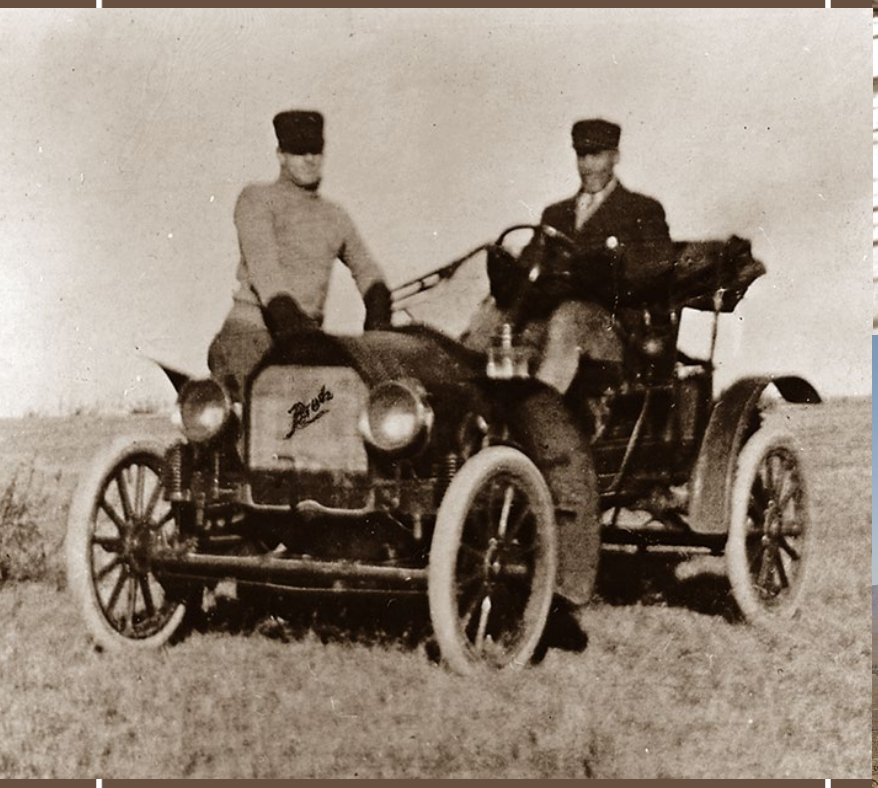
2024 ANNUAL REPORT



Bureau of Economic Geology

Mark W. Shuster

Interim Director

CONTENTS

Cover images:

(Top) Udden geologist group.
(Middle) Bureau's first vehicle.
(Bottom) Geologist adjusting lidar instrument.

Enjoy archival photos of the Bureau of Economic Geology and its people throughout this issue.

KEEP UP WITH THE LATEST FROM THE BUREAU

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Message from the Interim Director

THE STATE GEOLOGICAL SURVEY OF TEXAS LAUNCHES THE TEXAS IMPERATIVE

In 1909, the Bureau of Economic Geology (Bureau) was created with the mission to increase the understanding of geology and geological resources, and stimulate the economy in Texas. In 2024, the Bureau has two roles: one as a research organization that conducts translational and applied research on geosciences that have global reach and impact, and one as the State Geological Survey of Texas continuing its Texas-focused mission. These are synergistic, additive roles that foster broad impact on the geosciences, and at home, here in Texas, serve Texas stakeholders by providing information and insights on Texas geology and resources. With respect to its role as the State Geological Survey of Texas, it is essential that the Bureau stays in tune with the needs of the State, and produces reports and products that are accessible to, and digestible by, a range of stakeholders in Texas. The Bureau's dual role is an "AND" not an "OR".

In 2024, the Directorate at the Bureau recognized that, given the spectrum of important resource-related topics with potential impact on Texas, the Bureau needed to reaffirm our mission and obligation to the State of Texas. Hence, we initiated a series of project-based studies under the umbrella of "The Texas Imperative" with the goals of conducting research on key resources that in our view merited a new look, and providing reports of these studies in readily accessible and digestible formats.

The Texas Imperative comprises a series of separate, project-based resource studies: 1) Water—with a focus on drought in Central Texas; 2) Mineral resources in Texas including updates on critical minerals and industrial materials (aggregates); 3) Helium and native hydrogen gases; and 4) Geothermal energy for heat and power. By design, these studies complement ongoing programmatic research at the Bureau, and, also by design, are intended to translate state-of-the-art science to broadly inform the public and stakeholders.

Indeed, one of the mantras guiding The Texas Imperative is that the research on Texas resources is too valuable to be limited to the scientific community and academia. The intent is that these studies, and their reports and derivative information, will help to inform a wide range of stakeholders here in the great State of Texas.

The Texas Imperative has created a buzz of enthusiasm within the Bureau. Because these studies include hydrology, geophysics, geology, engineering, and the economic discipline, and extend across existing programs, there is broad participation and engagement across the Bureau. Perhaps more importantly, Bureau researchers and staff care about Texas, and appreciate the value of Texas' natural resources to the Texas economy and the importance of well-informed management of these resources and the environment.

Mark W. Shuster
Interim Director

THE TEXAS IMPERATIVE

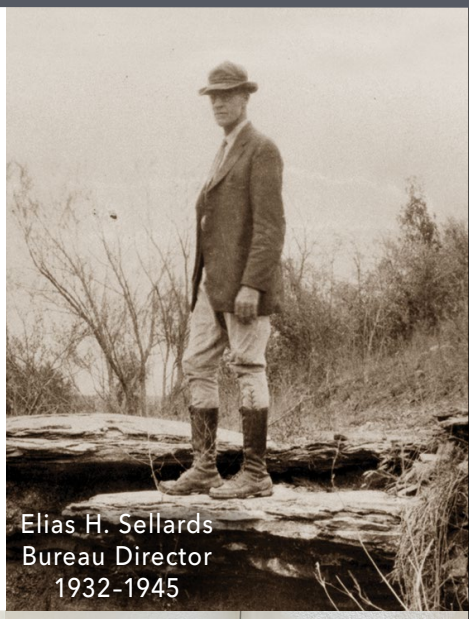
A Research Initiative of
The State Geological Survey of Texas

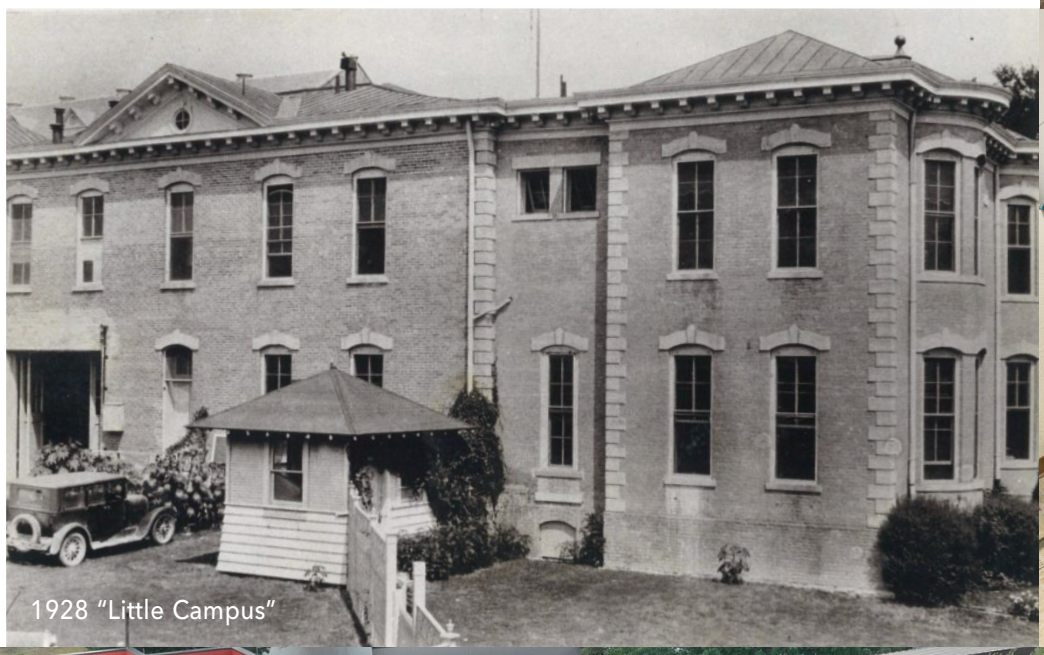
Mineral Resources
Critical minerals; Industrial minerals; Brines (e.g., lithium)

Water Systems and Drought
Survey drought impact on water systems;
Address water resource management issues

Geothermal Energy
Resource potential for heat and power generation

Non-hydrocarbon Gas Resources
Helium; Naturally occurring hydrogen

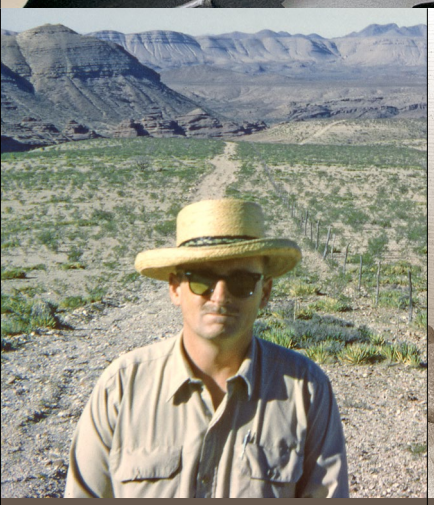

Elias H. Sellards
Bureau Director
1932–1945


1928 "Little Campus"


Roxana Darvari in the Geochemistry Lab

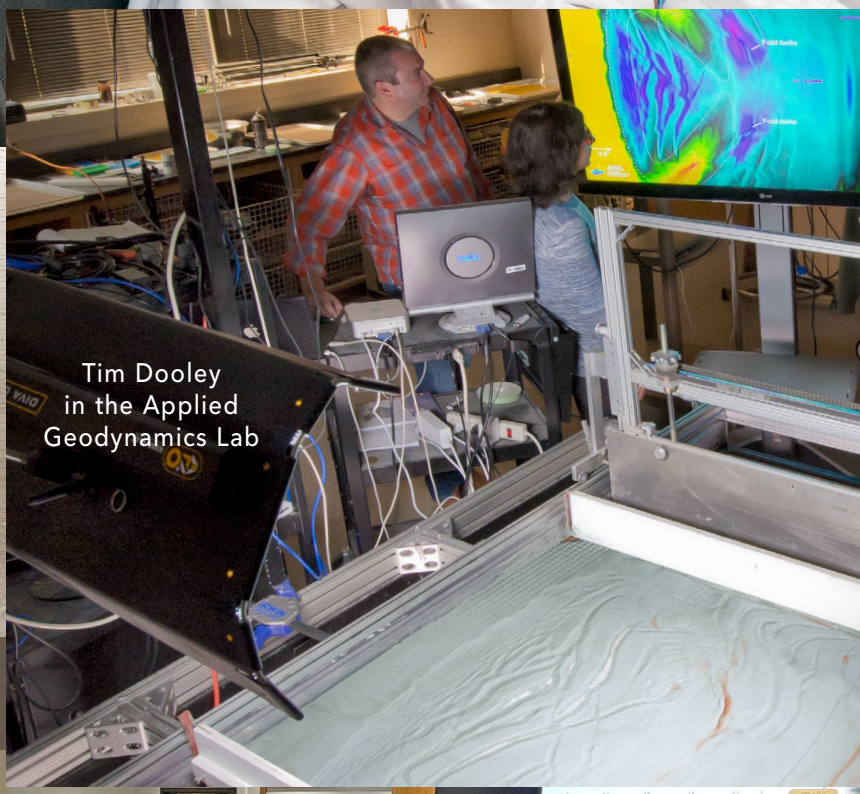

Bureau of Economic Geology Core Lab

Mohsen Ahmadian in the
Nano-Metrology Lab



Peter T. Flawn
Bureau Director
1960–1970

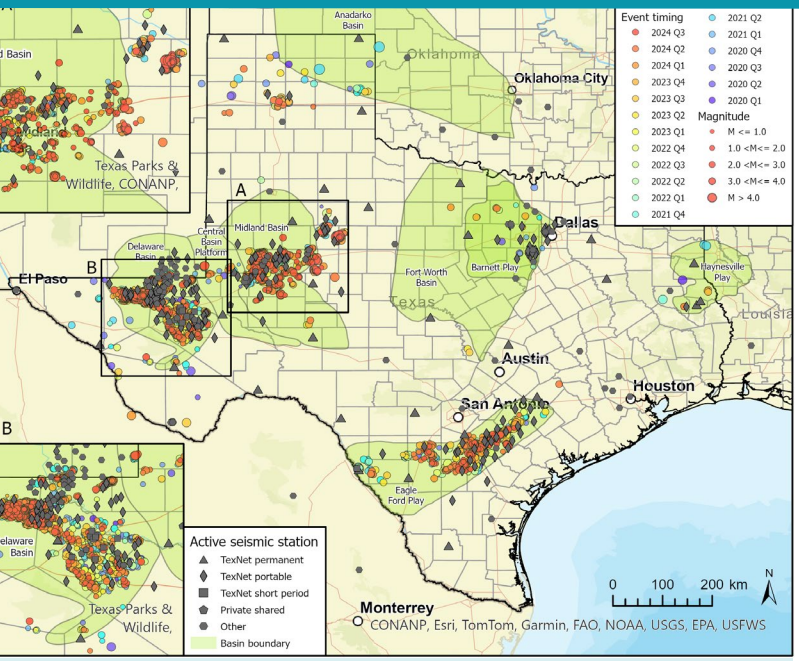
Virgil E. Barnes
Senior Research Scientist
1936–1998



Tim Dooley
in the Applied
Geodynamics Lab

Zoltán Sylvester leading an
Introduction to AI Workshop

NEWS AND EVENTS



Locations of monitoring stations and recorded earthquakes across the State of Texas.

The Texas Earthquake Dataset for Artificial Intelligence

In the past decade, the seismology community has seen numerous successes in data-driven earthquake studies due to the rapid development of machine-learning (ML) techniques. These methods rely on large datasets with high-fidelity labels from humans to train generalized artificial intelligence (AI) models. Among the seismological applications of ML, earthquake detection and P- and S-wave arrival picking are the most widely studied, with capabilities that can exceed humans.

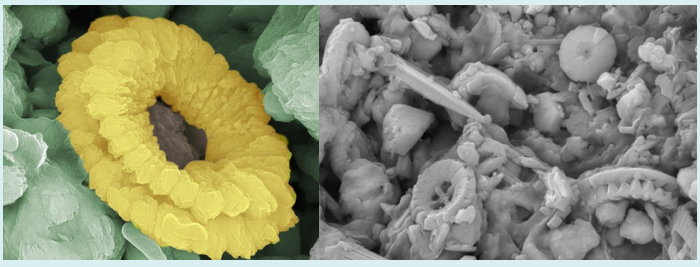
The **Texas Seismological Network (TexNet)** has developed a regional AI earthquake dataset for the State of Texas, called TXED. It is composed of earthquake signals with manually picked P- and S-wave arrival times and noise waveforms corresponding to more than 20,000 earthquake events spanning from January 1, 2017 to date.

This data supplements existing worldwide open-access seismological AI datasets, and represents the signal and noise characteristics of Texas. As a result, TXED can serve as a benchmark for fundamental AI research, like designing seismology-oriented deep-learning architectures.

Several initial applications of TXED demonstrate its promising scientific merits. TXED will be continuously maintained and developed to expand both the data collected and its functionality.

Tiny Plankton Fossils Provide Clues about Ancient Depositional Environment

Coccoliths (plankton nanofossils made up of calcite, an important component in natural chalk) are very common in deepwater sediments from the mid-Jurassic Period to the present. Researchers **Robert Loucks**, **Priyanka Periwal**, and **Robert Reed** of the Bureau of Economic Geology's **State of Texas Advanced Resource Recovery (STARR)** program have recently studied these fossils with the Bureau's scanning electron microscope (SEM).

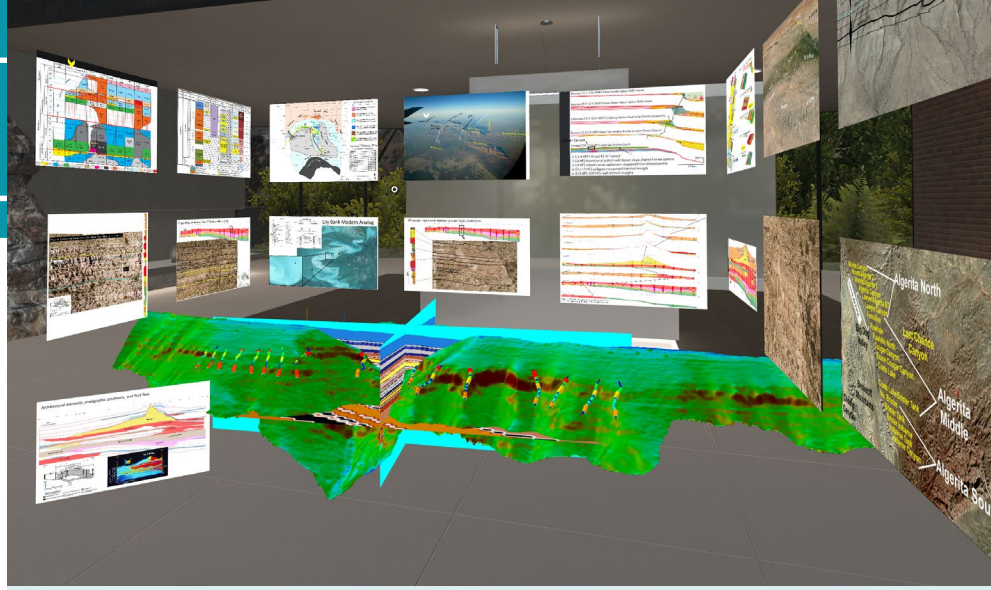


Coccolith images taken using a scanning electron microscope.

Coarse-grain limestones of South and Central Texas associated with Cretaceous-era volcanoes have previously been interpreted as originating in shallow water. However, SEM examination of these rocks has found that they are rife with deepwater coccoliths. Many rock samples associated with the volcanoes, including some from McKinney Falls State Park in the southern part of Austin, have been shown to contain coccoliths and broken pieces derived from coccoliths.

This mix of shallow-water and deepwater fossils in these limestones indicates formation by submarine landslides that mixed sediments on the flanks of the volcanoes. Sometimes the smallest details can have important scientific implications!

Bureau Researchers Create Groundbreaking Virtual Reality Geoscience Experience



RCRL 3D virtual reality comparing core descriptions to digital outcrop geology to subsurface models on seismic and well interpretations.

For over 20 years, the **Reservoir Characterization Research Laboratory (RCRL)** at the Bureau of Economic Geology has used three-dimensional (3D) digital outcrop models for research and educational purposes. Now, the RCRL can create virtual reality (VR) environments that enable researchers and industry partners to experience a wide range of investigation scales, from individual cores to multiwell regional studies. Researchers from the RCRL have put together an ideal VR field trip consisting of integrated 3D digital outcrops, geological interpretations, digital core descriptions, 3D geocellular models, and documentary materials from RCRL outcrop and subsurface knowledge bases.

Virtual reality applications provide a unique way to more accurately and coherently communicate geologic information compared to conventional media. Virtual reality field trip participants can achieve better understanding of the subsurface stratigraphic and facies architecture by directly comparing core descriptions and digital outcrop geology to subsurface models based on seismic and well interpretations. Contextualizing these critical scales in a collaborative environment helps to answer questions related to the spatial distribution of rock properties in 3D geomodels.

The resulting Lawyer Canyon Virtual Field Trip documents the regional stratigraphic setting, scale of stratigraphic cyclicity, the internal 3D facies architecture, and petrophysical heterogeneity at interwell scale. A VR field trip room provides an ideal environment for communicating multidisciplinary, cross-domain workflows and methodologies to a wide audience, including non-geoscientists, students, and industry professionals.

HotRock Geothermal Research Consortium Launches Kickoff Meeting

The Bureau of Economic Geology's newest major research initiative, the **HotRock Geothermal Research Consortium**, recently held its kickoff meeting at the Bureau's headquarters. HotRock is an industry-funded research consortium with the vision to find and fill science and technology gaps to further develop the geothermal anywhere ecosystem.

Ken Wisian

Shuvajit Bhattacharya

The meeting was held over two half-day sessions, and attendees included representatives from founding member companies of the consortium, Shell USA, SLB, and Chesapeake Energy, as well as representatives from additional interested organizations.

A host of HotRock researchers reported results from their recent state-of-the-art studies. They also discussed their ongoing work across a wide range of geothermal energy topics and recent additions to the consortium's research capabilities.

Representatives from member companies were particularly enthusiastic about HotRock's potential, and shared their priority research topics for the near future.

Bureau Researchers Compare Notes on Artificial Intelligence at Workshop

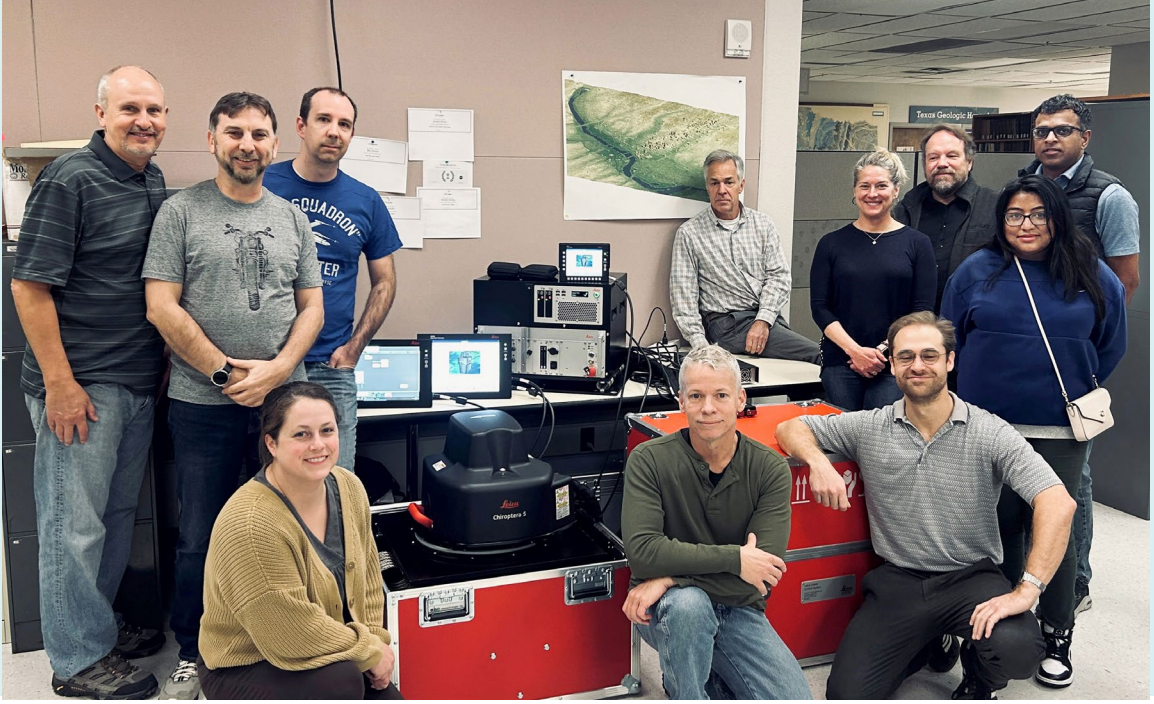
"What is the role of artificial intelligence (AI) in the future of geoscience research?"

That was the looming question pondered by a large assortment of Bureau of Economic Geology researchers at a lively recent workshop.

Conceived and organized by Bureau Research Professor **Dr. Seyyed Hosseini**, the **AI workshop** was designed for researchers who incorporate machine learning and AI applications into their work. The call that went out across the organization for interested parties and presentation ideas generated a huge response, and 60 Bureau researchers participated. The attendees enjoyed nine thought-provoking presentations, two panel discussions, and multiple occasions for sharing concepts and discussing future challenges and opportunities in the AI space.

Hot discussion topics included creating robust benchmark datasets, tying subject matter knowledge into AI models, and transforming geological data gathered through decades of research at the Bureau into formats ready for AI research. Underlying the overall conversation was a general desire to collaborate across research thrusts to maximize AI learnings and resources.

Bureau researchers Seyyed Hosseini (below) and Sergey Fomel and Hongliu Zeng (right) compare notes on artificial intelligence at workshop.



Bureau's lidar group expands new research airborne system.

Bureau Research Soars Higher with Airborne Lidar

In early 2024, researchers from the Bureau's **Near Surface Observatory** conducted an airborne lidar survey campaign covering the beaches, barrier islands, and shallow offshore along the entire Texas Gulf shoreline. This project, funded by the Texas General Land Office, was the first major data acquisition project using the Bureau's new **Leica Chiroptera Mark 5** airborne system. Preliminary results indicated higher spatial resolution of topography, and deeper water bottom mapping in the nearshore environment, than the previous system could achieve.

In addition to the coastal survey, researchers completed lidar data collection for other UT-Austin research groups. Researchers also acquired detailed near-infrared lidar data of downtown Austin to compare city infrastructure with data acquired with the Bureau's first lidar system in 2002, and assessed the impact of Hurricane Beryl, which made landfall along the Texas Gulf Coast in July of 2024.

Bureau Researchers Empower Next-Generation Geoscientists in Summer Program

This summer, nine Bureau researchers mentored students through the **Jackson School of Geosciences' Research Traineeship Experience (RTX)**.

The innovative training program provides undergraduates a paid opportunity to work alongside established researchers in the field for support and guidance. Students learn cutting-edge geoscience techniques, conduct research, and develop critical skills. The result is increased confidence and experience to achieve their academic and career aspirations.

"The RTX experience can give undergraduate students a chance to engage in research activities and experience research themselves with a good support system," program manager Ning Lin shared.

Bureau researchers empower next-generation geoscientists in summer program.

Wildfire images taken from drones.

STARR Researcher Recruits Successful XPRIZE Team

The Texas-Soton team competing for the **XPRIZE Wildfire Autonomous Response Competition** was recently announced as one of only 29 teams world-wide, and the only team from Texas, to continue to the next round. **Dr. James Thompson**, research assistant professor in the Bureau of Economic Geology's State of Texas Advanced Resource Recovery (STARR) program, was instrumental in recruiting the team, which also includes members from UT-Austin's Cockrell School of Engineering and from four other research institutions.

The XPRIZE Foundation holds global contests designed to encourage innovation and solve some of the world's biggest challenges. The Texas-Soton team is competing in the XPRIZE Wildfire competition's $5 million Autonomous Wildfire Response Track, and seeks to transform how fires are managed and fought by rapidly detecting and extinguishing destructive, high-risk fires in environmentally challenging areas.

Dr. Thompson is leading the effort to create satellite sensors which would utilize infrared imaging spectroscopy to quickly identify potential wildfires before they fully flare. The sensors would detect and characterize gasses emitted from the early fire to confirm what is burning, and deploy drones with specialized fire-fighting features to immediately suppress that particular type of fire.

The Bureau's STARR program has contributed to concept development and other activities of Texas-Soton. The Texas team has four more rounds of competition ahead before the winner is announced in November of 2026.

Annual Research Symposium Celebrates 10 Years

On Friday, September 20, the Bureau of Economic Geology held its **10th Annual Research Symposium**. The event provides "an opportunity to build collaborative relationships and learn about new research initiatives at the Bureau," explained Information Geologist Linda Ruiz McCall.

Researchers displayed twenty-three posters and gave thirteen nano talks (5-minute oral presentations) on an array of topics, from using algorithms to analyze reservoir behavior, to lithium supply chains, and many more.

Each year, the attendees cast a ballot vote for "Best Nano Talk" and "Best Poster" Awards.

This year's Best Nano Talk winner was **Shweta Singh**, with her presentation, "Wind Energy's Next Frontier: Forecasting Turbine Blade Waste in Texas."

Two posters tied for Best Poster: "Spatiotemporal variation of dust storm incidents," presented by **Hassan Dashtian**, and "CCS Comic Book Adventures: Designing Science Materials for Middle School Education in Texas," presented by **Dolores van der Kolk**.

Congratulations to the winners, and to all of the talented researchers who participated!

Annual Research Symposium building collaborative relationships.

Shweta Singh

Hassan Dashtian

Dolores van der Kolk

The Bureau's Houston Research Center Levels Up

The Bureau of Economic Geology's **Houston Research Center (HRC)** recently received some major structural and aesthetic upgrades. Visitors are now greeted with a new 16 ft. wide LED backlit sign in front of the administrative building, replacing a nearly 20-year-old sign that had become worn and tattered over the years.

Additionally, the administrative building itself is getting a facelift. The rock-surfaced walls are being power washed, and a fresh coat of paint will match the burnt orange wall where the new sign sits.

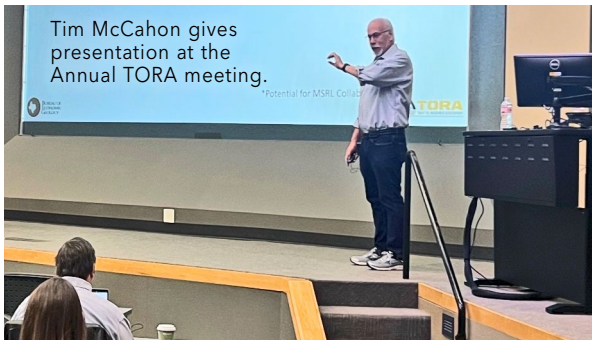
An entire HVAC system upgrade is also underway, including new rooftop units on the administrative building and new, large ground units for the warehouse areas, which are fully air-conditioned and climate-controlled.

These renovations have been in the works for a long time, and the Bureau is excited and proud to be investing in its facility near the heart of the oil and gas industry sector in Houston.

Congratulations to HRC Manager **Nick Hamilton** and his team for facilitating these improvements!

Tight Oil Resource Assessment Consortium Conducts Annual Meeting

The **Tight Oil Resource Assessment (TORA)** research consortium at the Bureau of Economic Geology held its annual meeting in Austin. The gathering included far-reaching discussions on a broad range of research topics. Over 30 representatives from TORA member organizations participated in two days of presentations from a dozen TORA geoscientists, engineers, and economists who addressed diverse research areas, including major resource play analyses and novel subsurface concepts.



Tim McCahon gives presentation at the Annual TORA meeting.

Presentations that piqued the most interest among attendees included the extension of TORA's ongoing Permian Basin analysis into the lower Paleozoic section, environmental topics (carbon sequestration, hydrogen sulfide [H_2S] occurrence, and hydrogen usage), and productivity and decline analyses.

Midland Core Archive to Relocate to Houston Research Center

The Bureau of Economic Geology's **Midland Core Research Center (MCRC)** has closed to the public. Ever since the Shell Oil Company donated the facility to the Bureau back in 1995, the MCRC has been in constant operation serving Permian Basin-area geologists, students, and the general public.


Midland Core Research Center

Under the leadership of the Bureau's **Nathan Ivicic** and **Brandon Williamson**, the MCRC's physical rock collection of over 75,000 boxes of core is being transferred to the organization's Houston and Austin repositories, with the vast majority going to the **Houston Research Center (HRC)**. The project is estimated to take between six and nine months to complete. HRC Manager **Nick Hamilton** will oversee the receiving, rack placement, and capturing of the physical and electronic inventory information of the transferred Midland cores.

The Bureau would like to thank long-time MCRC Facility Manager, **Andrew Faigle**, for his years of service and commitment to the Bureau and the MCRC, and wish him the best in future endeavors.

$GeoH_2$ Annual Meeting Furthers Research to Develop a Hydrogen Economy

The Bureau of Economic Geology's **$GeoH_2$ consortium** is the first and largest U.S. academic group dedicated to research on subsurface hydrogen storage, hydrogen as a low-carbon energy resource, engineering aspects of hydrogen production and storage, and hydrogen techno-economics. The consortium convened researchers and over 80 partners at the Bureau and online for a productive and very successful two-day annual meeting. Representatives from national and international energy companies, government research labs, environmental non-profit organizations, and academic institutions excitedly engaged to learn about cutting-edge hydrogen research.

Bureau's $GeoH_2$ consortium convened researchers in annual meeting.

$GeoH_2$ and guest researchers conducted presentations and led discussions related to capacity estimates for cavern and porous reservoir storage of hydrogen in the U.S. and abroad, novel technologies for geophysical monitoring of hydrogen migration in the subsurface, in situ generation of hydrogen from ultramafic rocks and organic matter, leakage and geomechanical behavior of reservoir and caprock for hydrogen storage, and the development of tools for economic and capacity calculations.

HONORS

Bureau Researchers Honored

Michael Young

Michael Young, the Jackson School of Geosciences Associate Dean for Research, has been named a fellow of the American Society of Agronomy (ASA).

The ASA is an international scientific and professional society that empowers scientists, educators, and practitioners in developing, disseminating, and applying agronomic solutions to feed and sustain the world. Based in Madison, Wisconsin, the ASA was founded in 1907 and has more than 7,000 members and 12,000 certified crop advisers dedicated to advancing the field of agronomy.

Kitty Milliken

The 2024 SEPM Francis J. Pettijohn Medal for Excellence in Sedimentology was awarded to **Kitty Milliken** at the SEPM's Award Reception during the International Sedimentary Geology Congress in Flagstaff. The Pettijohn Medal is awarded to those who have a significant record of outstanding contributions in sedimentary geology, including all aspects of sedimentology and stratigraphy.

First Author and Tinker Family Publication Awards

Each year, the Bureau hosts a special dinner and awards ceremony to recognize first authors and co-authors of papers written by first author students whose work was published during the previous year.

145 peer-reviewed Bureau papers were published in 2023, an almost 15% increase from the previous year. 75 Bureau authors were published last year, with 46 publications by first authors, 10 of whom were honored for the first time.

The event also served as the stage to announce the winners of the annual Tinker Family BEG Publication Award, presented to Bureau authors who published work that creates exceptional impact in the field or otherwise significantly benefits the Bureau scientific community.

The 2024 Tinker Family BEG Publication Award winners were **Alex Bump** and coauthors **Sahar Bakhshian**, **Hailun Ni**, **Susan Hovorka**, **Iulia Olariu**, **Dallas Dunlap**, **Seyyed Hosseini**, and **Tip Meckel**, for their timely and foundational work toward CO_2 storage security in the paper, "Rethinking geologic seals for permanent CO_2 sequestration" published in Greenhouse Gas Control.

Alex Bump | Sahar Bakhshian | Hailun Ni | Susan Hovorka | Iulia Olariu | Dallas Dunlap | Seyyed Hosseini | Tip Meckel

Rainmaker Awards

The Bureau of Economic Geology prides itself on being an entrepreneurial organization wherein the hard work of researchers to develop grant proposals and make pitches to funding entities is acknowledged and rewarded. These researchers are the Bureau's "rainmakers," bringing in external grants to further the organization's work, and they are recognized at the annual Rainmaker Awards Dinner.

That dinner was held in November of 2024. The cut-off for recognition in 2024 was set at $250,000 in grants, and 25 rainmakers were recognized for having raised at or above $250,000 in the past year. The funds brought in by this group represented $16 million, or about 73%, of all of the external funding generated last year at the Bureau. This was a fundamentally important group of entrepreneurial principal investigators and researchers without whose fund raising efforts carrying out the mission of the Bureau of Economic Geology would not have been possible.

The generosity of Bureau Visiting Committee member Elliott Pew and his family allowed for the creation of the Pew Family Bureau of Economic Geology Rainmaker of the Year Award which for several years has provided a cash award to be presented to that year's top rainmaker. The recipient of the 2024 Rainmaker of the Year Award was **Peter Hennings** whose efforts facilitated grants to the Bureau in excess of $3.5 million. Congratulations to Peter Hennings for his remarkable research and for his extraordinary efforts to acquire vital external funding in 2024!

(Top left to lower right) **Mohsen Ahmadian, Alex Bump, David Chapman, Jake Covault, Oliver Duffy, Sergey Fomel, Emery Goodman, Xavier Janson, Jay Kipper, Steve Laubach, Ning Lin, Tip Meckel, Lorena Moscardelli, J.-P. Nicot, Jeff Paine, Alexandros Savvaidis, Kutalmis Saylam, Bridget Scanlon, Mark Shuster, Alex Sun, Zoltán Sylvester, Scott Tinker, Ken Wisian, and Michael Young.**

Bureau Researchers Honored for Groundbreaking Research at GeoGulf '24


Shuvajit Bhattacharya


Bob Loucks


Rob Reed

At the GeoGulf '24 Conference, which was held in San Antonio, Bureau researchers **Shuvajit Bhattacharya, Bob Loucks,** and **Rob Reed** were presented with awards for their outstanding work.

Bhattacharya and his collaborator, Sumit Verma, University of Texas Permian Basin, won the Gulf Coast Section's A.I. Levorsen Memorial Award in the Best Oral Presentation category for their 2023 conference presentation, "Seismic attributes for deep water depositional systems."

Loucks and Reed received the President's Award for Outstanding Paper in the GCAGS Journal, Volume 12 (2023) for their paper, "Volcanic origin and significance of glauconite grains in the Upper Cretaceous Austin Chalk Formation in the Balcones Igneous Province, South and Central Texas."

Bureau Researchers Recognized for Achievements

The joint annual AAPG-SEG-SEPM "IMAGE '24" conference was recently held in Houston, and Bureau of Economic Geology researchers were recognized at the event for their noteworthy accomplishments.


Steve Laubach

Research Professor **Stephen E. Laubach** was named an Honorary Member of AAPG—one of the organization's highest honors. This prestigious distinction "is bestowed upon persons who have distinguished themselves by their service and devotion to the science and profession of petroleum geology and to the Association."

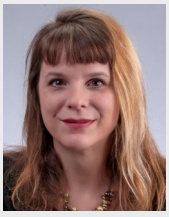

Sergey Fomel

The Bureau's **Sergey B. Fomel**, Wallace E. Pratt Professor of Geophysics, and his students won the AAPG-SEG 2023 "Best Paper in Interpretation" for their paper, "A deep learning framework for seismic facies classification." The lead author was Harpreet Kaur, a Ph.D. student. Other authors include Nam Pham, Zhicheng Geng, Luke Decker, Ben Gremillion, Michael Jervis, Ray Abma, and Shuang Gao.

Individual Achievements


Tim Dooley

The IMAGE 2024 conference Technical Program Co-Chairs recognized Bureau of Economic Geology Research Professor **Tim Dooley** for the Poster Award for Geological Technology for his "Assessing Carbopol as a mobile-shale analog in the laboratory: preliminary results under contraction."


Gwen Hebert

Winner of the 2024 Staff Excellence Award was Senior Grants & Contracts Specialist **Gwen Hebert**.


Julia Hennings

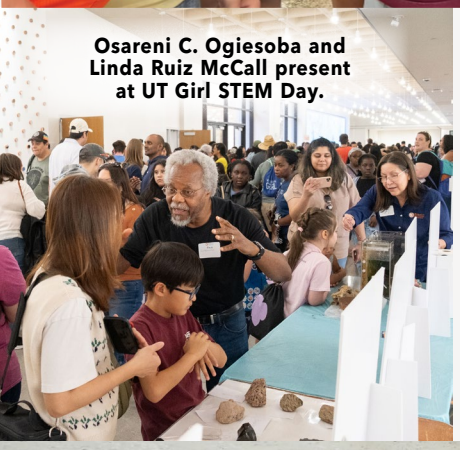
Julia Hennings was the 2024 AAPG's Geosciences in Media Award winner for her research contributions to the Bureau's immensely popular radio program, **EarthDate**, which tells captivating stories to remind listeners that science can enlighten, educate, and entertain.

OUTREACH

GeoFORCE high school students visit Natural Bridge Caverns as part of their research about geoheritage.

Texas Environmental Education Advisory Council

The Bureau hosted the annual meeting of the **Texas Environmental Education Advisory Council (TEEAC) of the Texas Education Agency (TEA).** This hybrid meeting brought together over 70 attendees from parks, camps, museums, zoos, and governmental agencies from across the state to coordinate the goals of the TEA with key informal educators.



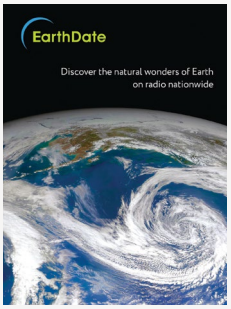
Osareni C. Ogiesoba and Linda Ruiz McCall present at UT Girl STEM Day.

UT Girl STEM Day

Bureau researchers reached out to hundreds of girls and their families during the **UT Girl STEM Day**. Attendees enjoyed hands-on demonstrations about groundwater/surface water interactions and rocks, sparking interest in earth sciences.

EarthDate

Broadcast in all 50 states, the **EarthDate** public service radio program engages listeners with earth science and reconnects them to the wonders of their world. Episodes are available on the EarthDate website, where you can listen, read, and download the full content.
https://www.earthdate.org/



High school students creating a dune profile as part of the Texas High School Coastal Monitoring Program.

Texas High School Coastal Monitoring Program

The **Texas High School Coastal Monitoring Program (THSCMP)** is a sponsored research and outreach initiative that completed 24 field trips. The program helps students along the Texas coast better understand their natural environment while providing valuable data about shoreline changes to coastal communities, decision-makers, and scientists.
https://www.beg.utexas.edu/thscmp

Teachers at CAST Workshop learning about carbon.

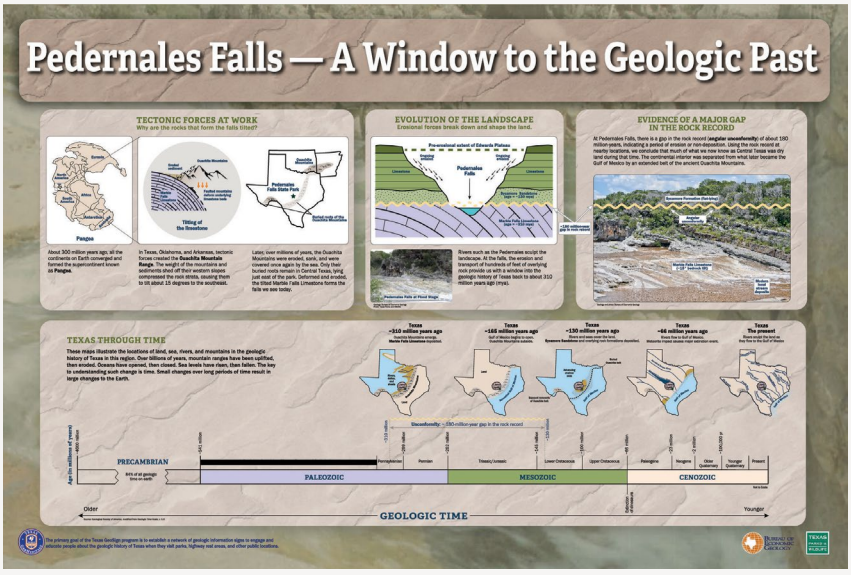
Conference for the Advancement of Science Teaching

The Bureau engaged educators across the state at the **Conference for the Advancement of Science Teaching (CAST)** in November. A key highlight was a workshop on carbon capture and sequestration, led by teachers and Bureau researchers from the Gulf Coast Carbon Center (GCCC). The curriculum, developed with teachers from the Houston and Corpus Christi areas, was part of the Texas-Louisiana Carbon Management Community project and reached 50 attendees. https://gccc.beg.utexas.edu/research/txla-cmc

High school students and research staff supported by the Bureau in the summer GeoFORCE program.

GeoFORCE

Bureau researchers instructed high school students enrolled in the **GeoFORCE Texas 12th Grade Research Academy and Symposium.** Fifty-five students spent the week interacting directly with Bureau scientists and staff to explore topics such as carbon capture, marine systems, global climate, and geoheritage. The geoheritage project on Comal Springs was selected to present their research poster at the American Geophysical Union (AGU) Annual Conference in Washington, D.C. https://www.jsg.utexas.edu/geoforce/summer-academies/#twelfth-grade



Texas GeoSigns

The Bureau's **Texas GeoSign** team partnered with Texas Parks and Wildlife to install interpretive signs at state parks. GeoSigns have been installed at Pedernales Falls and Guadalupe River State Parks. Bureau researchers **Linda Ruiz McCall, Carson Werner,** and **Chock Woodruff Jr.** also conducted an initial study with the USGS to identify geoheritage sites in Texas. https://www.beg.utexas.edu/geosign

Pedernales Falls State Park Texas GeoSign.

RESEARCH CONSORTIA

Research Partnerships with the Bureau of Economic Geology

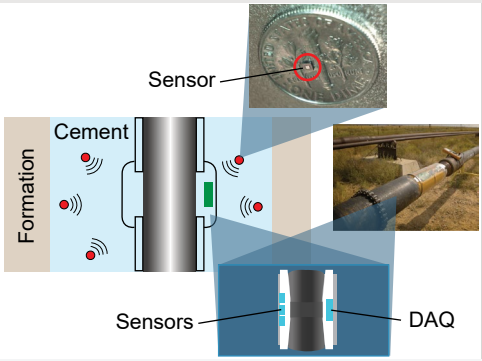
The Bureau of Economic Geology conducts objective, impactful, and integrated geoscience research on subjects of high interest to a broad spectrum of stakeholders, including energy and environmental firms, government agencies, and the scientific community, a great number of which actively participate in its many research consortia. Each consortium is designed to complement partner efforts to research a key exploration, production, environmental, or energy economics question. Participation is on a subscription basis. Member benefits vary, but generally include first-look privileges at research outcomes, access to research teams, invitations to annual review meetings, and individual meetings with researchers for presentation and dialogue.

Members also benefit from interactions with counterparts in fellow member organizations. Each Bureau research consortium has a dedicated team of full-time Bureau researchers. Many of them host talented graduate students, with the teams combining seasoned experts and early career specialists. Experienced and effective senior researchers lead each consortium.

Contact the principal investigator of any program of interest to you. For further information about these research consortia, or about the breadth of your organization's engagement with the Bureau, please contact us at 512-471-1534.

Download the consortia brochure: **www.beg.utexas.edu/about/reports-and-information.**

ADVANCED ENERGY CONSORTIUM



Mission

The Advanced Energy Consortium (AEC) pioneers innovative microsensors, nanotechnology solutions, and AI-powered analytics to optimize subsurface flow engineering, containment monitoring, and sustainable resource extraction. Our significant impact over the past 15+ years includes over $70+ million in R&D investment, 40+ patents, and a global network of 400+ researchers and entrepreneurs collaborating across 35+ institutions.

Research Thrusts

AEC's highly adaptive research encompasses smart nano-additives for flow assurance, flow mapping, and microsensors for IoT solutions in harsh subsurface environments. Our current member-directed research includes the following: (1) revolutionizing subsurface monitoring by developing miniaturized sensors for CO_2 sequestration and pipeline monitoring, and for cement integrity and abandoned well monitoring; (2) illuminating subsurface flow, including designing smart nano-additives to map flow and stimulated volume in conventional, unconventional, and geothermal reservoirs; (3) AI data-driven decisions–applying analytics to sensor data for optimized decision-making and resource extraction; and (4) production optimization, including designing delay-released asphaltene and scale inhibitors.

Research Challenges

The AEC is committed to pushing the boundaries of subsurface technology. We see complex research challenges as opportunities to develop groundbreaking solutions for energy and environmental applications. We are actively innovating to advance our robust microsensor platforms that can withstand the extreme conditions of the subsurface. We focus on accelerating these discoveries' translation into practical, cost-effective commercial products that benefit our members and the industry.

Membership

Join Our Community of Innovation and Impact. Become a member of a network driving groundbreaking applied nanotechnology R&D. Membership includes commercial rights to all AEC IP. The future promises exciting commercial solutions through startup incubation, establishing joint industry projects (JIPs), and licensing.

Contact
Dr. Mohsen Ahmadian
mohsen.ahmadian@beg.utexas.edu, (U.S.) 512-471-2999
www.beg.utexas.edu/aec

APPLIED GEODYNAMICS LABORATORY

Mission

Pure and applied research in salt tectonics has been a strong component of the Bureau's research program since the late 1970's. Applied Geodynamics Laboratory (AGL) research comprises a mix of physical and mathematical modeling, seismic- and field-based mapping, and structural, stratigraphic analysis of some of the world's most spectacular salt basins. In addition, starting in 2019, the AGL added a new research theme investigating mobile shales. Here we use our existing expertise in diapirism and seismic interpretation, combined with physical and mathematical modeling, to understand the origin, evolution, and seismic imaging of mobile-shale structures.

Research Thrusts

Concepts and terminology pioneered by the AGL over the past quarter century have profoundly influenced salt tectonics and are now widely disseminated throughout the oil industry. The AGL strives to effectively communicate these results via a variety of media, including *Salt Tectonics: Principles and Practice*, the leading textbook on the subject in the world.

Research Challenges

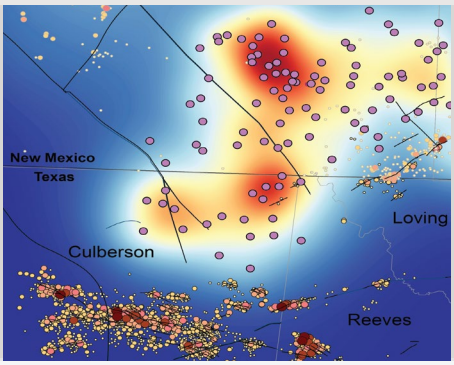
The primary goals of the AGL are to develop a conceptual framework for the full range of salt and mobile-shale tectonics; to analyze connections among physical models, mathematical models, seismic data sets, and field examples from all over the world; and to disseminate complex technical information to a constantly shifting spectrum of industrial and academic supporters. Areas of focus include mobile-shale mechanics; mobile-shale piercement mechanisms; salt weld; salt canopy; reactive, falling, and squeezed diapirs; shape of passive diapirs and sheets; fault families (with the University of Colorado); extrusive salt sheets (with BP and ExxonMobil); extensional turtle and mock turtle structures; mechanics of salt-sheet advance; the origins of minibasins; intrusive salt plumes; and salt sutures.

Membership

The 21 supporting companies of the AGL include a wide range of industry partners from around the world.

Contact
Dr. Michael R. Hudec
michael.hudec@beg.utexas.edu, (U.S.) 512-471-1428
agl.beg.utexas.edu

CENTER FOR INJECTION AND SEISMICITY RESEARCH



Mission

The Center for Injection and Seismicity Research (CISR) is a multidisciplinary, intercollegiate research consortium. CISR works to understand the processes that influence fault rupture and seismicity, and other dynamic reservoir impacts stemming from large-scale injection.

Research Thrusts

CISR conducts fundamental and applied research to assess the dynamic impacts of injection including seismogenic faulting, reservoir characteristics associated with stress change, fault slip hazard evolution, fluid flow and pore pressure effects, and to provide stakeholders with data, models and analyses to mitigate hazard and optimize subsurface operations. CISR relies on research specialists spanning geology, seismology, geomechanics, hydrogeology, reservoir engineering, and data science and collaborates broadly with other institutions within Texas and beyond.

Research Challenges

Billions of barrels of injection have occurred in basins undergoing unconventional petroleum development, resulting in induced earthquakes, deformation of the ground surface, and other challenges. Handling water produced with oil and gas is a challenge to the sustainability of current practices employed by the petroleum industry. CISR's research findings have application to all aspects of injection including CCS, subsurface gas storage, and geothermal energy development. Understanding the interplay among complex operational drivers of induced seismicity, other dynamic injection capacity constraints, and interdependent subsurface physical processes is a daunting challenge that the Bureau is pursuing head-on.

Membership

Most of the major energy companies that operate in Texas' unconventional plays as well as international operators are CISR members. Midstream water management and land management companies are also CISR members. Each company has one member on the CISR Advisory Committee. Member companies are encouraged to enter into additional confidentiality agreements with CISR to contribute proprietary data and information to advance CISR research.

Contact
Dr. Katie Smye
katie.smye@beg.utexas.edu, (U.S.) 512-471-6775
Dr. J.-P. Nicot
jp.nicot@beg.utexas.edu, (U.S.) 512-471-6775
cisr.beg.utexas.edu

COMPARING ELECTRICITY OPTIONS

Mission

The Comparing Electricity Options (CEO) research consortium works to understand the trade-offs among society's goals of mitigating climate change to improving local environments, and providing reliable and affordable energy that can sustain a healthy economy for future populations. Using a three-phase project design, the goals of the CEO consortium are to create tools that support energy-sector decisionmakers with better economic and environmental assessments to manage environmental, social, and governance risks across global supply chains; highlight where innovation can mitigate impacts; and inform policies that encourage innovation.

Research Thrusts

In Phase 1, we conducted comparative life cycle assessments (LCAs) of critical material supply chains and different types of power plants and compared them in terms of 16 environmental impact categories and damage pathways affecting human health, biodiversity and ecosystem. The LCA system boundaries are cradle-to-grave, which include natural resource extraction, generator manufacturing, power plant operations, and end of life. In Phase 2, we use electricity dispatch modeling and LCA to assess grid reliability using different mixes of technologies through 2050, and to understand the environmental footprint of these mixes. We also include new transmission and distribution infrastructure, yielding a comprehensive assessment of these trade-offs. In Phase 3, we use these results to develop a new type of consumer-level cost estimate for electricity that includes environmental and system costs.

Research Challenges

We consider many materials and technologies with complex global supply chains, with each supply chain including many processes. Values for numerous inputs vary widely by location. Publicly available data on global supply chain activities are often scarce. Therefore, we must analyze numerous scenarios for LCAs, power systems, and consumer costs while continuously pursuing new information, preferably primary data, from supply chain stakeholders. We have procured AURORA, a grid modeling software, and have been successful in modeling alternate energy transition scenarios for the ERCOT area.

Membership

Membership for new and existing industrial affiliates is tiered to accommodate all interested partners.

Contact
Dr. Michael Young
michael.young@beg.utexas.edu, (U.S.) 512-475-8830
ceo.beg.utexas.edu

FRACTURE RESEARCH AND APPLICATION CONSORTIUM

Mission

Fracture research at The University of Texas at Austin seeks fundamental understanding of fracture processes with the aim of finding new geological, geophysical, and engineering methods to explain and successfully predict, characterize, and simulate reservoir-scale structures. The research is both fundamental and practical, aiming at improving prediction and diagnosis of fracture attributes in geothermal and hydrocarbon reservoirs and accurately simulating their influence on production. Research is organized around the Fracture Research and Application Consortium (FRAC) and conducted together with scientists from member companies. Students are an important part of the program.

Research Thrusts

Accurate prediction and characterization of fractures hold great potential for improving production by increasing the success and efficiency of exploration and recovery processes. New analytical methods produce data that can enhance well test and seismic interpretations, and can be used in reservoir simulators. We are developing new and more reliable methods to quantify fracture patterns in 3D and to predict hydraulic-fracture propagation in naturally fractured, geothermal, and unconventional reservoirs.

Research Challenges

Faults and fractures are difficult or impossible to characterize adequately using currently available technology. Fractures have been challenging to sample and model, posing serious obstacles to exploration and development. FRAC's approach is helping to overcome the limitations of current methods.

Membership

Training in techniques, software, and FRAC's workflow is a benefit of membership. Annual meetings cover measurement, interpretation, prediction, and simulation of fractures and mechanical properties in carbonate rocks, mudstones, and sandstones.

Contact

Dr. Stephen E. Laubach
steve.laubach@beg.utexas.edu, (U.S.) 512-471-6303

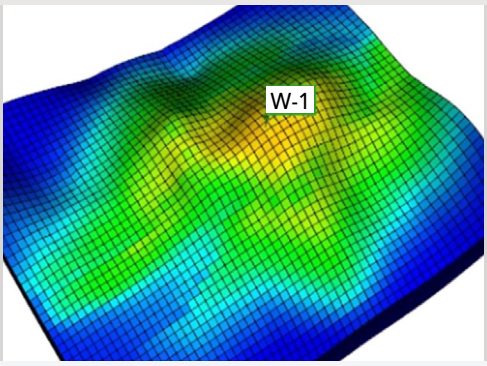
Dr. Julia F. W. Gale
julia.gale@beg.utexas.edu, (U.S.) 512-232-7957

Dr. Jon E. Olson
jolson@austin.utexas.edu, (U.S.) 512-471-7375

frac.beg.utexas.edu

www.jsg.utexas.edu/sdi/

GEOH$_2$



Mission

GeoH$_2$ conducts geoscience and economic research to facilitate and advance the development of a hydrogen economy *at scale*. GeoH$_2$ connects industry professionals in the energy and power sector with researchers in energy geoscience, subsurface engineering, and energy economics to conduct subsurface hydrogen storage research and technology development, market feasibility analyses, and to explore novel subsurface concepts related to hydrogen.

Research Thrusts

Research activities include reservoir modeling coupled with laboratory experiments to understand the behavior of hydrogen in geologic reservoirs such as depleted fields, saline aquifers, and salt dissolution caverns. This work informs techno-economic analyses for different reservoir types and fields for a range of anticipated energy markets and regulatory frameworks. Concepts such as in situ generation of hydrogen, controls on natural hydrogen, and dispersion of hydrogen in reservoirs are also investigated.

Research Challenges

While subsurface hydrogen storage can build on decades of natural gas underground storage, the unique properties of hydrogen require an adaptation of existing storage technology to account for differences in storage capacity, reservoir integrity, and requirements on hydrogen purity. Existing proven storage technology in underground salt caverns requires a reassessment for further upscaling. Predictive economic models of industrial-scale subsurface hydrogen storage face uncertainties in market, regulatory, and technology development.

Membership

Consortium members meet twice a year for research and development reviews, with additional project planning and review meetings as needed. Training and sponsor company visits can be arranged in person or virtually.

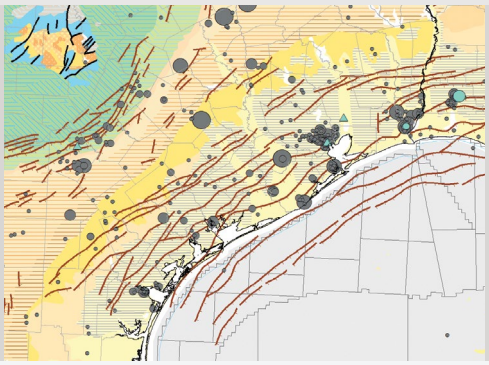
Contact

Dr. Mark Shuster
mark.shuster@beg.utexas.edu, (U.S.) 512-471-7090

Dr. Peter Eichhubl
peter.eichhubl@beg.utexas.edu, (U.S.) 512-475-8829

geoh2.beg.utexas.edu

GULF COAST CARBON CENTER



Mission

The Gulf Coast Carbon Center (GCCC) conducts research and training in geologic storage technologies used to reduce emissions of carbon dioxide (CO_2). CO_2 is captured from either highly concentrated emissions from industrial facilities or low concentrations from the atmosphere. Once captured, CO_2 is injected kilometers below the ground surface into porous rocks for permanent storage, and the CO_2 becomes isolated from the atmosphere.

Research Thrusts

The GCCC's mission and research into large-volume CO_2 storage achieves the following: (1) improves structural and stratigraphic characterization methods and simulation approaches for identifying suitable storage locations; (2) creates pore- to basin-scale workflows to help projects operate at maximum injection rates and over prolonged periods of time; (3) assesses storage resources in offshore subsea settings in the Gulf of Mexico and globally; (4) develops and tests monitoring approaches to meet regulatory and social license operating demands; (5) monitors long-running CO_2-enhanced oil recovery projects to help address the intersection of economic and storage value while also assessing life-cycle considerations; and (6) provides information and outreach on carbon capture and storage (CCS) to a variety of stakeholders.

Research Challenges

CCS deployment is not happening at the rate and scale needed to achieve global emission reduction goals. Many influential stakeholders, from industrial investors, policymakers, to journalists, do not have the proper information needed to see the critical role of CCS in order to attain these goals and the viability of CCS.

Membership

Members meet twice a year, sometimes jointly with other related groups to discuss priority areas of research, and members receive a quarterly newsletter to stay updated with GCCC events and activities.

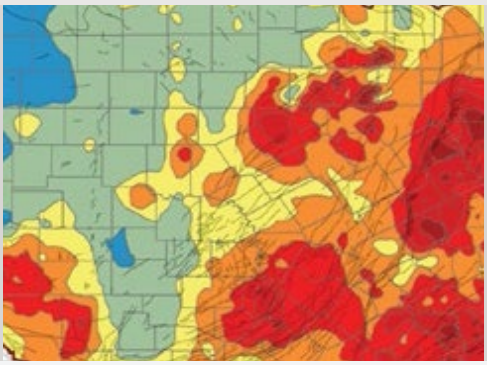
Contact

Dr. Susan D. Hovorka
susan.hovorka@beg.utexas.edu, (U.S.) 512-471-4863

Dr. Timothy "Tip" Meckel
tip.meckel@beg.utexas.edu, (U.S.) 512-471-4306

gccc.beg.utexas.edu

HOTROCK GEOTHERMAL



Mission

HotRock is an industry-funded research consortium to find and fill the science and technology gaps needed to further develop the geothermal anywhere ecosystem. This incorporates science, engineering, economics, policy, and entrepreneurship efforts led by the Bureau, an organization with the skills and proven track record to lead a major enterprise such as this.

Research Thrusts

The HotRock research consortium addresses the broadest of research and engineering topics, from deep within the subsurface to the consumer, including subsurface geology and engineering; surface power generation, grids, economics, and policy; and direct heat applications for heating and cooling, agriculture, and more. As these applications have disruptive impact in the race to lower carbon emissions, the scope is international, exploring how resources and certain technologies that are successful in one region could be scaled up in others.

Research Challenges

Evident issues that need work include, but are not limited to, the following: fit-for-purpose geothermal reservoir characterization–best indicators of suitable heat reservoirs–transfer of oil and gas methodology into geothermal; downhole tools and methods for well construction, well monitoring, and production enhancement; modeling heat transfer in fractures and into wellbores; super-critical CO_2-rock interactions; induced seismicity monitoring and mitigation, higher-temperature materials, sensors, cements, and more.; comparing designs and economics of diverse methods for harvesting heat; techno-economics of converting heat to electricity; low-temperature heating and cooling uses.

Membership

HotRock membership is $75,000 per year. Companies are able to collaborate with principal investigators and researchers, obtain all research results, and influence areas of research. Each member company appoints a representative to the advisory board to help make strategic decisions on spending and research. HotRock holds annual meetings attended by sponsors and other invited guests.

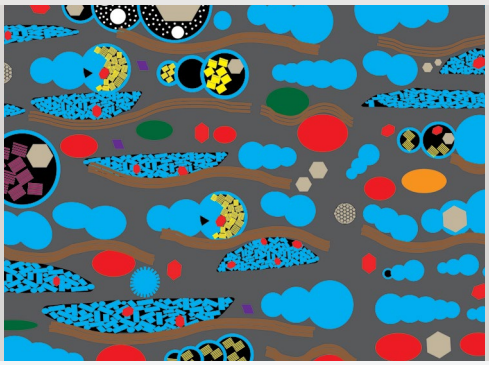
Contact

Dr. Ken Wisian
ken.wisian@beg.utexas.edu

Dr. Shuvajit Bhattacharya
shuvajit.bhattacharya@beg.utexas.edu, (U.S.) 512-471-1289

hotrock.beg.utexas.edu

MUDROCK SYSTEMS RESEARCH LABORATORY



Mission

Since 2009, the Mudrock Systems Research Laboratory (MSRL) has improved our knowledge of reservoir characterization and the stratigraphic framework of mudrock systems by integrating core measurements, fluid saturations, fluid flow modeling, and petrophysics. MSRL studies integrate geology, geochemistry, petrophysics, and well logging to understand geological heterogeneities in the subsurface of oil and gas reservoirs. MSRL research involves exploration, drilling and completions, and understanding controls on reservoir quality and fluid properties.

Research Thrusts

MSRL's core-based research and workflow aims to understand fundamental processes impacting reservoir quality and deliverability. Our petrophysical labs not only measure porosity and permeability, but are working toward advancing workflows to measure relative permeability and wettability. The inorganic geochemistry lab applies X-ray fluorescence and isotope geochemistry to better define facies and their continuity. The organic geochemistry lab measures gas adsorption, oil and gas compositions, thermal maturity, and biomarkers from rock extracts and produced fluids to understand the sources and quality of organic matter, to compare and correlate sources to produced fluids, and to help interpret the drainage rock volume. Reservoir heterogeneity in 3D was quantified using an integrated wireline log and chemofacies model validated by core-based lithofacies, which includes microscopic study of grain types, texture, and diagenesis.

Research Challenges

Mudrock systems are reservoirs for unconventional resources, source rocks for conventional petroleum plays, caprocks and seals for conventional resources, and CO_2 and hydrogen storage in the subsurface. There is a great need to devise more efficient ways of extracting oil and gas from these reservoirs. MSRL seeks to develop new methodologies and workflows for characterizing the dynamics of rocks and fluids over production history.

Membership

Consortium members receive priority access to research data, interpretations, and reports. Results are distributed to members through annual workshops, seminars, short courses, and the internet.

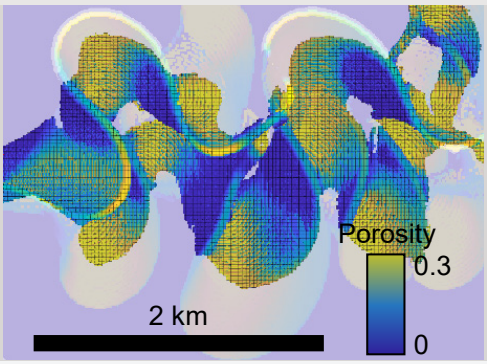
Contact

Dr. Toti Larson

toti.larson@beg.utexas.edu, (U.S.) 512-471-1856

www.beg.utexas.edu/msrl

QUANTITATIVE CLASTICS LABORATORY



Mission

The mission of the Quantitative Clastics Laboratory (QCL) is to develop a predictive understanding of processes and controls on sediment transport and the stratigraphic evolution of depositional systems, with applications in subsurface characterization, modeling, and correlation.

Research Thrusts

The QCL's researchers study entire sediment routing systems, from source to sink, and all clastic depositional environments. The laboratory's researchers are experts in traditional methods of field geology and subsurface characterization. They also develop machine learning algorithms for correlation of rock properties in the subsurface and mapping of depositional systems in remote sensing data and take characterization further through analog comparison and numerical modeling to gain a more predictive understanding of depositional systems.

Research Challenges

The QCL offers research, training, and technology development for subsurface characterization. Research is motivated by the following questions: (1) What are the sources and scales of heterogeneity impacting subsurface fluid flow in production or carbon capture, utilization, and storage (CCUS)?, (2) How should realistic geology be incorporated into subsurface models, and how does it affect fluid flow?, and (3) What training, algorithms, and software tools can we develop to estimate subsurface risk and expedite subsurface characterization?

Membership

Multiple meetings, workshops, and face-to-face consultations with industry and government members are held annually. The QCL offers members unique access to UT Jackson School of Geosciences expertise, industry subsurface data, investigations of depositional environments and their interconnections at multiple scales, and an evolving quantitative database of clastic depositional systems architecture.

Contact

Dr. Jacob (Jake) Covault

jake.covault@beg.utexas.edu, (U.S.) 512-475-9506

Dr. Zoltán Sylvester

zoltan.sylvester@beg.utexas.edu, (U.S.) 512-475-9514

qcl.beg.utexas.edu

RESERVOIR CHARACTERIZATION RESEARCH LABORATORY

Mission

The primary objective of the Carbonate Reservoir Characterization Research Laboratory (RCRL) is to utilize geological, geophysical, and petrophysical data obtained from both outcrop and subsurface carbonate reservoir strata. This data is the foundation for development of innovative methodologies and concepts aimed at explaining and describing the 3D reservoir environment to enhance hydrocarbon recovery. The RCRL is committed to technology transfer and education, consistently providing cutting-edge training opportunities.

Research Thrusts

The RCRL adopts a comprehensive approach to reservoir characterization, focusing on four main scales of investigation: (1) platform- to basin-scale stratigraphy and structural geometries; (2) reservoir architecture encompassing matrix and nonmatrix systems; (3) characterization of petrophysical, structural, and geomechanical properties; and (4) pore networks and their distributions within the reservoir. The RCRL places a strong emphasis on quantifying observations, ensuring that its findings are applicable to reservoir development. We aim to provide valuable predictive relationships and conceptual tools for reservoir characterization and play analysis.

Research Challenges

The RCRL is actively investigating: (1) the Paleozoic shelf-to-basin stratigraphic and structural architecture of the Delaware and Midland Basins, focusing on Mississippian, Pennsylvanian, and Permian systems; (2) the Jurassic Smackover's stratigraphic framework and facies distribution to support critical mineral development; (3) Gulf of Mexico carbonate reservoirs, including pore systems, fracture characteristics, and margin variability; (4) Cenozoic carbonate platform systems, emphasizing high-resolution stratigraphy and shelf margin structures; (5) fractured carbonate reservoirs through both outcrop and subsurface analogs; (6) the origin and petrophysical properties of tight limestone and dolomite reservoirs; and (7) carbonate rock mechanics and acoustic properties.

Membership

RCRL membership is available at a cost of $65,000 per year. Sponsors are encouraged to commit to a two-year agreement at a reduced rate of $60,000 per year, allowing for better planning of longer-range research programs.

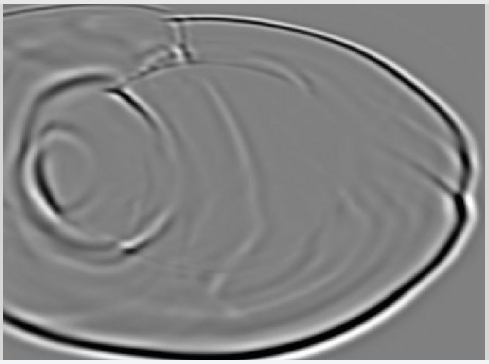
Contact

Dr. Xavier Janson
xavier.janson@beg.utexas.edu, (U.S.) 512-475-9524

Dr. Christopher (Chris) Zahm
chris.zahm@beg.utexas.edu, (U.S.) 512-471-3159

www.beg.utexas.edu/rcrl

TEXAS CONSORTIUM FOR COMPUTATIONAL SEISMOLOGY



Mission

The mission of the Texas Consortium for Computational Seismology (TCCS) is to address the most critical and challenging research problems in computational geophysics as experienced by the energy industry and to educate the next generation of research geophysicists and computational scientists.

Research Thrusts

TCCS has pioneered new developments in several application areas: deep learning methods for seismic interpretation, including automatic detection of lithofacies, faults, and geobodies; deep learning methods for seismic data processing and imaging, including noise attenuation, computational wave propagation, and least-squares seismic migration; optimal transport methods for seismic full-waveform inversion; shaping regularization for improving acquisition and imaging with simultaneous sources; diffraction imaging for increasing the resolution of seismic imaging and reservoir characterization; and seismic anisotropy and attenuation parameterizations for efficient imaging in complex media. A new research thrust focuses on instrumentation and techniques essential for the energy transition, such as survey design for seismic monitoring and quantitative analysis of signal-to-noise ratios and data repeatability in land seismic.

Research Challenges

A collaborative effort between the Bureau and the UT Oden Institute for Computational Engineering and Sciences, TCCS develops innovative analysis methods for seismic data. Focusing primarily on resource exploration and carbon capture and storage, TCCS addresses critical research areas such as quantitative data-driven survey design with quality metrics to ensure better evaluation of uncertainty, data-acquisition optimization with simultaneous sources, seismic interpretation automation, increased resolution in seismic reservoir characterization, and accurate estimation of subsurface properties through full-waveform inversion.

Membership

TCCS delivers two written reports and presents its findings in two research meetings annually. TCCS follows the discipline of reproducible research: every computational experiment result links to the open-source code required for reproduction and verification.

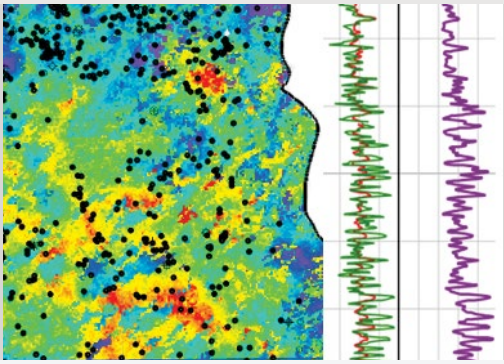
Contact

Dr. Sergey Fomel
sergey.fomel@beg.utexas.edu, (U.S.) 512-475-9573

Dr. Andrey Bakulin
andrey.bakulin@beg.utexas.edu, (U.S.) 512-232-9464

tccs.beg.utexas.edu

TIGHT OIL RESOURCE ASSESSMENT



Mission

The mission of the Tight Oil Resource Assessment (TORA) is to provide our stakeholders with reliable and up-to-date estimates, projections, play-scale geologic models, and insights at the basin scale for the major U.S. tight oil and shale gas plays by conducting innovative, integrated research of in-place resources and recoverable volumes, play and well economics, and production forecasts with their environmental implications.

Research Thrusts

TORA employs a multidisciplinary, highly iterative evaluation process combining geoscience and engineering: (1) we create a basin-wide 3D facies architecture populated with petrophysical and geomechanical attributes and calculate in-place resources; (2) we model and match all well-production history before projecting future production, and we perform decline analysis using innovative in-house software; (3) we relate the productivity of existing wells to key subsurface and operational attributes to model the productivity of all undrilled locations; (4) we develop the full range of expected outcomes per well, including technological and cost improvements, pricing, logistics, drilling pace, well spacing, and lease accessibility; and (5) we use digital mapping to spatially link key geologic and operational practices to changes in per-well productivity. We also build sector-scale 3D subsurface models for focused studies and develop machine learning and physics-based workflows.

Research Challenges

TORA aims to characterize unconventional reservoirs up to the basin scale, building integrated models and market independent production outlooks. Building on over a century of Bureau Permian research and data from over 30,000 horizontal wells, TORA studies tight oil and gas formations to produce unbiased, data driven, and comprehensive, yet granular results. Our team continues to enhance our workflow to predict future productivity, hydrocarbon recoveries, economic viability, and play-wide production rates at a one square mile scale.

Membership

TORA membership is $60,000 annually.

Contact

Dr. Tim McMahon

tim.mcmahon@beg.utexas.edu, (U.S.) 512-471-1891

www.beg.utexas.edu/tora

RESEARCH PROGRAMS

TEXNET SEISMIC MONITORING PROGRAM

Mission

The Bureau's TexNet research program is the State of Texas' earthquake analysis service. TexNet operates a statewide network of over 200 seismometers, capturing vital information on seismic activity across Texas. TexNet hosts a skilled, multidisciplinary team of scientists and engineers who research the geologic and seismic data obtained by the network and from other resources.

Program Thrusts

TexNet actively monitors earthquake activity throughout Texas. TexNet members are also working to determine the causes of earthquakes and to lessen these events' future impacts on people and property, developing algorithms to improve the seismic data analysis and imaging workflow and proposing machine learning approaches to solve diverse seismological problems. TexNet provides the public with safety information, emergency agencies with earthquake facts important to first responders, regulatory agencies with solid data to inform earthquake mitigation policy and decision-making, industry with information to shape earthquake safety and prevention practices, and researchers with reliable seismic data and interpretations for answering complex scientific questions.

TexNet Information

Earthquake data and earthquake monitoring information are now available through the interactive TexNet Earthquake Catalog at catalog.texnet.beg.utexas.edu. Relocated high-resolution earthquake data is now available at hirescatalog.texnet.beg.utexas.edu. Injection of produced water volume information is available at injection.texnet.beg.utexas.edu. All data products are available at texnet.beg.utexas.edu.

Contact
Dr. Alexandros Savvaidis
alexandros.savvaidis@beg.utexas.edu
(U.S.) 512-475-9549
texnet.beg.utexas.edu

STATE OF TEXAS ADVANCED OIL AND GAS RESOURCE RECOVERY

Mission

The mission of the Bureau's State of Texas Advanced Oil and Gas Resource Recovery (STARR) program is to conduct geoscience and engineering research to increase the profitability of earth resources within the State of Texas while encouraging responsible economic development and supporting education and environmental stewardship.

Research Thrusts

Research thrusts of the STARR program and ongoing technology transfer to operators in the Texas energy industry are focused on: (1) carrying out integrated geoscience characterization studies relevant to the oil and gas industry; (2) developing improved oil recovery strategies, including optimization of waterfloods and CO_2 enhanced oil recovery; and (3) conceptualizing and developing geological, geophysical, and engineering projects to support the energy transition in Texas.

Research Challenges

Challenges undertaken by the STARR team are wide and varied, ranging from explaining subsurface characteristics that control oil and gas production in Texas reservoirs to engineering challenges associated with identifying best enhanced recovery practices that have the potential for increasing oil and gas production in Texas oil fields. STARR challenges have expanded into the understanding of how Texas subsurface resources can be positioned to play a role in the ongoing energy transition, aiming at increasing the diversification and resilience of Texas' energy industries and its economy.

Membership

No costs are associated with participation in the STARR program, which is funded by the State of Texas, although research matching support and willingness to facilitate publication of research results is encouraged.

Contact
Dr. Lorena Moscardelli
lorena.moscardelli@beg.utexas.edu
(U.S.) 512-471-0258
starr.beg.utexas.edu

CRITICAL MINERALS

Geopolitical and technology developments related to energy transitions and other societal changes have placed unprecedented global demands for metals, critical minerals, and industrial materials. The United States is heavily dependent on foreign sources for the vast majority of these materials, notably for the critical minerals that are key to energy production and storage and other aspects of technology advancement and national security.

The economic geology program at the Bureau is collaborating with industry and other state and federal entities to locate, assess, and catalog critical and other mineral resources within Texas and the Gulf Coast, making available data and related sample sets to promote exploration for and development of domestic mineral supplies.

These resource studies range from conventional metal resource settings such as West Texas magmatic-hydrothermal, Coastal Plain uranium, and Central Texas and Gulf Coast industrial and critical mineral systems. Current mapping efforts focused on critical minerals associated with igneous bodies in Trans-Pecos Texas are being supported by the cooperative federal and state components of the STATEMAP and Earth MRI programs. These efforts follow the 2021 completion of a regional airborne geophysical survey flown by the U.S. Geological Survey.

In addition, unconventional sources of critical minerals such as lithium from produced waters, rare earth elements in Gulf Coast lignites, coal power plant ash, bauxite residue, and historic mine wastes are being studied. Domestic supply chain security and related environmental concerns require innovation to responsibly source key mineral resources to support large-scale energy and infrastructure development for the growing Texas population.

Contact
Dr. Brent Elliott
brent.elliott@beg.utexas.edu
(U.S.) 512-471-1812
www.beg.utexas.edu/minerals/rare-earth

STATEMAP

Bureau geologic mapping efforts continue to expand in response to the U.S. GeoFramework Initiative to prepare seamless, three-dimensional geologic maps and models of the United States by 2030. Bureau researchers, illustrators, and editors have produced 13 new geologic maps and geodatabases for the most recent installment in the multi-decadal STATEMAP program. STATEMAP is a core element of the National Cooperative Geologic Mapping Program administered by the U.S. Geological Survey. The Bureau's mapping efforts are also supported by the State of Texas Advanced Resource Recovery (STARR) program and the Jackson School of Geosciences, which provide funding that matches the federal support in this cooperative program.

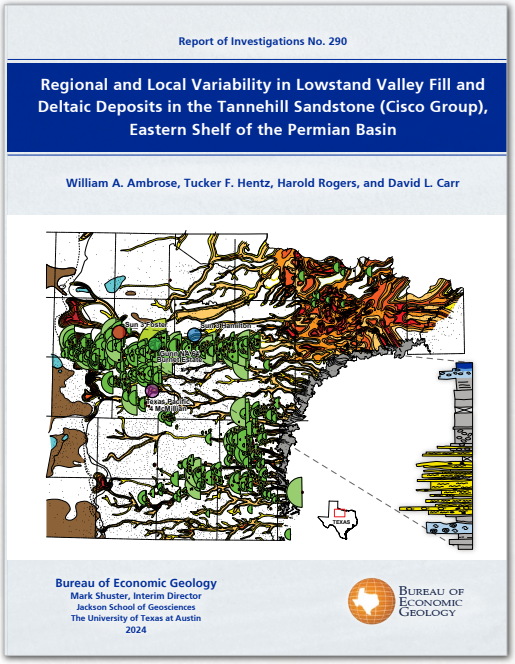
Since STATEMAP began in the 1990s, 285 geologic maps have been published in the Bureau's Open-File Maps series, along with several compilation maps in the peer-reviewed Miscellaneous Maps series. All maps are available through The Bureau Store.

This year's new maps include the Oak Island quadrangle in the Galveston Bay area; the Aransas Pass, Gregory, and Lamar quadrangles in the Corpus Christi and Aransas Bay areas; the Art, Loyal Valley, and Webberville quadrangles in central Texas; the Oasis Ranch quadrangle in western Texas; and the Norton Mesa quadrangle in far western Texas. In addition, two compilation maps at 1:50,000- or 1:62,500-scale were completed for the Big Bend area in western Texas and the San Antonio Bay area on the middle Texas coast. The coastal maps document the relationships among geologic units deposited and modified during major sea level changes during repeated glacial and interglacial cycles of the late Pleistocene and Holocene eras. The central and western Texas quadrangles focus on water resources and on geologic units relevant to rapidly changing land-use patterns in the central Texas urban growth corridor. The Norton Mesa quadrangle adds to recent efforts to characterize critical mineral resources in the Trans-Pecos following completion of a regional airborne geophysical survey by the USGS. Also completed during the year was a geothermal attributes map (1:500,000 scale) for the southern Texas coastal plain and an initial compilation of Texas geoheritage sites.

Major contributors to the recent STATEMAP effort include Tiffany Caudle, Brian Hunt, Jeffrey Paine (Principal Investigator), Chock Woodruff Jr., Brent Elliott, John Andrews, Jennifer Morris, Ben Grunau, Mark Helper, Linda McCall, and Carson Werner. Bureau graphics and editing staff Francine Mastrangelo, Jana Robinson, Nancy Cottington, and Jason Suarez prepared the maps for publication.

Contact
Dr. Jeffrey Paine
jeff.paine@beg.utexas.edu
(U.S.) 512-471-1260
www.beg.utexas.edu/research/areas/geologic-mapping

PUBLICATIONS



Regional and Local Variability in Lowstand Valley Fill and Deltaic Deposits in the Tannehill Sandstone (Cisco Group), Eastern Shelf of the Permian Basin

Ambrose, W. A., Hentz, T. F., Rogers, H., and Carr, D. L., 2024, Regional and local variability in lowstand valley fill and deltaic deposits in the Tannehill sandstone (Cisco Group), Eastern Shelf of the Permian Basin: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations No. 290, 48 p., doi.org/10.23867/RI0290D.

Report of Investigations 290 is a detailed study of incised valley-fill fluvial reservoirs in the Wolfcampian Tannehill sandstone in the Eastern Shelf of the Permian Basin. Building on previous investigations by Frank Brown at the Bureau of Economic Geology, this study integrates regional net-sandstone maps with core and production data, delineating major oil and gas exploration trends. This study extends previous work depicting the distribution of lowstand valley-fill and deltaic systems at both regional and local scales, adds core control and provides interpretations of facies in non-marine, marginal-marine, and shallow-marine deposits, allowing reconstruction of the depositional history, and provides an exploration framework and geologic context for Tannehill producing fields and trends, as well other areas in the Eastern Shelf with potential for additional oil and gas production.

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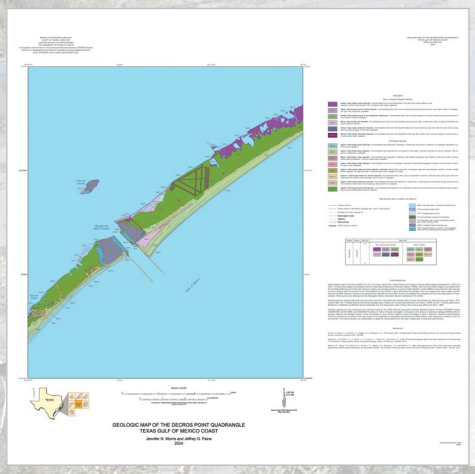
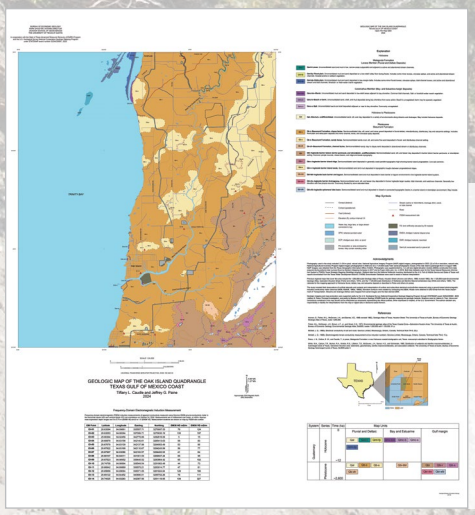
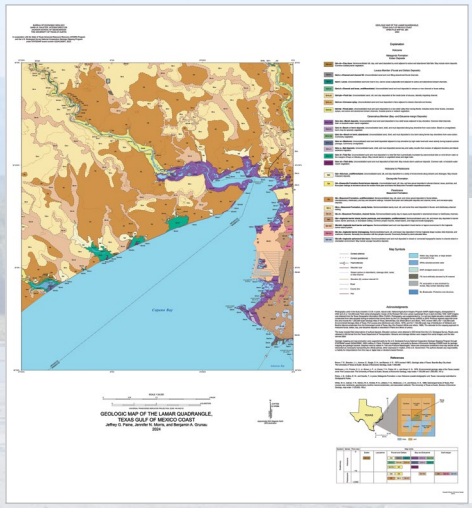
The Bureau's Open-File Maps series, along with several compilation maps in the peer-reviewed Miscellaneous Maps series, are available through The Bureau Store.



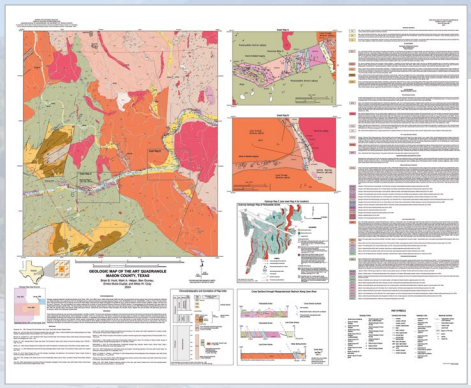
Geologic Map of the Decros Point Quadrangle, Texas Gulf of Mexico Coast
Morris, J. N., and Paine, J. G., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 281, scale 1:24,000.



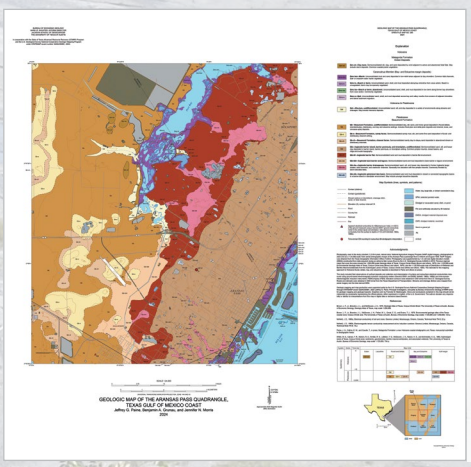
Geologic Map of the Oak Island Quadrangle, Texas Gulf of Mexico Coast
Caudle T. L., and, Paine, J. G., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 283, scale 1:24,000.



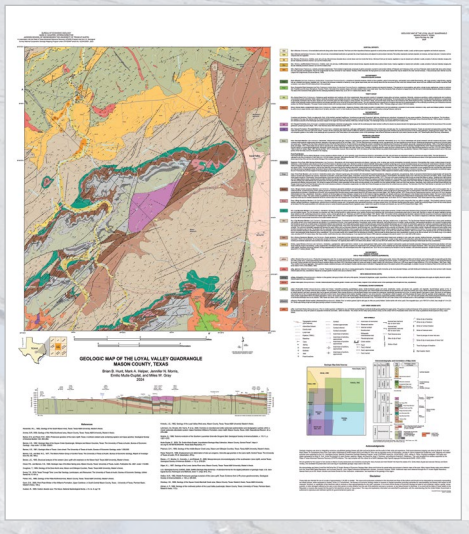
Geologic Map of the Lamar Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Morris, J. N., and Grunau, B. A., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 284, scale 1:24,000.



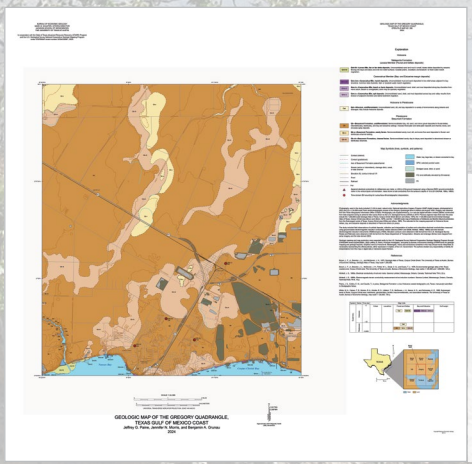
Geologic Map of the Art Quadrangle Mason County, Texas
Hunt, B. B., Helper, M. A., Grunau, B. A., Mutis-Duplat, E., and Gray M. W., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 288, scale 1:24,000.



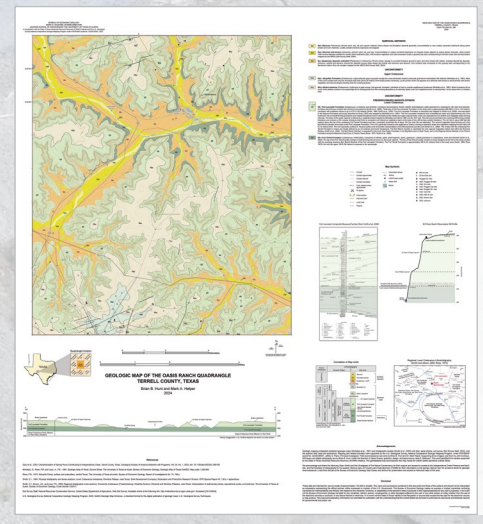
Geologic Map of the Aransas Pass Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Grunau, B. A., and Morris, J. N., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 285, scale 1:24,000.



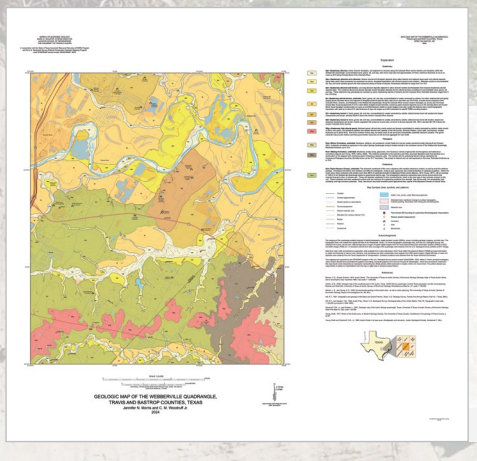
Geologic Map of the Loyal Valley Quadrangle Mason County, Texas
Hunt, B. B., Helper, M. A., Morris, J. N., Mutis-Duplat, E., and Gray M. W., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 289, scale 1:24,000.



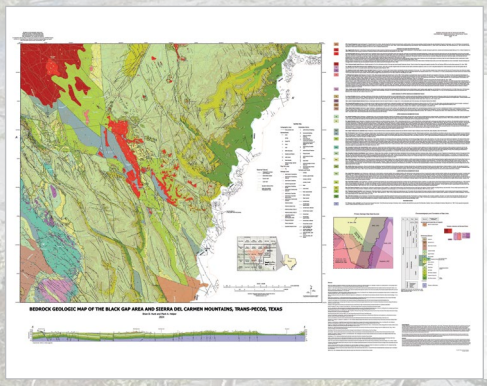
Geologic Map of the Gregory Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Morris, J. N., and Grunau, B. A., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 286, scale 1:24,000.



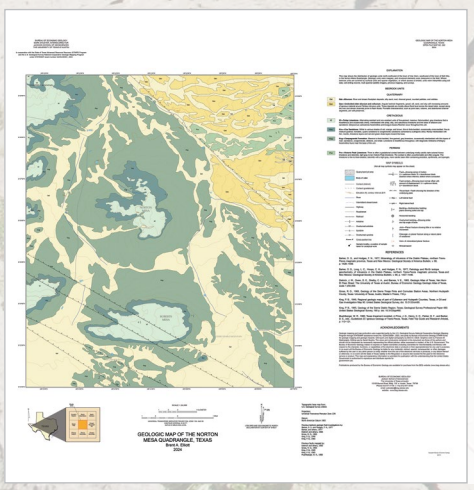
Geologic Map of the Oasis Ranch Quadrangle Terrell County, Texas
Hunt, B. B., and Helper, M. A., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 290, scale 1:24,000.



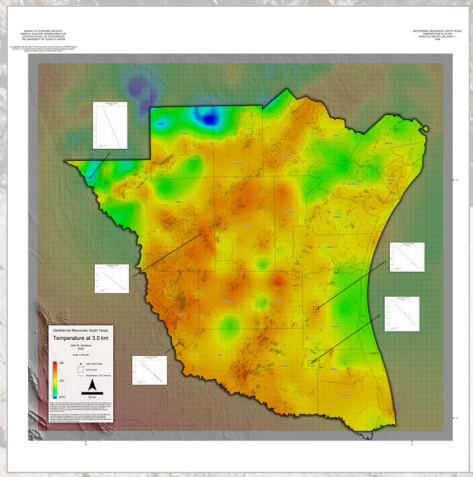
Geologic Map of the Webberville Quadrangle, Travis and Bastrop Counties, Texas
Morris, J. N., Woodruff Jr., C. M., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 291, scale 1:24,000.



Bedrock Geologic Map of the Black Gap Area and Sierra Del Carmen Mountains, Trans-Pecos, Texas
Hunt, B. B., and Helper, M. A., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 294, scale 1:50,000.



Geologic Map of the Norton Mesa Quadrangle, Texas
Elliot, B. A., 2024: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 292, scale 1:24,000.



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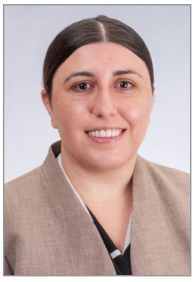
TRANSITIONS

New Employees

The Bureau of Economic Geology continues to attract some of the most talented geoscientists in the world to conduct impactful research on a wide range of energy and environmental questions–and equally talented support staff to help them in their efforts. The year 2024 was no exception, as the Bureau brought a diverse group of 26 new people on board.

Please help us welcome them to the Bureau!

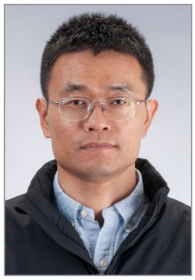
Rama Chandrudu Arasada
Postdoctoral Fellow



Mariam Arzumanyan
Postdoctoral Fellow

Nikolaos Bakirtzis
Software Developer

Ankit Chakraborty
Postdoctoral Fellow



Wanjie Feng
Project Manager

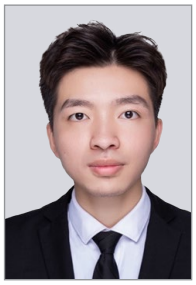
Andres Felipe Gomez
Research Scientist Associate IV

Sofia Yiwen Gong
Research Assistant Professor

Ruichang Guo
Postdoctoral Fellow

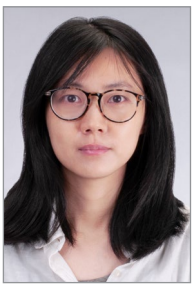
Nancy Krail
Administrative Associate

Larry Syu-Heng Lai
Postdoctoral Fellow



Sai Liu
Postdoctoral Fellow

Angela Luciano
Research Scientist Associate II



Xing Li
Postdoctoral Fellow

Emily Martinez
Research Scientist Associate II

Abouzar Mirzaei Paiaman
Research Assistant Professor

Camilo Munoz
Research Scientist Associate III

Amari Nunn
Stores Clerk III

Emmanouil Parastatidis
Research Assistant Professor

Jon Paul Pierre
Research Scientist Associate IV

Russel Rogers
Research Scientist Associate III

Elizaveta Rybina
Administrative Program Coordinator

Shelby Short
Research Scientist Associate II

Tiffany Sun
Departmental Buyer

Alexa Torres
Administrative Program Coordinator

Valerie Tran
Graphic Designer

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Research Scientist Associate III

Retirees

Michael DeAngelo
Research Scientist Associate

Stephen E. Laubach
Research Professor

Robert C. Reedy
Research Scientist Associate IV

The Bureau thanks 2024's retirees for their years of invaluable service and wishes them a happy retirement. They will be missed!

In Memoriam

Thomas Carl Gustavson
Senior Research Associate

2024 VISITING COMMITTEE

The Bureau of Economic Geology's Visiting Committee includes leaders from industry, State agencies, academia, and nonprofit organizations, each with a keen interest in furthering the research and activities of the Bureau and advancing its mission.

The Visiting Committee came together in Austin in August for its Annual Meeting, with 14 members participating. The Committee was welcomed and briefed by Interim Director Mark W. Shuster on overall Bureau undertakings during the previous year.

Dr. Shuster laid out the Bureau's major initiative as the State Geological Survey of Texas, "The Texas Imperative," wherein groups of researchers will catalogue and assess the State's water, geothermal energy, mineral, and natural hydrogen and helium resources. Directors presented summaries of activities in their areas, and Bureau researchers shared several key research priorities. The meeting also provided Committee members with opportunities for dialogue, and there were sessions set aside for them to exchange insightful ideas about possible new research areas and potential Bureau partners.

For more information about the work of the Bureau or its Visiting Committee, please contact **Mark W. Blount**, Assistant Director, External Affairs, mark.blount@beg.utexas.edu.

(From left to right) **Mr. Bud Brigham** (Anthem Ventures, Brigham Minerals, Brigham Exploration, Atlas Sand), **Mr. Elliott Pew** (Enerplus Corporation, Retired), **Dr. Ken Wisian** (Bureau of Economic Geology), **Mr. Dan Domeracki** (The University of North Carolina at Chapel Hill), **Mr. William "Billy" Murphy** (University Lands), **Mr. Scott Anderson** (Environmental Defense Fund), **Mr. Bud Scherr** (Valence Operating Company), **Dr. Claudia Hackbarth, Chair** (Shell Global, retired), **Dr. Mark Shuster** (Bureau of Economic Geology), **Mr. James "Jim" Farnsworth** (Beacon Offshore, Azimuth Capital), **Mr. Jay Kipper** (Bureau of Economic Geology), **Ms. Carol Lloyd** (Exxon Mobil Corporation), **Mr. Jeff Walker** (Executive Administrator, Retired), **Mark Blount** (Bureau of Economic Geology), **Colby Eaves** (General Land Office), and **Tom Currah** (Comptroller's Office).

Interim Bureau Director
Deputy Director: Energy Division
Mark W. Shuster

Deputy Director: Operations
Jay P. Kipper

Associate Director: Environmental Division
Ken Wisian

Assistant Director: External Affairs
Mark W. Blount, CFRE
512-471-1509
mark.blount@beg.utexas.edu

Website
www.beg.utexas.edu

Media Manager
Jason Suarez

Editor
Susan Quaglino

Senior Graphic Designer
Jamie H. Coggin

Public Information and Outreach
Linda Ruiz McCall
512-471-0320
linda.mccall@beg.utexas.edu

Austin Core Research Center
Nathan Ivicic
512-475-9561
nathan.ivicic@beg.utexas.edu

Houston Core Research Center
Nicholas Hamilton
713-466-8346
nicholas.hamilton@beg.utexas.edu

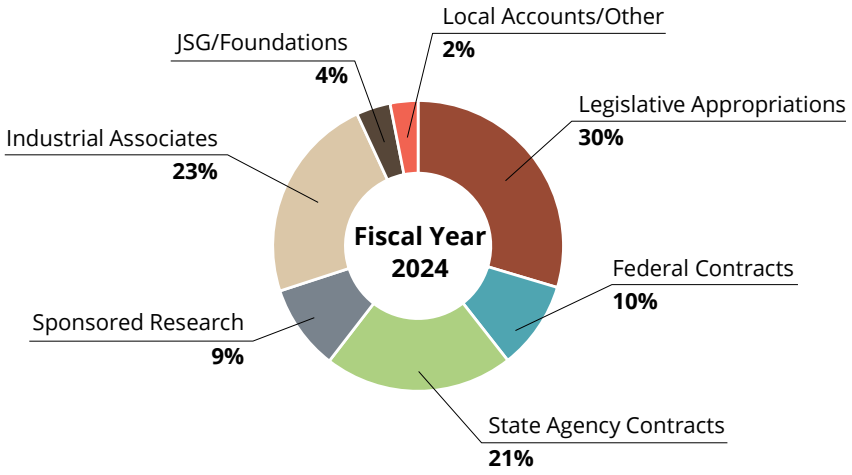
Geophysical Log Facility
Nancy Krail
512-471-7144
pubsales@beg.utexas.edu

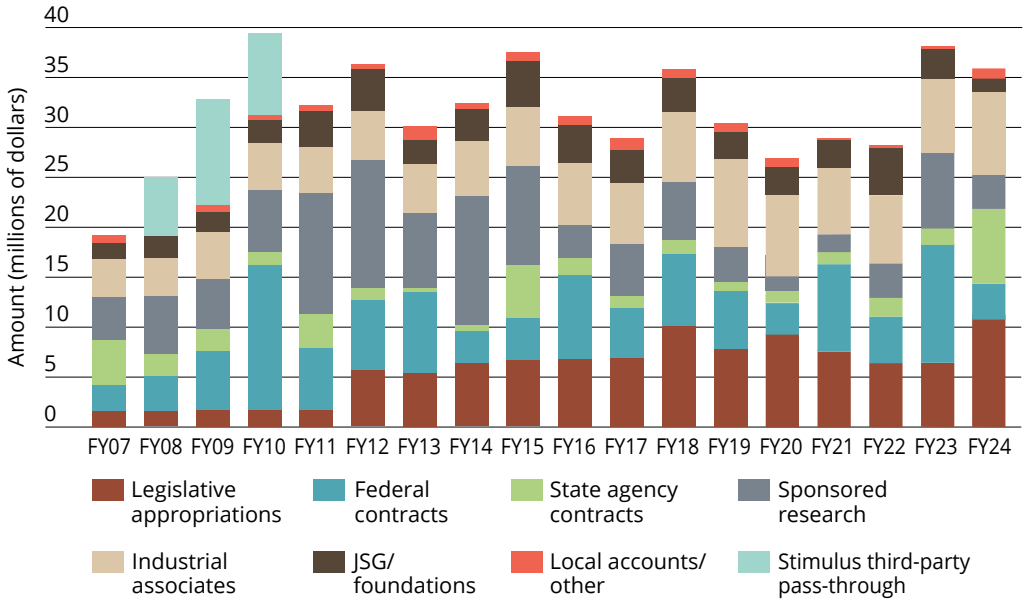
Publications, The Bureau Store
Carson Werner
512-471-7144
pubsales@beg.utexas.edu

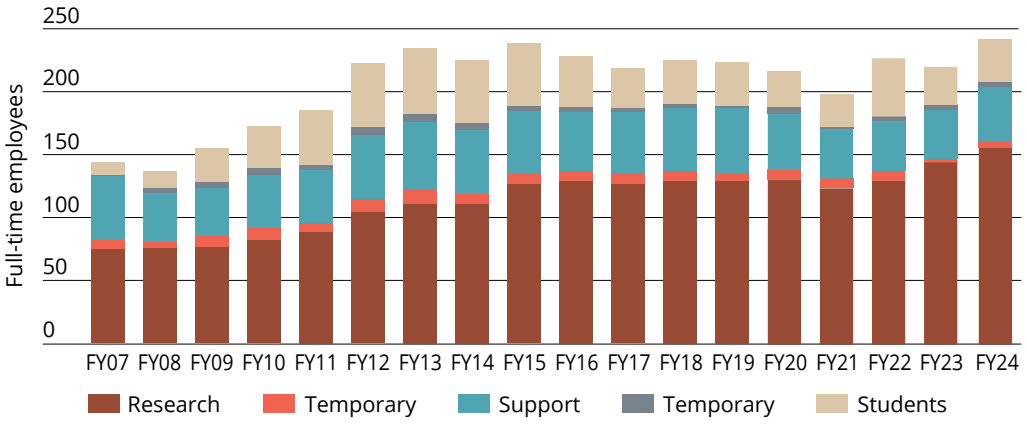
Research and Administrative Facilities
J.J. Pickle Research Campus
10100 Burnet Road, Bldg. 130
Austin, Texas 78758-4445
512-471-1534, Switchboard
512-471-0140, Fax

Mailing Address
Bureau of Economic Geology
The University of Texas at Austin
10100 Burnet Road, Bldg. 130
Austin, Texas 78758-4445

FINANCES







BUREAU OF ECONOMIC GEOLOGY
The University of Texas at Austin
Jackson School of Geosciences
10100 Burnet Road, Bldg. 130
Austin, Texas 78758-4445
Address Service Requested

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