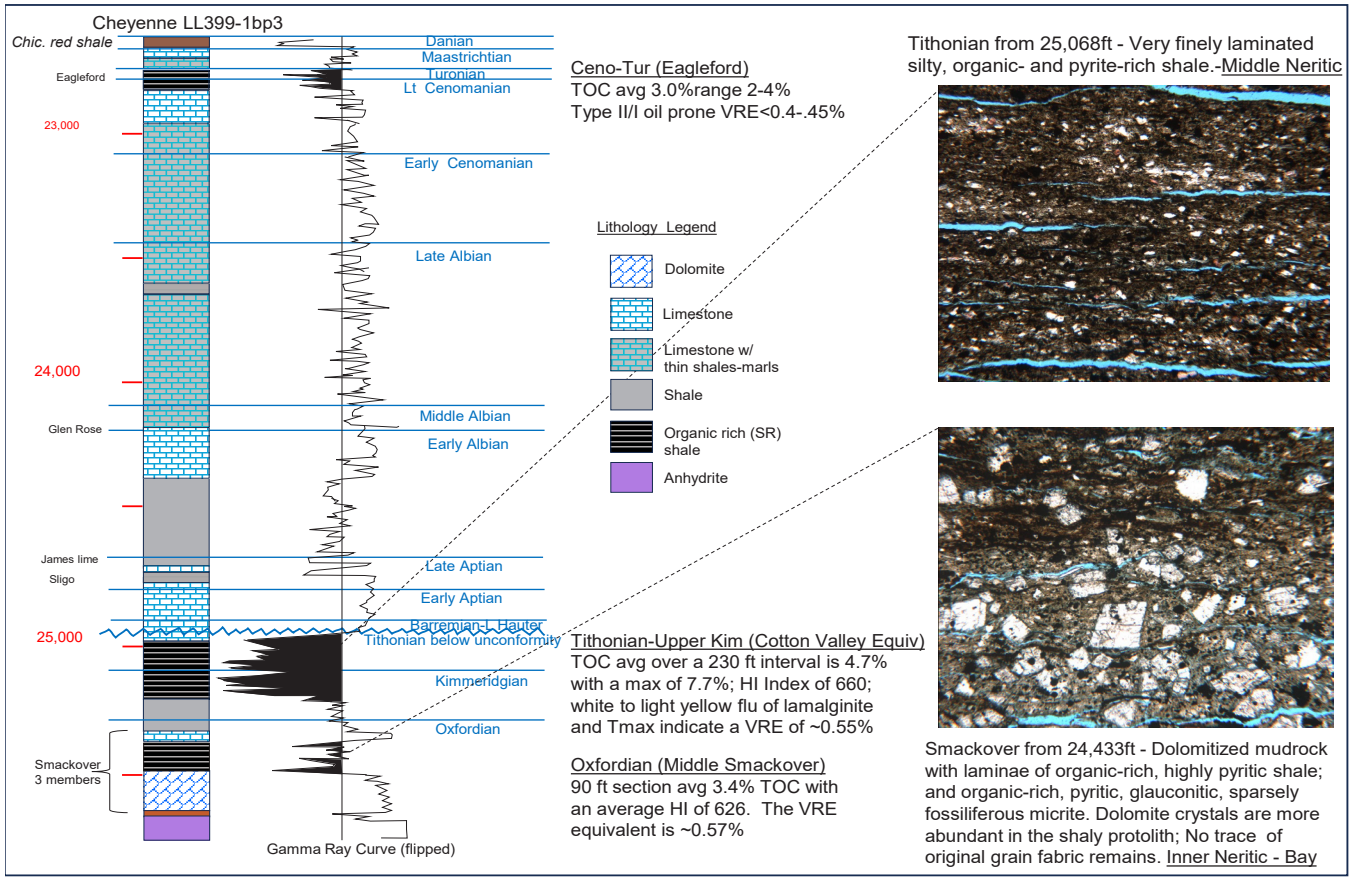

Figure 8 *Three source rock interval at Cheyenne. Summary richness and maturity values are shown in the texts located in the center column of the slide. Two representative thin section photomicrographs (one from the Tithonian and one from the Oxfordian) are shown on the right side.*

wells (excluding the Sake well which is on the basement arch). Although the origin of anhydrite caprocks on salt domes have different specific models, the observations at Cheyenne are merely suggestive. The recorded observations here may help the reader further investigate and integrate them into the best model.

The Smackover isopach at Cheyenne is also a compelling, potentially additional feature to supporting a salt dome model. The isopach shows a thinning of the Smackover near the top of the salt dome, but then at the top, it has an increased thickness. This suggests a collapse of the most crestal position during Oxfordian over the salt dome cap, possibly related to the dissolution of the underlying halite followed by an underplating of a growing anhydrite thickness (Kirkland, 2024) (**Figure 11**). Jackson (2017) describes that caprock forms at the crest of a diapir as halite dissolves and the residue is chemically altered. Supporting the flow of hydrothermal fluids at Cheyenne will be shown. Mullican (1988) discusses the collapse of shallower formations, attributing it to the loss of tensile strength caused by the arching effect over the dome roof. The failure or collapse of the dome crest is caused by a gravity pull in the center, thus creating a circular subsidence space. Whatever the method was at Cheyenne, the Smackover isopach shows a thickening in a circular area atop the salt dome (**Figure 11**).

Further supporting evidence for a salt dome model is seen by the collapse of an arched Smackover during Oxfordian deposition. This collapse occurred within the Smackover just after deposition initially began. The structural collapse then happened, with the resumption of Smackover deposition. This is seen from images taken from the Oil Based Dipmeter Image (OBMI), which strongly supports this event. Bedding within the Lower Smackover changes from unfractured regular bedding with low dip to chaotic bedding and massive fracturing over a transition interval between ~25,520 ft to ~25,580 ft. The fractured bedding then continues to the top of the anhydrite. An OBMI example image at 25,500 ft shows even bedding with no faulting or slumping compared to the second example image, which is heavily slumped and or faulted (25,600-610 ft) (**Figure 12**). The lower, most heavily disrupted bedding below approximately 25,580 feet appears to have collapsed upon itself. Above this depth, it appears to be filled by passively deposited and unfaulted Smackover.

Regarding hydrothermal processes, Warren (2019) describes three main products created by the invasion of hydrothermal fluids into a limestone host: 1) saddle dolomite (burial dolomite), 2) leached limestone ("hydrothermal karst"), and 3) sulfide

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minerals, particularly galena, and sphalerite. Katz (1971) further describes that zoned dolomite crystals are replacement products of a calcium carbonate sediment, which was dolomitized while still soft. The basal Smackover at Cheyenne exhibits some of Warren's (2019) products formed by hydrothermal fluids (**Figure 13**). Open fractures are common in the basal Smackover, as seen in the rotary core thin section (**Figure 13** middle photo). Photos taken from the rig (not shown) illustrated that the rubber packers above and below the rotary core tool blistered and stretched as they inflated into open fractures. Oil was extracted from rotary cores having open fractures with hydrocarbons. Gas Chromatography (GC) fingerprints on the extract samples indicated a local Smackover source.

The final evidence for a salt dome model is the presence of collophane. Collophane is locally common and abundant in the basal Smackover, suggesting condensed zones. The collophane intervals are in the part of the Smackover that is speculated to have

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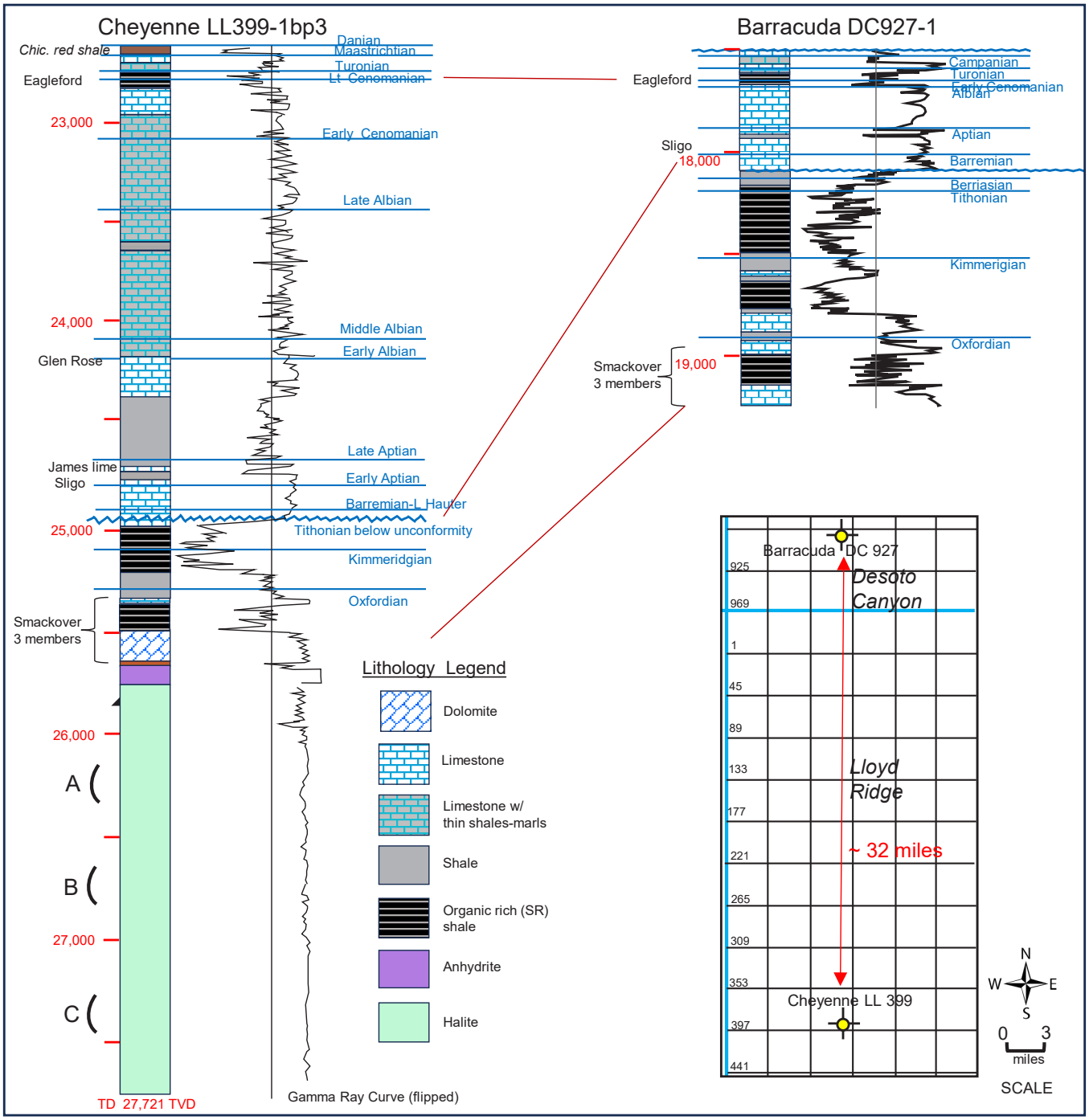

Figure 9 *Comparison of Mesozoic thicknesses in Barracuda and Cheyenne. Cheyenne has a much thicker Cretaceous section while at Barracuda the Jurassic is thicker. The index map at the lower right shows the approximate 32 miles distance between the two salt domes penetrations.*

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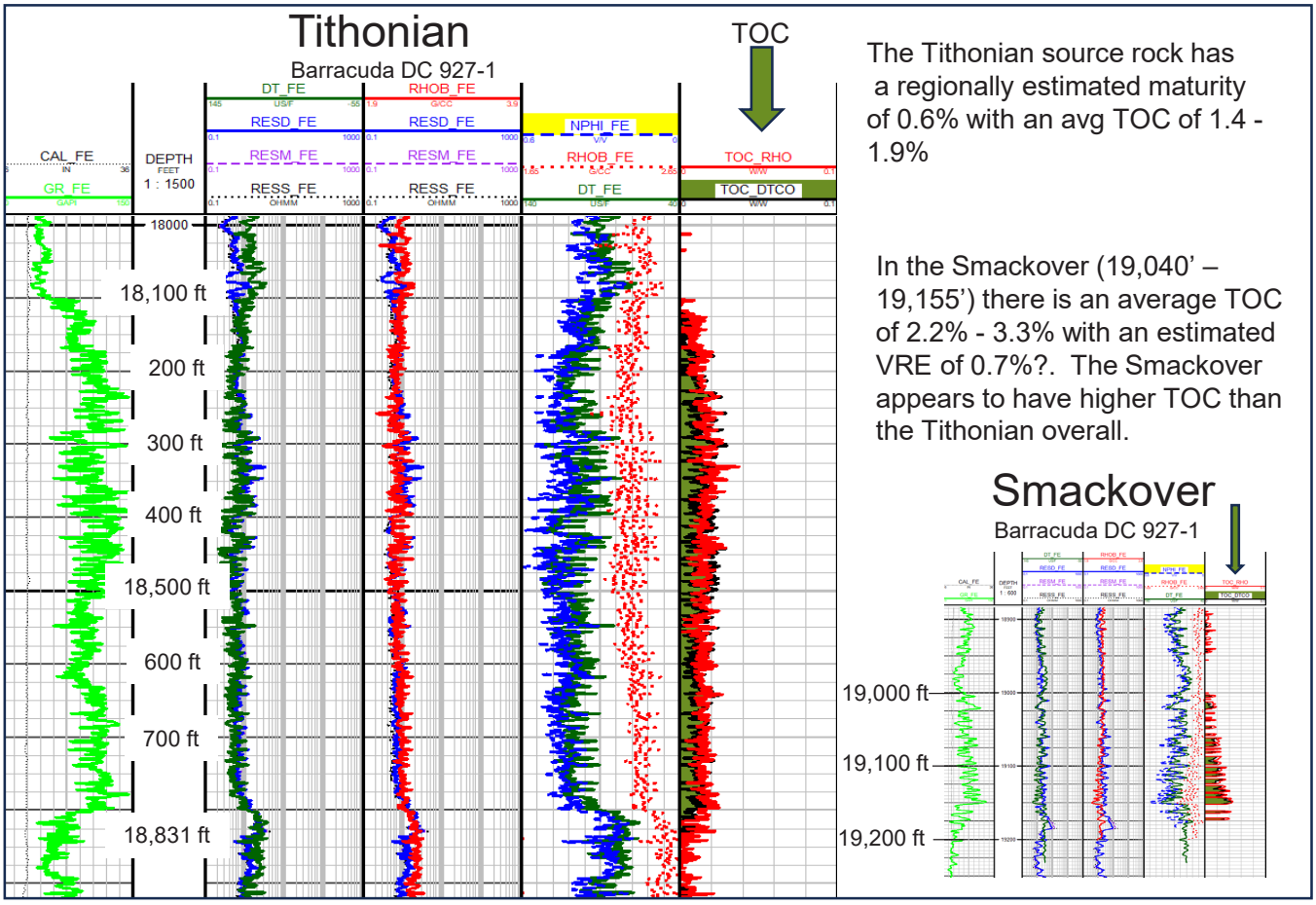

Figure 10 *Barracuda Tithonian and Oxfordian source rock intervals as estimated using the Passey log measurement method. Thermal maturity is also estimated regionally. Both intervals show some liquids in the mudlog gasses*

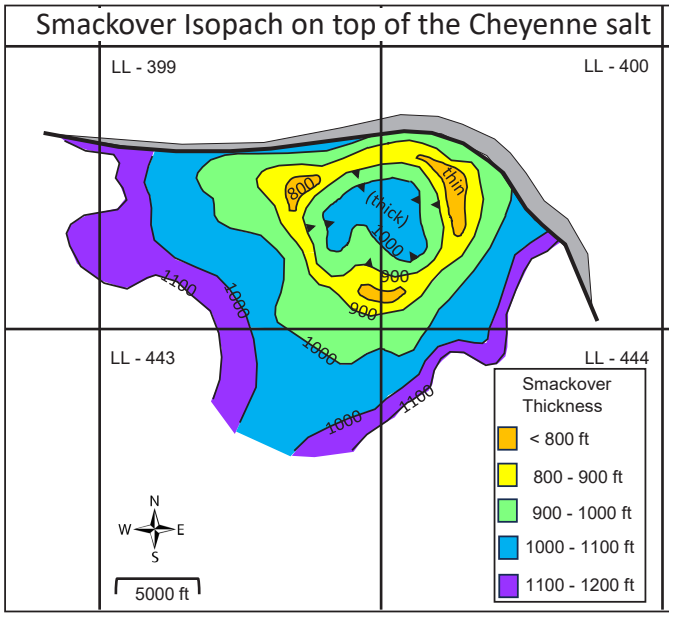

Figure 11 *Smackover Isopach at Cheyenne. The circular thickened isopach over the dome crest indicates some increased subsidence, probably created by collapse of the crest during the Smackover and filled with slightly younger Smackover*

been in an arch geometry before the collapse by the dissolution of the underlying salt. The occurrence of collophane is not exclusively diagnostic of non-deposition or erosion, but its local abundance is strongly suggestive. Collophane is thought to be made up of fragments of bone and/or fish scales. The identification of internal textures was not the author's expertise.

SEISMIC ARTIFACTS FOR THE JURASSIC A, B AND C OBJECTIVES

Drilling into salt, this shallow, at Cheyenne was not expected. Before drilling Cheyenne, Shell assembled six other geophysical interpreters unfamiliar with the Cheyenne or the Mesozoic stratigraphy. They were asked to independently interpret a top salt event under Cheyenne. Four of the six interpretations were clustered around the depth and "event" just below objective "C". Another interpreter picked the top salt just above "event" A. Only one of the interpreters picked the actual top salt found at Cheyenne. In retrospect, perhaps we should have listened and followed up with discussions on this interpreter's point of view – or were many of us too emotionally focused on drilling an "exciting" well?

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It is true, the velocity of the clastics in the Cotton Valley or Norphlet have interval velocities similar to salt (~14,500 ft/sec). Hence, there is often no "top salt" confident seismic reflection. However, the velocity of anhydrite is much faster and will create a nice seismic hard event if thick enough. Dolomite, like anhydrite, also has a high interval velocity and can create a strong seismic event if sufficiently thick. Add to this, closely spaced strong faster seismic velocities often "amplify" intervening slower velocity rocks, making them appear as overly strong soft events. All this to say is that the Smackover dolomite was not expected to be penetrated, nor was the thick anhydrite. These strong seismic events were thought to be the strong events associated with the Base Knowles limestone and in the uppermost Cotton Valley therefore, making events A, B, and C expanded Cotton Valley to Haynesville seismic targets.

We learned that the events target A, B, and C are seismic artifacts largely created by mode conversion of compressional (P-wave) to shear (S-wave) waves. Mode conversion is the transformation of a seismic wave at an interface. So, for example, when a P-wave encounters a boundary between different velocity materials, some of the energy is converted into an S-wave and then possibly migrated incorrectly. With the otherwise seismic reflectionless halite salt dome, incorrect migrated events might otherwise migrate into the low reflection area and become interpretable by some erroneously. Post-well analysis included geologists in the office and lab looking through the cuttings in the salt and sought to find some other lithologies that could be thick enough to have created an event, but only pure halite was found through the interval.

In summary, additional negative polarization through careful reprocessing, including model-based analysis of P-S mode converted waves, might have reduced the ambiguity in seismic interpretation over Cheyenne. If enough negative polarization

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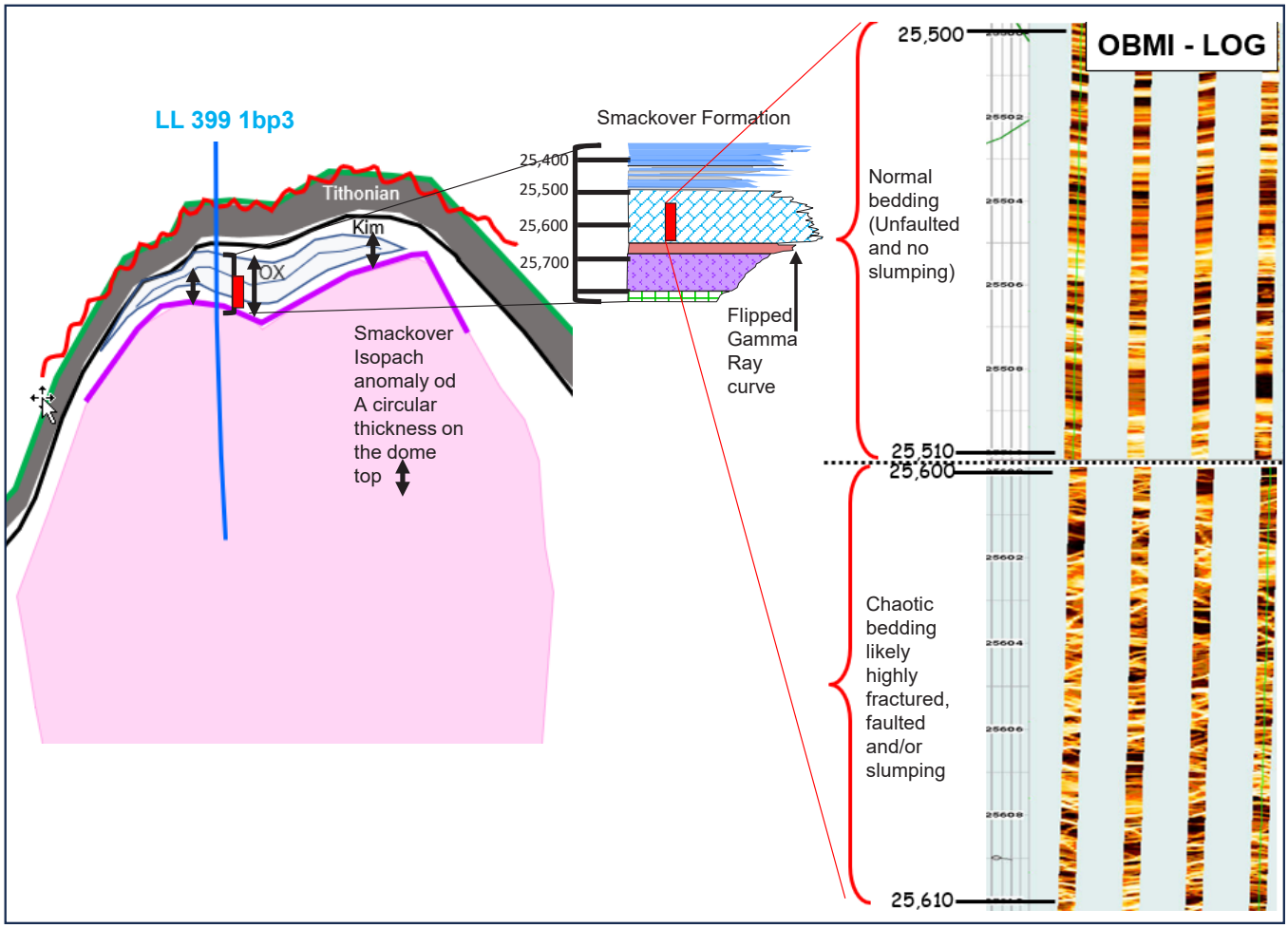

Figure 12 *The OBMI Image log at the right shows two 10-foot images of the Cheyenne borehole. The upper image from 25,500 -510 displays normal unfaulted bedding with a low dip, while the interval shown beneath it beginning at 25,600 has many fractures disrupting the image of the bedding. The interpreted collapse of the Smackover occurs over a short transition zone over a 60 foot interval (25,520 to 25,580 ft). The upper part of the zone is interpreted as basin fill and unfaulted, while the lower part of the bar (all in the basal Smackover Member collapses on itself.*

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occurred, Cheyenne may have dropped in prospect ranking to a higher-tiered risk, and the team may have recommended more attention northward on a second well for the Norphlet objective, for example. Another lesson is that rig pressure (which we had at Cheyenne) drives a continual drilling procedure and should only be used with many drill-ready prospects. However, when does one decide when they are genuinely drill-ready?

SUMMARY

The learning and lessons from Cheyenne that are of primary importance are the Jurassic pre-drill objectives A, B, and C, which are seismic artifacts. Potentially more careful work on reprocessing and model-based analysis of converted waves may have increased the prospects risk profile. Listening to all opinions has been a theme of articles during the author's tenure, which, in the Cheyenne case, may have also raised more concern about prospect risk. Finally, perhaps having two seismic correlation models of a "low-road" and "high-road" correlation may have led to a new prospect: maybe even one targeting the SAKARN section, which remains undrilled to date.

More careful observations on salt highs may lead to a new play of deep-water Mesozoic "caprock" plays for fractured dolomite Smackover reservoirs, where thermal maturity would be higher than at Cheyenne.

Lastly, the authors aim to provide a comprehensive understanding of this key deep-water well, will hopefully improve interpretations beyond the well and offer ideas for other plays. ■

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Journey Through the Important Cheyenne Well *continued on page 35*

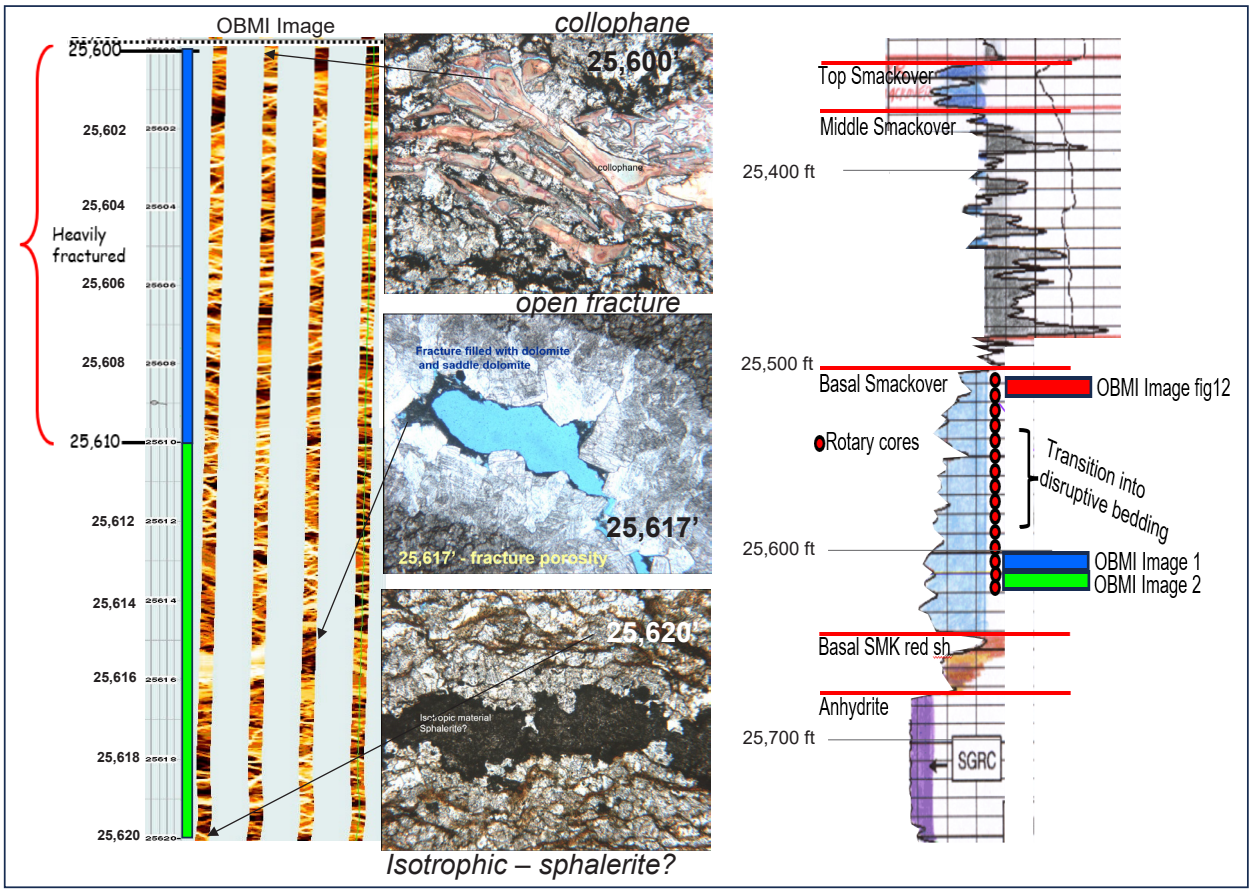

Figure 13 *The OBMI displayed shows a continuation of the heavily fractured Smackover with three rotary cores taken over this interval. The log display on the right shows in red circles the regular sampling of rotary cores taken over the Basal Smackover interval. The red bar is from Figure 12, an unfaulted Smackover, and the blue and green bar intervals are shown here. Collophane, open fractures, and sphalerite are features seen in these cores.*

Journey Through the Important Cheyenne Well continued from page 34

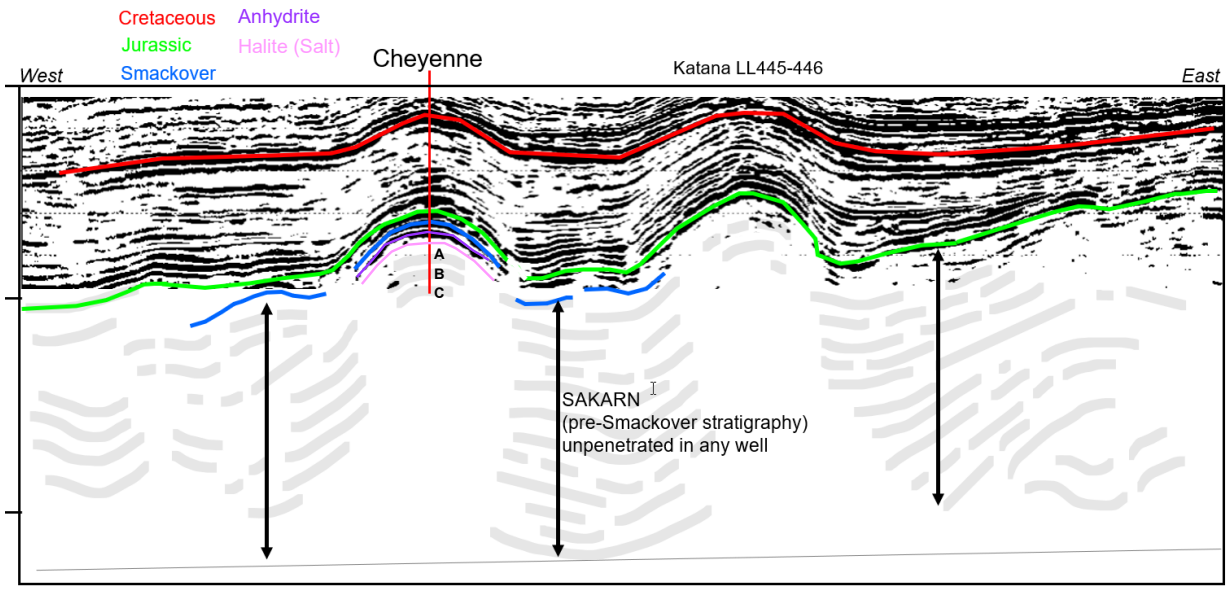

Figure 14 *Seismic line drawing over Cheyenne and its adjacent similar prospect named Katana. The reflections in the Sakarn, in general, have a somewhat lower reflectivity compared to the Upper Jurassic and Cretaceous (known) sections.*

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Moore, V, Donnelly, S:, and Moser, E., 2024, Jurassic structures of the eastern Gulf of Mexico: Sakarn, Louann, Norphlet, and Breakup; SEG Technical Program Expanded Abstracts : 1450-1454; https://doi.org/10.1190/image2024-4094344.1

Mullican, W.F., 1988, Subsidence and Collapse at Texas Salt Domes, Geologic Circular 88-2, Bureau of Economic Geology, 36p.

Rives, T., Pierin, A.-R., Pulham, et.al., 2019, The Sakarn series: A proposed new Middle Jurassic stratigraphic interval from the offshore eastern Gulf of Mexico. In GCSSEPM: Salt tectonics, associated processes, and exploration potential: Revisited (pp. 371–393).

Warren, J., 2029, Saline Dolomites: Ancient-Part 4 of 4 – Saddle dolomite, calcite and anhydrite spar burial salt, https://saltworkconsultants.com/downloads/53%20Dolomite%20-%20saline%20ancient%20burial%20dolomite.pdf

WORD BRECCIA – A GEOLOGY WORD JUMBLE

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

Words are Rock Lithologies and/or Elements

OOHNELALCP ◯__ __ __ __ __◯__ __

EINYRADHT __ __ __ __ __ __ __ __ __

YCTUFMNIRNOO __ __ __ __ __ __ __◯__ __ __ __

DOTLEOIM __◯__ __ __ __ __ __

URFCSARET __ __ __◯__ __ __ __ __

HINT: Lithologies and Features in a

__ __ P __ __ __ K

Monday, april 14, 2025

5:30 – 8:00 p.m.

HGS Members/Emeritus/Honorary Life $65
Students $40 • 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=2579
Event Contact: Catie Donohue

HGS General Dinner Meeting

Michael Young, Jani Das, Gurcan Gulen
University of Texas at Austin

Comparing Life-Cycle Environmental Impacts and Costs of Electricity Generation Systems

Significant public discussion and policy decisions surround the broad topics of how best to decarbonize the electricity sector, especially given potential supply constraints of material needed to support these efforts. Research is needed to understand and quantify trade-offs among society's goals of providing reliable and affordable energy, mitigating climate change, and improving local environments that can sustain the current population of eight billion people. The goals of this research are to better understand potential environmental risks across global supply chains; highlight where impacts can be mitigated; and develop and test a more comprehensive approach for determining consumer costs of electricity. We achieve these goals by conducting a comparative life-cycle assessment (LCA) of different generation systems, including natural gas-fired combined cycle gas turbines, and wind and solar power plants, with and without batteries to address intermittencies. We assess environmental impacts for 18 different pathways, including greenhouse gas and local (PM, SOX, NOX) emissions; land and water use and pollution, biodiversity and ecosystem services, and others. These LCA analyses consider extraction of natural resources (gas, minerals, etc.), manufacturing of generation equipment, power plant operations, and end-of-life options (e.g., landfilling or recycling of equipment). Our area of interest for electricity generation is the Permian Basin, the center of energy development.

We show in our study how environmental impacts are manifested along global supply chains that support energy development at different times during the 30-year lifespan of the facilities. For example, CO_2 emissions are elevated early in the construction phase of wind and solar (at locations mostly overseas), but CO_2 emissions from combustion at the CCGT plant in west Texas eventually exceed those from wind and solar. Alternatively, results indicate that particulate matter formation and ecotoxicity are higher for wind/solar/batteries than CCGT throughout all life phases, because of higher material processing and refining needs. Finally, we include these environmental impacts into the costs of electricity for different grid mixes, each tested for reliability using an electricity dispatch model. The results show the complicated nature of impacts along the global supply chain of materials needed for energy development and while electricity is generated, and they point to areas where impacts can be mitigated through innovation and action. ■

BIOGRAPHICAL SKETCH

Dr. Michael Young is Associate Dean for Research in the Jackson School of Geosciences at University of Texas at Austin, and a Research Professor at the Bureau of Economic Geology. He received his PhD focusing on soil physics and hydrology from the University of Arizona in 1995, an MS in Geological Sciences from Ohio University in 1986 and a BA in Geology from Hartwick College in 1983. From 2010-2020, Dr. Young was Associate Director for Environmental Research at BEG, where he coordinated research programs for a group of ~60 scientists involved in research spanning energy/water issues, geological sequestration of CO_2, groundwater recharge processes, water quality and resources, and other areas. Previously, he has held leadership and academic positions at Desert Research Institute in Nevada, and Georgia Institute of Technology.

Dr. Young's personal research interests and experiences include life cycle assessment; water/energy nexus; water and land impacts from energy development; groundwater recharge; and the connection between water resources, landscape development, and human interactions. He has authored or co-authored over 100 peer-reviewed journal articles, several book chapters and many reports, and has given more than 200 presentations at scholarly meetings. He is the former Editor of the Vadose Zone Journal and is Fellow of the Geological Society of America, Soil Science Society of America, and the American Society of Agronomy. Dr. Young mentors several graduate students and sits on numerous other committees in scholarly organizations.

The Houston Geological Society Continuing Education Committee Presents

Geomechanics for CCS

Ewerton Araujo, PhD – Senior Consultant Geomechanics Specialist
Fermin Fernandez-Ibanez, PhD - Senior Consultant Geoscientist
Jorge Pastor, PhD - Senior Consultant Geomechanics Specialist

April 24, 2025, 8:00am – 12:00pm
Zoom meeting
Attendees will receive a Certificate of Continuing Education for 4 PDH

PRICING

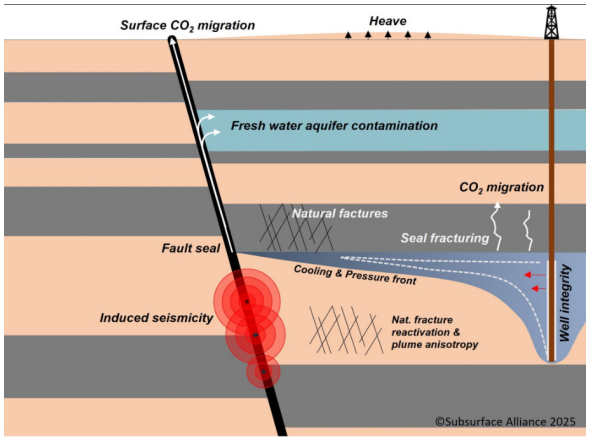
$150.00 for HGS Members, $75.00 Emeritus, $75.00 Student/In Transition, $200 Non-Members or
Non-Members can submit an application and pay their dues before registering to get the member price.
Please call the HGS office at 713-463-9476 to be registered only AFTER your application and dues are submitted.

REGISTRATION

Registration will close Thursday, April 17, 2025
Register online www.hgs.org (https://www.hgs.org/civicrm/event/info?id=2649) or call 713-463-9476

BIOGRAPHICAL SKETCHES

Ewerton Araujo, PhD – Senior Consultant Geomechanics specialist with 20+ years in the oil and gas industry. Ewerton started as an R&D engineer before joining GeoMechanics International, where he worked on projects in the Americas, Middle East, and Africa. After that, he joined Equinor as the SME for geomechanics of USA and Canada assets, and following that, was hired by BHP to implement and develop the geomechanics discipline in the Petroleum business. His expertise covers all geomechanics-related aspects of planning wells, drilling, completions, operation, and abandonment, in addition to reservoir geomechanics during exploration, appraisal, and production.



Fermin Fernandez-Ibanez, PhD – Senior Consultant Geoscientist with 15+ years of experience in Development, Production, and Research & Technology. Structural geology and geomechanics expert. He worked as geomechanics consultant for GeoMechanics International before joining ExxonMobil where he became corporate SME for fractured reservoirs. He also has experience in geothermal and CCS projects. Fermin has worked assets around the world, including SE Asia (PNG, Vietnam, Indonesia, Australia-NZ, Malaysia), South America (Colombia, Argentina, Mexico, Brazil pre-salt), Europe/Caspian (Kazakhstan, West Med), Kurdistan, Gulf of Mexico, and Canada.

Jorge Pastor, PhD – Senior Consultant Geomechanics specialist with 30 years of experience in the oil and gas industry. Jorge started his career as R&D engineer developing geomechanical simulators for Petrobras. In 2004, he joined Schlumberger where he was directly involved in 1D and 3D projects for Brazil, Mexico, Colombia, and USA. Later, he joined BHP in Houston where he led the development of coupled 3D projects for multiple Gulf of Mexico fields. He used these models for wellbore stability, sanding, compaction/subsidence, cap/casing integrity and fault reactivation analyses. His expertise also includes interpretation and QC of rock mechanics tests as well as software development.

The Houston Geological Society Continuing Education Committee Presents

Carbonate Reservoir Characterization with Lucia Petrophysics

Dr. Bill Raatz, Occidental Petroleum
May 19, 2025, 8:00am – 5:00pm
Oxy Petroleum at 5 Greenway Plz, Ste 110, Houston, Texas 77046
Attendees will receive a Certificate of Continuing Education for 8 PDH

PRICING

$280.00 for HGS Members, $140.00 Emeritus, $50.00 Student/In Transition, $350 Non-Members or
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.

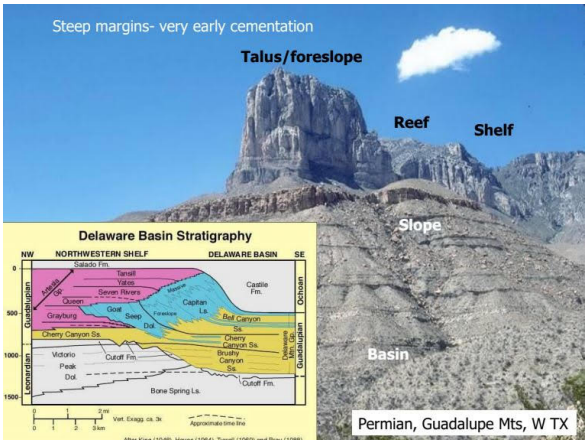
REGISTRATION

Register online www.hgs.org (https://www.hgs.org/civicrm/event/info?id=2650) or call 713-463-9476

COURSE DESCRIPTION

This one-day course uses a lecture and group exercise format to introduce the basics of carbonate reservoir characterization. It emphasizes rock typing and the integration of Geology with quantitative petrophysical techniques. Although the principles taught are critical for geological modeling, it is not a modeling course. Time constraints also limit the extensive integration of seismic datasets. The course sections include:

- Controls over Carbonate Deposition and Diagenesis
- Carbonate Classification (Dunham) and Rock Typing (Lucia)
- Carbonate Porosity Types (Choquette & Pray, Lucia)
- Connected vs Nonconnected Porosity (Lucia)
- Permeability and Saturation (Lucia, Leverett J Functions)



BIOGRAPHICAL SKETCH

Bill Raatz is currently an Oxy Fellow with Occidental Petroleum. Past positions with Oxy include Worldwide Chief Geologist and Director of Geosciences. Bill's specialties are carbonate depositional systems, stratigraphy, and reservoir characterization, which he has applied extensively in the Permian Basin and Middle East. He teaches short courses in reservoir characterization, sedimentary petrography, core interpretation, and field trips to New Mexico, West Texas, and Oman.

Bill has served AAPG as a Search and Discovery editor and as a member of the Corporate Advisory Board. He has published numerous papers and edited special publications on the geology of the Permian Basin region.

Bill previously worked for ARCO International Exploration, ARCO Alaska, Phillips Alaska, and New Mexico Tech University. He received his BS and MS in Geology from the University of Iowa, and his PhD from the University of Wisconsin-Madison.

APRIL 2025

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Make your reservations online at hgs.org		1	2	3	4 **HGS Annual Shrimp Peel & Crawfish Boil** *https://www.hgs.org/civicrm/event/info?id=2647*	5
6 **GeoGulf2025 at SFA University** *Page 8* *https://www.hgs.org/civicrm/event/info?id=2567* *Geology of Nacogdoches Field Trip* *https://www.hgs.org/civicrm/event/info?id=2635*	7	8 **Field Trips in Arkansas and East Texas** *https://www.hgs.org/civicrm/event/info?id=2636*	9 **HGS E&E Dinner Meeting** *TBD* *https://www.hgs.org/civicrm/event/info?id=2615*	10	11	12
13	14 **HGS General Dinner Meeting** *Comparing Life-Cycle Environmental Impacts and Costs of Electricity Generation Systems* *Page 36* *https://www.hgs.org/civicrm/event/info?id=2579*	15	16	17 **HGS NeoGeos Happy Hour - Trivia Night!** *Page 40* *https://www.hgs.org/civicrm/event/info?id=2631*	18	19
20	21	22 **New Energies Committee Luncheon** *TBD* *https://www.hgs.org/civicrm/event/info?id=2601*	23	24 **HGS Continuing Education** *Geomechanics for CCS* *Page 37* *https://www.hgs.org/civicrm/event/info?id=2649*	25	26
27 **AAPG Southwest Section Conference** *https://www.hgs.org/civicrm/event/info?id=2568*	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.**

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).

NeoGeos 2025 Happy Hours

FEB 20
UH AAPG WILDCATTERS NIGHT
Kirby Ice House
(3333 Eastside St.)

MARCH 20
IMPAC - EXPLORATION SERVICES
Corn Hole Tournament
Eleven Below (Spring, TX)

APRIL 17
INTERTEK
Trivia Night
Location TBD

MAY 22
CORE GEOLOGIC
Members Drink Free
Kirby Ice House
(1015 Gessner Rd.)

JUNE 19
CO-SPONSORSHIP AVAILABLE*
Intern Night
Cottonwood

JULY 17
SPONSORPSHIP AVAILABLE
Location TBD

AUG 21
SABATA ENERGY CONSULTANTS
Platypus Brewing

SEPT 18
GVERSE-GEOGRAPHICS
Trivia Night
Location TBD

OCT 16
GEOMARK & PETRICORE
Pickleball Tournament
PKL Social

NOV 13
SPONSORSHIP AVAILABLE
End of Year Celebration
Location TBD

ALL EVENTS 6-9PM

WWW.HGS.ORG

*Seeking Multiple Sponsors

Candidates for the 2025–2026 Executive Board

Houston Geological Society Officer Election

THE CANDIDATES PUT FORTH BY THE NOMINATIONS COMMITTEE ARE:

President-Elect: Matthew Cowan, Bryan Guzman

Vice President: Allison Barbato, Caroline Wachtman

Secretary: Bryan Bottoms, Troy Meinen

Treasurer-Elect: John Bishop, Andrea Reynolds

Editor-Elect: Sharma Donamraju

Directors (2 positions):
Bill DeMis, Amanda Johnston, Kenneth Mohn, David Perez

HGS ELECTION VOTING INSTRUCTIONS

HGS Members will be able to vote online via the HGS website. You must be logged into your account to cast your vote. Ballots will be online only - no mailed ballots! Please check the HGS website in the coming weeks for updates and announcements.
PLEASE VOTE

THE VOTING PERIOD OPENS APRIL 10, 2025 AND CONTINUES TO MAY 10, 2025.

President-Elect (two candidates)

Matthew R. Cowan

Education
MS Geology, Texas A&M – Kingsville – 2000
Secondary Earth Science Certification – Texas A&M – Kingsville – 1994
BS Geology with a minor in Mathematics, Texas A&I University – 1993

Licensure
Louisiana Licensed Geologist - Geology – 2013 to Present.
Texas Licensed Geoscientist – Geology 2003 to Present
TCEQ Corrective Action Project Manager – 2005 to Present
Texas Certified Secondary Earth Science Teachers License – 1994 to Present

Employment
Chief Geologist Terrain Solutions Inc 2010-Present
Chief Geologist Lone Star Environmental 1997-2010
Staff Geologist LSI Environmental 1996-1997

Houston Geological Society Officers or Committees Activities
Houston Geological Society Environmental and Engineering Committee – Chair 2007-Present
Houston Geological Society Groundwater Hydrogeology Short Course – Committee Member 2019
Houston Geological Society Big Bend State Ranch Field Trip – Co-Chair 2019
Houston Geological Society Surface Faults of West Houston Field Trip - Committee Member 2019
Houston Geological Society Flooding in Southeast Texas: The Science Behind the Floods Conference – Committee Member 2018

Matthew R. Cowan *continued on page 48*

Bryan Guzman

Education
2008 – BS Geology University of Texas at San Antonio
2018 – MS Analytics Texas A&M University

Experience
2008 – 2011 Geologist - Ingrain Inc.
2011 – 2013 Geoscientist - Ingrain Inc.
2014 – 2015 Product Champion – Drill Cutting Technologies – Ingrain Inc.
2015 – 2017 Geologic Advisor – Ingrain Inc.
2017 – 2018 Senior Technical Advisor – Halliburton
2018 – 2019 Senior Account Manager – TGS
2019 – Present Veilvox LLC - Founder
2020 – 2021 Senior Account Manager – Premier Corex
2021 – Present Director Global Business Development & Technology – Premier Corex

Professional Affiliations
HGS, AAPG, SPE, SPWLA, GCAGS

Professional Activities
2011 – 2017 HGS Chairman Exhibits Committee
2013 – 2014 HGS Secretary
2015 – 2016 HGS Treasurer Elect
2016 – 2017 HGS Treasurer
2017 – Present HGS Advertising Committee Chairman
2018 – 2019 GCAGS Houston Treasurer
2019 – Present GCAGS Treasurer
2020 – 2021 HGS Vice President
2022 – 2023 GeoGulf Treasurer

Bryan Guzman *continued on page 48*

Candidates for the 2025–2026 Executive Board *(continued)*

Vice President (two candidates)

Allison Barbato

Biography

Dr. Allison Barbato is an exploration geologist with a diverse international background and a passion for inspiring others to succeed in the petroleum industry. Born in Lafayette, Louisiana, she spent 15 years abroad in Indonesia, Brazil, the Netherlands, and Egypt, an experience that shaped her global perspective and deep appreciation for geology. Inspired by her father's career as a petroleum engineer, she developed a strong enthusiasm for the earth sciences and a commitment to bringing people together within the industry. Dr. Barbato earned her B.S. in Geology from Louisiana State University (LSU) in 2018, where she continued her academic journey, completing her Ph.D. in 2024. Her doctoral research integrated biostratigraphy, geochemistry, and organic petrography to reconstruct the paleoenvironments of Eocene-aged deltaic systems in Coos Bay, Oregon, while assessing their hydrocarbon potential.

During her time at LSU, Dr. Barbato served as President of the LSU AAPG student chapter, where she successfully increased membership by 400% during the COVID-19 pandemic and mentored students toward career opportunities in the petroleum industry. She was an eight-time recipient of the Houston Geological Society (HGS) Calvert Memorial Scholarship and gained industry experience through internships with Hess and Chevron. Upon completing her PhD in 2024, Dr. Barbato joined Chevron in Houston, Texas, as an exploration geologist working in the Gulf of Mexico. She remains actively involved in the geological community, serving as an Associate Editor for the *AAPG Bulletin* and as the 2025 co-chair, and 2026 Chair, for the HGS Scholarship Night.

Interest in Serving on the HGS Board

I am honored to be considered for the role of Vice President of the Houston Geological Society (HGS), an organization that has been instrumental in my personal and professional growth. As an eight-time recipient of HGS Calvert Memorial scholarship during my undergraduate and graduate studies, I have experienced firsthand the society's dedication to supporting geoscience students and fostering industry excellence. Now, as an exploration geologist at Chevron and the HGS Scholarship Night Chair, I am eager to give back to this community that has played such a significant role in my development. HGS unites a diverse geoscience community through high-quality technical talks, educational initiatives, and scholarships. I aim to leverage

Allison Barbato *continued on page 48*

Caroline Wachtman

Biography

Caroline Wachtman is the Carbon Certification Lead for Oxy and is based on Houston. Previously, she spent 15 years with ExxonMobil, where she led multiple cross-functional teams identifying and evaluating resources throughout West Africa, the Caribbean and Caspian regions. In 2021, she held roles at energy start-ups before joining Oxy in 2022 to lead regulatory certification efforts for carbon storage projects. Caroline is a licensed Professional Geologist with a MS in Geology from University of Wisconsin-Madison and a BS in Geology from College of William and Mary.

Wachtman serves in multiple leadership roles for geoscience professional societies. Currently, she co-chairs the CCUS Event, an annual conference sponsored by AAPG, SEG and SPE and she co-chairs the Carbon Management Pavilion at the IMAGE Conference (AAPG and SEG). Wachtman chaired the Africa Conference for HGS in 2022 and served on the HGS board from 2022-2024, including a term as 2023-2024 Editor of the HGS Bulletin. She was awarded the HGS President's award in 2023 and HGS Outstanding Board Member in 2024.

In addition to professional service, Caroline co-leads a mentoring circle for the Women's Energy Network and serves on the steering committee for the United Way of Greater Houston's Women's Initiative. She is a Girl Scout troop leader for 28 girls, including her two daughters.

Why I Want to Serve the HGS

Supporting the profession of geology and volunteering in my community are two of my core values. I would like to volunteer for my geoscience community and profession by serving the HGS as Vice President. There are three key reasons why I'd like to continue serving the HGS:

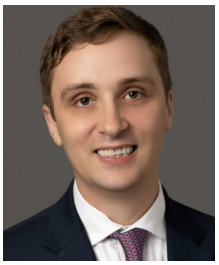
I know from first-hand experience that every HGS volunteer can have a meaningful and measurable impact on the Society.

I have the skills and capabilities to excel at the Vice President's role. I will bring nearly 20 years of professional experience and network connections to deliver content that appeals to a wide range of HGS members.

I look forward to building a future where more early and mid-career geoscientists are eager to become HGS members. I'm well-equipped to demonstrate the value of HGS to the next generation. ■

Candidates for the 2025–2026 Executive Board *(continued)*

Secretary (two candidates)



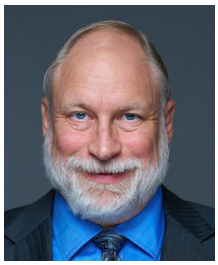
Bryan Bottoms

Education & Certifications
P.G. State of Texas, License # 15091
MS University of Arkansas; 2017
BS University of Arkansas; 2012

Employment History
Analyst, Associate, VP, & Director (Current) – Geology, Detring Energy Advisors, Houston, TX – 08/2019 – Present
Associate Geologist – Tapstone Energy, Oklahoma City, OK – 10/2017 – 08/2019
Graduate Student, Teaching Assistant, and Research Assistant - University of Arkansas, Fayetteville, AR – 08/2015-10/2017
Field Geologist/MWD Engineer – Chesapeake Energy/77 Energy – Oklahoma City, OK - 02/2013-05/2017

Previous HGS Officers or Committees
NeoGeos Committee Chair – 04/2022 – 05/2024

Candidate Statement
I am honored to accept the nomination for the HGS Secretary. I have spent the past few years becoming increasingly involved in the HGS organization, recently serving as the NeoGeo Committee Chair from 2022 through 2024. As the NeoGeo Committee Chair, I hosted monthly Happy Hour and Trivia events targeted at increasing member involvement among early career geologists. While serving as chair, the NeoGeos committee was revitalized, and once again hosts regular monthly events after languishing during covid. Under my leadership we increased sponsorship outreach and boosted event turnout and revenue for the society. I have since passed the torch to a new group of NeoGeos Chairs, and they have continued the amazing growth in turnout and sponsorship. In addition to serving as NeoGeos chair, I have volunteered at numerous events such as the education outreach in elementary schools program targeted at teaching local elementary students about rocks and fossils, serving as a poster judge for the annual Sheriff Lecture event, and serving as a judge at the 2023 Science and Engineering Fair of Houston on behalf of HGS. I'm excited for the opportunity to continue serving this organization in an increased capacity. By serving as Secretary, I hope to set an example among other early career geologists, encouraging them to become more involved with their local geologic society. I hope that my potential presence in the organization can bring some fresh perspectives and ideas to the organization that will benefit the society as we continue to adapt to an ever-changing world. ■



Troy W. Meinen

Education
MS Geology, Baylor University, 1996
BS Geology, Baylor University, 1993

Professional Affiliations and Registrations
Registered Professional Geologist in the States of Texas and Tennessee
Associate Safety Professional (ASP-25540)
American Society of Safety Engineers
Houston Geological Society

Candidate Statement
I am honored to be invited to stand for election as secretary of HGS Board. My past position as Director and current positions as treasurer and now co-chair of the Environmental and Engineering committee in HGS have been most rewarding to me and I welcome the opportunity to further serve my fellow Members should I be elected.

We are living in exciting but challenging times when our collective expertise as Geologists is more valuable than ever. Who better than Geologists to help todays leaders understand the complex nature of energy, the carbon cycle, natural disasters, and the impact of each on our world. My hope is that organizations like HGS will bring wisdom and sound scientific reasoning to decision makers in the many public arenas where we serve.

I am a Technical Director and Global Health and Safety Advisor with Environmental Resources Management (ERM) in Houston. Over my 28-year career, I have served as an environmental and health and safety consultant servicing global oil and gas, chemical, manufacturing, and mining companies. I have utilized my geological expertise to assist global oil and gas companies to understand and address contaminated ground water, soil and sediment issues. My background includes managing investigation and remediation of upstream oil and gas sites and assisting with due diligence for large oil and gas acreage position transactions for major oil and gas clients, which includes assessment of water use and protection, property transaction support, environmental impact assessment, environmental permitting and management, and Stakeholder concerns. I currently utilize my field experience to support teams globally in improving health and safety performance primarily within Global oil and gas companies.

Troy W. Meinen *continued on page 48*

Candidates for the 2025–2026 Executive Board *(continued)*

Treasurer-Elect (two candidates)

John Bishop

Brief Biography
John is an independent strategy consultant and transaction advisor to the upstream oil and gas sector. He began his career as an exploration geologist in the Gulf of Mexico division of Exxon. He later worked in First Boston's, Bear Stearns' and Wells Fargo's investment banking energy practices where he advised and completed M&A and financing transactions for numerous international and domestic companies. He has been a member of HGS since 2010 and has served on the North American and International Exploration Committees. John has BA and MS degrees in Geology from Colgate University and the University of South Carolina, respectively, and an MBA Finance degree from the University of Texas. He is also a current member of AAPG, SIPES, HEFG and EPG.

Interest in Serving HGS
I have been a member of the HGS for over 14 years and find its hosted talks, seminars and conferences to be very valuable. I also greatly enjoy the sense of comradery of the Society and its members. With HGS' long and storied history as an educational and professional networking hub for Houston area geology professionals, I believe it is imperative to contribute to its continuing success. I believe I can utilize my background in both geology and finance to effectively serve as HGS Treasurer (elect). ■

Andrea Reynolds

I am honored and excited to stand for the role of HGS Treasurer-Elect. Having previously served as Director and Vice-President earlier in my career, I am eager to continue giving back to this remarkable organization that has been instrumental in shaping my professional journey. After spending time working outside of Houston, this opportunity to once again serve HGS feels like coming full circle.

The role of Treasurer-Elect aligns closely with my experience, particularly my tenure at Shell, where I honed my skills in leadership, decision-making, and had P&L accountability for the Appalachia asset. I am an organized, high-energy individual with a passion to lead and drive meaningful impact". Throughout my career, I have been dedicated to supporting the HGS and AAPG communities by contributing my time, talent, and resources to foster professional growth, collaboration and improve membership value.

Having recently taken early retirement from Shell, I am now pursuing a variety of interests, including consulting, coaching, and cherishing time with my high-school twins before they embark on their college journeys. This new chapter has reignited my enthusiasm to serve HGS with fresh energy and focus. As Treasurer-Elect, I aim to strengthen HGS's financial foundation to ensure we continue offering outstanding technical content, continuing education, scholarships, and vibrant social networking opportunities for all members—new and longstanding. HGS has provided me with the foundation for a fulfilling and successful career, and it would be my great privilege to give back to our proud geological society and community.

Education and Certification
MS Geology, Texas A&M University
BS Geological Sciences, SUNY Geneseo
ICF Executive Coach, Coach Rice Executive program, Rice University
APM Chartered Project Professional

Professional Experience
2021 – 2024 GM Innovation & Improvement, Shell, Upstream & Deepwater
2018 – 2021 GM Business Transformation / BA to EVP, Shell Global Exploration
2011 – 2018 Exploration & Development Manager, Shell, Appalachia

Andrea Reynolds *continued on page 49*

Candidates for the 2025–2026 Executive Board *(continued)*

Director – Two-year term *Vote for two candidates*

Bill DeMis

I am honored to stand for the position of Director at the HGS. I will bring my 35 years of business experience to the Executive Board and strive to make the HGS economically profitable, scientifically relevant for all HGS members … and fun!

The critical strength I can bring to the HGS is a strong understanding of the financial challenges we face as a professional society, and HGS's need to continue to grow its outreach and appeal to all geoscientists.

My executive experience ranges from small independents to "big oil companies" to investment banking. I have held the positions of Exploration Manager at Marathon Oil Company, Exploration Vice President at Roxanna Oil Company (a local Houston independent oil-and-gas company founded by the late, great Maryln Downey), and Senior Vice President and Chief Geologist at Goldman Sachs here in Houston.

I am an active member of HGS. I actively participated in the Continuing Education Committee by teaching HGS classes and doing the logistical minutia of soliciting new teachers for HGS classes, finding event venues, and even picking up the bagels and coffee for the class's morning breakfast.

I have received the HGS President's Award and the HGS Chairman's Award for my service to HGS. I have also received the dedicated Service Award from the AAPG and the West Texas Geological Society.

I currently run a consulting company. I am an angel investor in a major domestic start-up where we aspire to drill some very important wildcat wells in the Gulf Coast. I like to look at deals and participate in oil wells. I also generate my own prospects for fun and, rarely, for profit.

Thank you! ■

Education
BS Geology and Geophysics, The University of Wisconsin at Madison, 1980
MS Geology, The University of Texas at Austin, 1983

Amanda Johnston

Professional Bio
Amanda is a dedicated exploration geologist with a strong passion for volunteering. Amanda has contributed significantly to the growth and success of major energy companies. She is currently serving as an exploration geologist at TotalEnergies and she spent five years at Hess Corporation, where she gained valuable hands-on experience in exploration, development, and operations across a variety of basins.

In addition to an exciting professional career, Amanda has been deeply committed to volunteerism and professional development within the geoscience community. A longstanding member of the Houston Geological Society (HGS), Amanda has served on the Student Expo Committee for over seven years, culminating in leadership roles as Vice Chair (2020) and Chair (2021-2023). During this time, she helped orchestrate one of the most impactful student-focused events in the country that also bolstered the HGS balance sheet. Additionally, Amanda served as Secretary on the HGS Board of Directors from 2022 to 2023, contributing to the membership and governance of the society.

Recognizing her dedication to the geological community, Amanda was honored with a position in the AAPG House of Delegates, where she will serve from 2023 to 2026, advocating for the interests of gulf coast geoscientists and the future of the profession. Amanda is also a member of the IBA Committee, where, as Education Coordinator, she organized foundational seminars that supported students worldwide in their pursuit of careers in the petroleum, geothermal, and CCS industries.

In addition to these roles, Amanda is passionate about community outreach and education. She organized the AAPG Bufalo Bayou Educator's Hike, a program that provides K-12 teachers in the Houston area with valuable resources and tools to enhance their teaching of geoscience and environmental topics in local classrooms.

With a commitment to professional excellence and service, Amanda continues to make meaningful contributions to both the energy sector and the broader geoscience community. ■

Candidates for the 2025–2026 Executive Board *(continued)*

Director – Two-year term *Vote for two candidates*

Kenneth Mohn

I am interested in serving on the Board of the Houston Geological Society as HGS Board Director for the 2025-2026 term. I have served as Secretary and have been involved as a volunteer in the HGS over time. My goal is to support the HGS and continue the work that benefits the Members of the Society.

Ken has Bsc Geology, Msc Geology degrees

Currently, he is a founder and director of Mohn & Associates LLC. formed in 2018 were is working on Working on Multi-Client and Proprietary onshore and offshore seismic acquisition design, operations supervision, and processing projects:
- Developing onshore and offshore 2D and 3D surveys.
- Data Brokerage Sales of seismic data
- Consulting on seismic data acquisition and processing projects
- Sales of oil and gas Prospects developed by others.
- Working with a team developing prospects.
- Client representative for several companies.

In the past, Ken was a Managing Director and Vice President of Multi-Client Geophysical for NSA during 2013-2018,
As an Exploration Vice President, at Fugro, he started the Multiclient Services group for North and South America 2002-2012, where he grew the seismic library, with offices in Houston and Brazil, to over 290,000 Km of seismic data (both 2D and 3D data).
Prior to this, he worked in Business Development and Marketing Management at TGS Geophysical, from 1987-2002.
His international and domestic projects cover the Gulf of Mexico, onshore Canada, offshore Africa, and Latin America, where he designed and acquired Multiclient surveys for oil and gas exploration companies with a major focus on Quality in acquisition and processing. ■

David Perez

Two years ago, I noticed that HGS had not hosted its annual skeet shoot in some time. After discussing the matter with the previous Chair of the Skeet Shooting Committee, he mentioned that he no longer had the time to oversee the event due to other commitments. He asked if I would be interested in stepping in, and I agreed—on the condition that we switch the venue to Sporting Clays. He was on board, and as a result, we launched the first HGS Annual Sporting Clays event two years ago. It was a great success, offering a lot of fun, some hard work, and tremendous support from Andi Peoples. This last year was equally successful and well-attended. I am honored to now be nominated for the position of Director.

My career began as a Geologist with the Oil and Gas division of the Railroad Commission, where I gained foundational experience in all aspects of the Oil and Gas Industry including, drilling, production, blowouts, and well plugging. This led me the role of Project Manager at Harding Lawson Associates and Fluor Engineering, where I managed and executed complex environmental projects across the U.S.

I was recruited by British Gas to lead Environmental Impact Studies in Tunisia, Argentina, Trinidad, and Gabon for oil and gas operations. In 2004, I joined GlobalSantaFe/Transocean, where I created and managed their global Corporate Environmental Program. I played a pivotal role in scaling operations across 35+ countries, overseeing the establishment of environmental and operational programs that adhered to international and local regulations while aligning with corporate objectives. I led negotiations with Ministries of Environment and Petroleum to ensure the successful integration company programs into country specific initiatives. During this time, I also became a Fellow of The Geological Society and Chartered Geologist. I led Transocean's response to the Macondo Well Incident, spending four months at the command center in New Orleans.

In 2010, I transitioned to R360 Environmental Solutions as Corporate Vice President of Operations and Development, where I was responsible for operations across multiple U.S. states. I oversaw the management of oil-based cuttings and waste disposal, ultimately leading to the company's successful sale in 2012.

David Perez *continued on page 49*

Candidates for the 2025–2026 Executive Board *(continued)*

Editor-Elect (one candidate)

Sharma Dronamraju

Candidate Statement

It is a great honor to be nominated for the Editor-Elect position for the HGS *Bulletin* for 2025-26. I served HGS in various roles as Co-Chair of Continuing Education Committee, International Exploration Committee, and the Chair of Memberships for over 24 years with HGS. I have organized several one-day education symposiums and conferences (Geopressures, Coal Bed Methane, Reservoir Modeling), co-chaired an International Explorationists Conference, served and represented HGS interests on AAPG House of delegates, and offered Dinner Talks over these years. I am currently serving as Director on the Executive Board of HGS, for the second year.

In its 100th year, HGS has come a long way, with the *Bulletin* representing the face of the organization both before and after the internet era. The *Bulletin* maintained an active connection with its members, patrons, and sponsors. The *Bulletin* now is digital, consistent with times, and surprisingly resilient, with the most recent energy transition. This is largely due to the countless volunteer hours by many geoscientists, who have regular day jobs, and get involved purely because of the shared dedication to the profession we are in and the camaraderie.

My sincere regards to the previous geoscientists who graciously upheld these values and served various roles and responsibilities in the HGS, and managed the chronicles in the *Bulletin*. I am sure, I will learn a great deal here in the new role, from my predecessors and peers, on "behind the scenes" work that happens in getting the *Bulletin* online in a timely manner. I request your support and encouragement.

Sharma Dronamraju, MS, MBA, PG Bio

Sharma Dronamraju is a Geoscientist and Director, AKD Professional Solutions in Houston, Texas, USA. He worked for Petrobras USA, Marathon Oil, Halliburton, Landmark Graphics, Fugro, and ONGC for over 30 years in upstream oil and gas. His expertise lies in rejuvenating mature fields. He was associated with several deep-water developments and exploration appraisals in GoM, the Gulf of Thailand, Indonesia, deep-water Nigeria, Equatorial Guinea, and the South China Sea. Sharma's recent work includes Geomodeling for EOR in mature oil fields in Miocene Syn-rift clastics and carbonates and regional prospectively of Gulf of Suez, Egypt, heavy oil development in Powder River Basin in Lower Cretaceous incised valley fills (Newcastle Fm.), addressing subsurface heterogeneity of Mishrif Carbonates in Southern Iraq and reservoir modeling of HPHT fields in offshore East Malaysia and Borneo, and sub-salt interpretation, appraisal, and reservoir delineation of Lucius Field, GoM. Sharma's current focus is continental rift basins and their contribution to geoscience. He is also interested in Earth Observation, satellite imagery and processing, and future alternative fuels , and Geological Hydrogen exploration. He held several trainings in Mature Field development, Subsurface Fluid pressures, Field-scale High Resolution Sequence Stratigraphy, for target audiences and clients in the US, Middle East, and Asia; HGS and AAPG Technology Workshop in the US.

Mr. Sharma currently serves as Director on the Executive Board of HGS. He held previous roles with Continuing Education, International Explorationists, and Membership committees of HGS.

Sharma earned his Master's degrees from the Indian Institute of Technology, Texas A&M University, an MBA from Rice University, and a Diploma in Data Analytics and Machine Learning from MIT-Professional Education. He is a state-registered Professional Geologist in Texas. ■

Candidates for the 2025–2026 Executive Board *(continued)*

continued from page 41

Matthew R. Cowan—*Candidate for President-Elect*

Houston Geological Society (HGS) – Secretary 2011-2012
Houston Geological Society Environmental and Engineering Committee – Treasurer 2006-2007
Houston Geological Society Coastal Subsidence Conference – Committee Member 2005

Other Geological Society Associations or Committees

American Institute of Professional Geologists (AIPG) – Board of Director 2016 to Present
Association of Environmental and Engineering Geologists (AEG) – Secretary 2021-2023
Texas Association of Professional Geologists – President 2006-2018
Geo-Gulf – Session Chair - 2015
Geo-Gulf – Session Presenter – 2014

Candidate Statement

I have been a member of the Houston Geological Society since the Late 1990's as I was finishing up college. In 2005, I got involved volunteering with several committees; Environmental and Engineering Group and Continuing Education. Through that time, I got to meet a lot of people who expanded my knowledge of not only my specific field of geology but the greater world of geology. I understood the value of being involved in a Professional Society. I have served on statewide organizations relating to professional licensure, continuing education and involved with hosting conferences for the geological profession. That experience will help me be a Board of Director for the Houston Geological Society. It was a privilege to see the HGS turn 100.

If elected, I would continue to ensure that value is added through membership in the Houston Geological Society. That would be achieved by offering timely short courses that serves the needs of our profession. I would also work towards organizing more field trips to aid in expanding our knowledge of our area but the state as well. We are the Premier Geological Society and it would be an Honor to have your vote. ■

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Bryan Guzman—*Candidate for President-Elect*

2023 – Present HGS New Energies Chair

Statement

Ever since I joined the HGS, I have enjoyed the benefits of education, networking, and friendship. Currently, I am working with the GCAGS as Treasurer. For about 7 years, I spent much of my time working on the exhibits committee organizing the set-up and transportation of the HGS booth for various conventions throughout the year. When I served as HGS Secretary, it afforded me the opportunity to learn more about the many functions of the HGS. I was also exposed to the duties as the HGS Treasurer-elect and Treasurer where I witnessed the society's dedication to the various efforts through the annual budget. I was then given the opportunity to serve as the HGS Vice President during the COVID19 pandemic where I was able to schedule all our monthly technical talks digitally for the first time. Currently, I am chairing the HGS New Energies Group which meets regularly to discuss carbon sequestration, lithium extraction, geothermal, and other new areas where geoscientists play a key role in supporting projects. It has been a pleasure meeting many people along the way and I am thankful to the opportunities the HGS has provided me while serving as a Chairman, Secretary, Treasurer, and Vice President. It would be my great pleasure to serve in the capacity of HGS President Elect. ■

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Allison Barbato—*Candidate for Vice-President*

leadership experience as LSU AAPG Student Chapter President to keep HGS relevant and engaging for geoscientists at all career stages. By strengthening connections between students, early-career professionals, and industry leaders, I hope to enhance HGS's role as a hub for knowledge-sharing and professional growth. It would be an honor to serve the geologic community as Vice President of HGS. ■

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Troy Meinen—*Candidate for Secretary*

In my personal life I have served for more than 20 years as a mentor of students through my church and Scouting. Most recently, I have expanded my leadership experience through my service as the Chairman of a local Houston District of Scouting America and President of the University of Houston parents group.

I believe my technical experience in the oil and gas industry combined with my experience and leadership in HGS and other organizations has prepared me to help serve on the board of HGS as we continue in challenging times. ■

Candidates for the 2025–2026 Executive Board *(continued)*

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Andrea Reynolds—*Candidate for Treasurer-Elect*

2009 – 2011 Team Lead, Shell, Mid-Bossier / Haynesville
2008 – 2009 Strategy & Portfolio Advisor, Shell, Americas Exploration
2002 – 2008 Senior Exploration Geoscientist, Shell – Brazil, Alaska
1998 – 2002 Exploration Geoscientist, HESS – Gulf of Mexico, North Dakota

HGS Service

Member since 1999
Vice-President, 2006 - 2007
Director, 2003-2005
HOD Delegate
Founder and Chair of NeoGeos young professional network, 1999
Chair and member of multiple committees, 2000's

Other Professional Associations

Reynolds is a longtime member of AAPG, and has served in leadership and volunteer roles, beginning with President of the Texas A&M AAPG Student Chapter, and more recently as VP and President of 2 AAPG divisions (DPA, EMD), the Advisory Council, and the Reimagine Committee. She has also served as Chair and member of multiple AAPG and HOD committees and 2011 ACE Technical Program. She is also an active member of the Association of Project Management (APM) and the International Coaching Federation (ICF). ■

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David Perez—*Candidate for Director*

In 2013, I joined LUKOIL International Upstream, where I managed Operations and Environmental programs across Africa, Europe, and the Americas. I was responsible for ensuring operations and environmental compliance, and driving operational efficiencies across diverse international teams. I led the company's efforts in navigating internationals and local regulatory landscapes of multiple countries, fostering cross-border collaboration to optimize performance.

Currently, I apply my expertise in scaling operations to guide innovative start-ups. I serve as an Advisor for Reformed Energy, a company that uses plasma gasification to convert organic waste into synthetic gas, and also serve as a Principal Consultant for vPSI Group, leading high-impact environmental projects. Additionally, as Co-Founder and CEO of CherAmi Digital, I lead a team dedicated to leveraging stranded and vented gas to create energy for Bitcoin mining, with a focus on scaling sustainable energy solutions.

EDUCATION

Master of Science, Geology (Hydrogeology/Geochemistry) Texas A&M University, Kingsville
Bachelor of Science, Geology, Texas A&M University, Kingsville
Wharton Business School – Executive Presence and Leadership

REGISTRATIONS

Licensed Professional Geoscientist, Texas 3078
U.K. Chartered Geologist (CGeol)
Fellow of the Geological Society of London

PROFESSIONAL MEMBERSHIPS

International Association of Drilling Contractors (Chaired Environmental Affairs Committee)
Houston Geological Society
Houston Society of Petroleum Engineers
Houston Geophysical Society

HGS ANNUAL

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HGS volunteers at Nottingham Elementary Science Night

Steven Johansen and Elizabeth Baker of HGS. Leslie Bernal, took the photograph.

Three HGS volunteers displayed poster sessions and rocks, minerals, and fossils to students and families at Nottingham Elementary School's annual Science Night on February 26th. HGS volunteers were Leslie Bernal, Elizabeth Baker, and Steve Johansen. We distributed 144 samples of salt provided by Janet Combes and the rock salt volunteers. We interacted with at least 175 children; the total number of child & adult interactions was probably 300 or greater. The school values our presentations and will likely invite us back next year. ■

Search for Ancient Life on Mars from the Stratigraphic Record

(A look back on last month's HGS dinner talk by Kevin Bohacs)

By Townes Pressler and Penny Pressler

The HGS Dinner meeting held on March 11, 2025 featured Dr. Kevin Bohacs, who presented a fascinating review of his research studies with the NASA Jet Propulsion Laboratory that focuses on whether ancient life ever has or does exist on Mars. This has been a tantalizing question for scientists for many, many years.

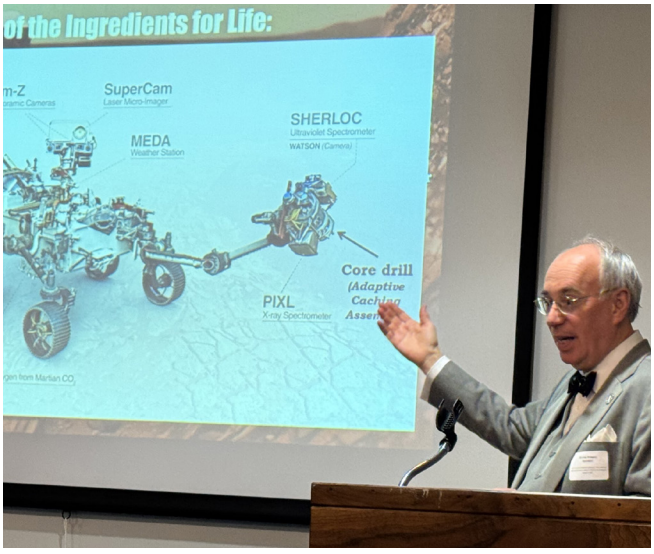
Since 1997, NASA has successfully landed five rovers on the Martian surface. Two of the five rovers, Perseverance and Curiosity, continue to transmit interesting and valuable data back to Earth for analysis and study. Transmissions from these rovers occur only twice a day, at noon and midnight, and, hence, make for long and arduous work.

Dr. Bohacs provided a brief overview of Mars. It is a rocky planet that formed ~4.5 billion years ago. Between 3 to 4 billion years ago, it is interpreted that a warm and wet climate prevailed on the planet that transitioned to its current cold and dry climate.

Dr. Bohacs began working with NASA during the planning stages for a landing site for Curiosity, which was targeted to land on fluvio-lacustrine rocks considered ideal for investigating ancient life on Mars. With Dr. Bohacs' extensive research on Earth's ancient lake systems, he and the NASA team selected a 10 by 20 km landing site on Gale Crater, which was one projected to provide critical stratigraphic, mineralogic, and geochemical information.

Curiosity landed precisely within the proposed landing site using a highly complex system of parachutes to lower the rover onto Mars' surface. And the landing occurred "without a hitch" – a remarkable achievement in and of itself! Shortly after landing, Curiosity began transmitting data back to NASA. The voluminous and detailed data acquired by Curiosity are impressive. Results from Curiosity's data obtained in the Pahrump Hills area of Gale Crater reveal the presence of well-defined fluvio-lacustrine stratal successions. Applying sequence-stratigraphic principles and utilizing data from analogous strata on Earth, Dr. Bohacs and the team interpreted five depositional sequences that accumulated as evaporite lake deposits. These evaporite sediments are interpreted to have been deposited during fluctuating water conditions that varied from saline to hypersaline. Using analogous data from lake systems on Earth, the evaporite deposits studied at Pahrump Hills on Mars are interpreted to have accumulated within an underfilled lake basin characterized by closed surface drainage but through-flowing subsurface waters. The presence of lake systems characterized by fluctuating salinity conditions certainly provides surprising possibilities that microbial life may have existed on Mars.

As Dr. Bohacs and NASA continue to work and analyze more data, it is exciting to anticipate the findings and discoveries that may unfold!. We certainly look forward to inviting Dr. Bohacs back to HGS for a continuation of this unique and totally interesting saga. ■



Barbara Faulkner, Terry Baganz, Susan Bohacs, Dr Kevin Bohacs, Penny Patterson

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HGS Membership Application

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Active Membership

In order to qualify for Active Membership you must have a degree in geology or an allied geoscience from an accredited college or university or, have a degree in science or engineering from an accredited college or university and have been engaged in the professional study or practice of earth science for at least 5 years. Active Members shall be entitled to vote, stand for election, and serve as an officer in the Society. Active Members pay $36.00 in dues.

Associate Membership

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

Student Membership

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

Membership Benefits

Digital HGS Bulletin

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

Discount prices for meetings and short courses

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

Networking

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

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

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

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

Phone _____

Preferred Address for HGS mail_____

This is my home address _____ business address _____

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

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

Student **$0.00**_____

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

Total remittance_____

Payment:

Check #_____

Credit card: V MC AE Discover

Credit Card#_____

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

Signature: _____ Date: _____

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

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

Company Address _____

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

School *(required)*_____

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

Year Graduated _____

School *(optional)*_____

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

Year Graduated _____

Years Work Experience *(required)*_____

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

AAPG Member Number _____ OR

HGS Sponsor's Name _____

Signature: _____ **Date:**_____

Professional Directory

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Consulting Geologist

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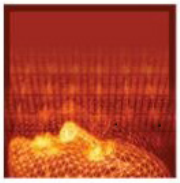

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