

ASK EGI

ACCESS
SCIENTIFIC
KNOWLEDGE

NEWSLETTER
SPRING 2024

2023 EGI
Annual
Technical
Conference
wrapup

Message from the
Director, Milind
Deo, Ph.D.

Geothermal
Energy at the U

Spring EGI
Webinar lineup

EGI

Energy & Geoscience Institute
UNIVERSITY OF UTAH

CONTENTS

1

Message from the Director

2-5

2023 EGI Annual Technical Conference and Field Trip

6-8

A Climate of Hope – Utah FORGE Featured in NHMU’s Groundbreaking Exhibit

9-10

Utah FORGE Poster and Song Parody Contests – Expanding Geothermal Literacy

11-12

UGS / EGI Field Study

13

Searching for a Greener Future

14 - 15

EGI’s Carbon Management team Update

16

EGI Spring Webinars

17-18

Brief news from EGI

19-20

A Celestial Symphony Over Stone: The 2023 Annular Eclipse at Bryce Canyon

21

Guyana Suriname project

22

iCORDS: A Transformative Offshore Exploration Tool

23-24

Recent publications from EGI staff and projects

2024 EGI MESSAGE FROM THE DIRECTOR



***Dr. Milind Deo,
EGI Director and Peter D. and Catherine R. Meldrum
Professor of Chemical Engineering***

As we navigate the early months of 2024, I find it imperative to pause and reflect on the remarkable journey we've embarked upon together. Our collective efforts at the Energy & Geoscience Institute (EGI) have fostered groundbreaking research and also have contributed to the advancement of sustainable energy solutions, embodying our commitment to an energy-secure, low-carbon future.

Utah FORGE had a particularly remarkable year. The successful demonstration of interwell connectivity was a testament to the ingenuity and perseverance of our team. This breakthrough marks a notable milestone in geothermal energy production, signaling promising new opportunities in the realm of renewable energies. The recent spotlight at the Natural History Museum of Utah's "A Climate of Hope" exhibit is a confirmation of our pivotal role in fostering an optimistic narrative toward our shared energy future. This acknowledgment underscores the broader societal and environmental impact of our endeavors, extending beyond the realms of academia and industry.

Our commitment to carbon management, as highlighted by the CarbonSAFE Phase II award, reinforces our position as one of the world leaders in carbon capture and sequestration research.

Project implementation in the Uinta Basin will provide new opportunities in an area traditionally strong in oil and gas production activity. Another project of note awarded recently is the U.S.-Canada Center on Climate-Resilient Western Interconnected Grid (WIRED Global Center), co-led by the University of Utah and the University of Calgary. This project, funded by the National Science Foundation on the US side, is led by EGI faculty affiliate Dr. Masood Parvania.

We were pleased to showcase our research at the 2023 Annual EGI Technical Conference, which was a confluence of expertise and vision, where industry leaders, researchers, and professionals gathered to share insights and foster collaborative dialogues. The discussions and outcomes of this conference have contributed to our ongoing mission and set a foundation for future initiatives.

In closing, I extend my deepest gratitude to each member of the EGI community. Your dedication, expertise, and vision are the driving forces behind our achievements.

2023 EGI ANNUAL TECHNICAL CONFERENCE AND FIELD TRIP



CCUS: Expert Panel Discussion

The Energy & Geoscience Institute (EGI) at the University of Utah has been serving the energy industry for over 50 years. On September 18, 2023, we held our Annual EGI Technical Conference with corporate associates and special guests which included a field course. We showcased our research in petroleum and minerals, carbon management, and geothermal energy.

The conference consisted of technical sessions on Geothermal and CCUS and technical sessions on petroleum and minerals and energy efficiency.

The geothermal session discussed Utah FORGE (Frontier Observatory for Research in Geothermal Energy) and how it made significant progress in the geothermal field by pumping water through deep granite. The Utah FORGE team had connected two deep wells that could one day generate a continuous flow of hot water for electricity production and a variety of direct uses.



Sid Jones, Francesca Salvi, Brenda Bowen and Kristie S. McLin



Technical Session

During this technical session of the conference, attendees met the scientists working on Utah FORGE and learned about the advances the DOE-funded geothermal laboratory has made.

The field trip on the last day of the conference consisted of a tour of the Great Salt Lake. From prehistoric to the present, archaeology, geology, and geomorphology of the Great Salt Lake region was discussed in detail. Stops included Knolls Sand dunes, lunch at the Historic Wendover Airfield, Danger cave, Juke Box Trench, and Bonneville Salt Flats.

CONTINUED ON NEXT PAGE

Throughout the conference week there was a variety of awards presented along with speakers from the energy industry and multiple panels.

Alan Walker, Operation Manager at EGI, presented John Baza, Director of the Utah Division of Oil, Gas, and Mining (DOGM) with the EGI Service Award. Baza retired from the position in December.

At DOGM, Baza initiated e-permitting, rebuilt the data management system, and used technological solutions such as drones with GIS and electronic inspections. Further, he shared his expertise and knowledge nationwide with colleagues as a leader in the Interstate Oil & Gas Compact Commission, the Interstate Mining Compact Commission, and currently serves on the Board of the Ground Water Protection Council. At the IOGCC his leadership and service were recognized with the Marland Award.

“John Baza is highly respected and consequently, Utah is well regarded and our nation is well served by John Baza” said Walker.

EGI’s Dr. John McLennan received the Researcher of the Year award from EGI Director Dr. Milind Deo.

John is a USTAR Associate Professor in the Department of Chemical Engineering at the University of Utah. He holds a Ph.D. in Civil Engineering from the University of Toronto, Canada (1980). His experience extends to petroleum service and technology companies. He worked for Dowell Schlumberger in Denver, Tulsa and Houston; later, with TerraTek in Salt Lake City, Advantek International in Houston, and ASRC Energy Services in Anchorage. He has worked on coalbed methane recovery, mechanical properties determinations, produced water and drill cuttings reinjection, as well as casing design issues related to compaction. John’s recent work has focused on optimized gas production from shales and unconsolidated formations.

The EGI Corporate Leadership Award was awarded to Luca Rigo de Righi, General Manager of Global New Ventures at Chevron. Righi was not in attendance and Sid Jones of Chevron accepted the award on his behalf.



John Baza receiving EGI Service Award from Al Walker.



Dr. John McLennan receiving Researcher of the Year award from Dr. Milind Deo



Sid Jones of Chevron accepted the EGI Corporate Leadership Award on Luca Rigo de Righi's behalf.



Group photo at Bonneville Salt Flats

During the last day of the EGI 2023 Technical Conference EGI research scientist Bryony Richards and Utah Geological Survey (UGS) Director Bill Keach took EGI members, students and Corporate Associates on an exciting day trip that consisted of touring:

- Sand Dunes - Knoll OHV Park
- Wendover Historic Airfield
- Bonneville Salt Flats - Bonneville Raceway Tour
- Juke Box Trench and Danger Cave

The Great Salt Lake is shaped by the interplay of water and sediment dynamics, fluctuations in lake level, and the accumulation of salts and minerals. However, in recent history, it is the human impact that has started to change the lake in ways we are only just starting to understand; declining water levels, altering salinity, habitat loss, dust storms and associated declining air quality are among some of the concerns the Great Salt Lake Region is facing. During the field trip the group tracked the history of the Great Salt Lake; from its precursor geology and evolving geomorphology to the human influences that have shaped it from Prehistoric peoples to modern exploration for critical minerals.

Throughout the immersive experience, participants experienced a diverse range of geological settings, including striking salt flats, sculpted sand dunes, and dramatic mountain ranges. Led and attended by experienced geologists, the field course blended hands-on fieldwork with engaging discussions, fostering a deeper understanding of the region's tectonic history, hydrogeological processes, unique mineralogy, and the delicate balance between human interaction and the preservation of its natural wonders.



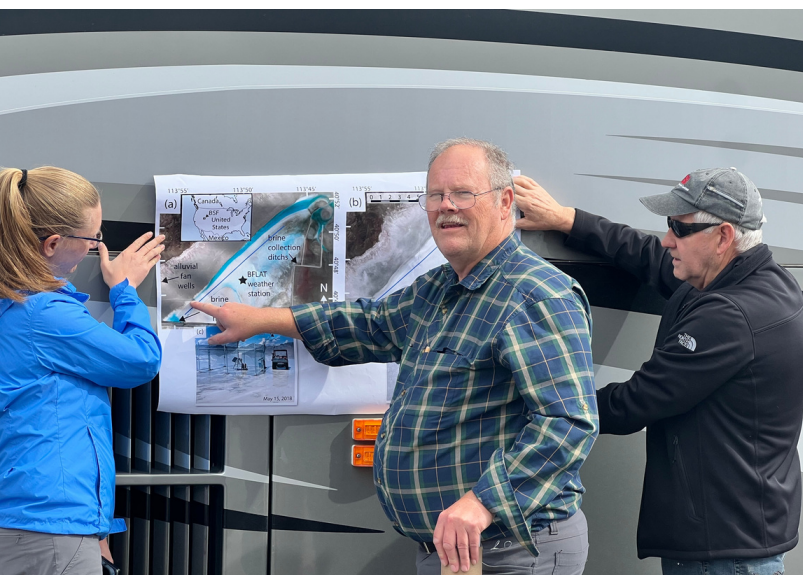
Sand Dunes - Knoll OHV Park



Tour of the Great Salt Lake



Danger Cave



UGS Director Bill Keach



Juke Box Trench



Entering Danger Cave



Wendover Historic Airfield

Innovators Needed!

Seeking brilliant minds to crack tough climate challenges

There are many effective technologies and plans we can implement now, but we don't have all the climate solutions we need yet. Some sectors of the economy won't be easy to power with renewable electricity, like air travel and cargo ships. Traditional methods of producing steel and concrete release a lot of carbon dioxide. And accelerating a major expansion of the electric grid faces many coordination challenges. Scientists, entrepreneurs, and leaders in Utah and across the globe are devising solutions to these and other remaining challenges.

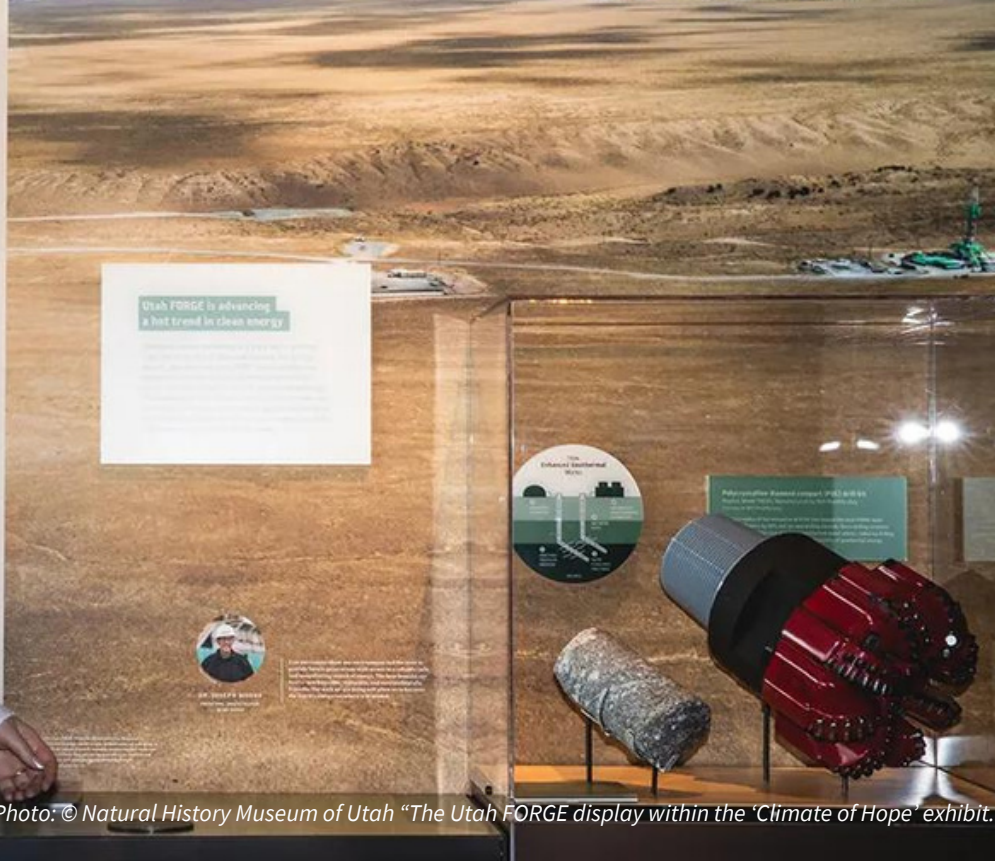


Photo: © Natural History Museum of Utah "The Utah FORGE display within the 'Climate of Hope' exhibit."

A CLIMATE OF HOPE - UTAH FORGE FEATURED IN NHMU'S GROUNDBREAKING EXHIBIT

February 21, 2024

By: Sarah Buening

On November 11, 2023, the Natural History Museum of Utah (NHMU) showcased its newest permanent exhibit: "A Climate of Hope." Located on the museum's fifth story, this addition focuses on climate change in a unique way. Lisa Thompson — an Exhibit Developer with NHMU and a driving force behind "A Climate of Hope" — described how the exhibit aims to "change the way climate change is communicated" by embracing solution-oriented and rational optimism.

Utah FORGE is proud to be featured among the display's examples of modern energy innovators. It is our hope, as well as NHMU's, that people walk away from "A Climate of Hope" with greater confidence in our ability to build a clean energy society.

NHMU's Climate Communication Research

"A Climate of Hope" was carefully curated to meet the needs of Utah's community members. Before the pandemic in 2020, the museum ran tests with visitors to gauge what they most wanted to see in an exhibit about climate change. Responses overwhelmingly indicated a desire to focus on building a better future. Thompson accredited part of this desire to the fatigue many people experience when climate change is communicated solely through a bombardment of data. It was clear that visitors wanted something different than what they had seen before.

With that in mind, the museum built "A Climate of Hope" as part of an adaptive, ongoing research project on best practices in climate communication. Lynne Zummo, NHMU's Curator of Learning Sciences, is in charge of a four-year study to understand visitors' learning process as they experience "A Climate of Hope." The study's results will inform changes to the exhibit over time as it's continually adapted to better empower climate learning and engagement.

Engaging with the public about climate change can prove challenging, however, and that’s what makes this research so necessary. No two people will approach the climate crisis in the same way, and not everyone feels motivated to mobilize in the ways we might hope. A Yale research project studied this phenomenon and created the concept of “Global Warming’s Six Americas.” The “six Americas” identifies six categories of audiences within America that respond to climate change in different ways. People tend to be: alarmed, concerned, cautious, disengaged, doubtful or dismissive. Expanding climate change understanding means catering to each group and knowing how to communicate with each. Ideally, the contents of “A Climate of Hope” will help people bridge the gaps between their fear, hope or dismissal of the issue.



Photo: © Natural History Museum of Utah

Utah-Specific Considerations

To combat data fatigue, the exhibit first strives to foster a much-needed sense of peace. When entering “A Climate of Hope,” visitors are greeted by an aspen grove room — complete with a panoramic view of aspen trees and the sound of leaves rustling in the wind.

In this room, visitors are encouraged to communicate how they feel via a list of emotions displayed on a screen in front of them. The choice of aspen trees, as Thompson said, was no accident. Singular aspen trees exist not as individuals, but as a mere part of a much larger organism. The trees are unified by an interconnected root system, with the largest living organism on earth being Utah’s very own 106-acre Pando aspen grove. Like aspens, Utah communities need to come together and act as one to achieve climate solutions.

For Utahns to do this, they first need to recognize the tangible impacts of climate change that are relevant to them. After leaving the aspen grove, visitors land in the “Hotter Drier Smokier” section of the exhibit, where Thompson says one photo has had a particular impact on long-time Utah residents. It features people ice skating on the Liberty Park Pond in the 1930s — before shorter, warmer winters made it unsafe to do so anymore. Although the loss of an ice skating space may seem minor, the image has resonated with visitors who were made to realize how their local climate has changed markedly throughout their lifetimes.

This area also highlights how climate change impacts people differently within Utah. For instance, Utah’s air pollution and inversion episodes disproportionately impact those with pre-existing health conditions. This information, as well as a series of interviews displayed under “Results May Vary,” introduces a critical element of climate justice and equity to the conservation. There are even tools provided in the exhibit to help parents teach their kids about climate change. One play table uses the “Earth’s blanket” metaphor as a digestible way to communicate global warming to children.

Encouraging “Rational Hope” and Community Mobilization

The rest of the exhibit leans heavily into the idea of “rational hope” presented in Katharine Hayhoe’s novel, “Saving Us: A Climate Scientist’s Case for Hope and Healing in a Divided World.” In Hayhoe’s words, rational hope is a solutions-focused approach which “looks the crisis in the eye.” So having acknowledged the climate consequences experienced by Utahns, the next step is to learn about the solutions we have available to us. This begins with a stand of updateable panels portraying examples of green projects in Utah. As stories get filtered out, Thompson said that the museum will create a companion website to hold the exhibit’s archived stories.

The “Innovators Needed” section is also update-able, with new innovators featured yearly. This section highlights examples of clean energy innovation in Utah and emphasizes the economic viability of renewable technologies. Here, Utah FORGE is featured as “advancing a hot trend in clean energy” through the development of geothermal energy as a more accessible, affordable and constant source of clean power. Exhibit items donated from FORGE include a gneiss core extracted from one of the site’s monitoring wells — a 1.7 billion-year-old piece of metamorphic rock taken from its 460 degree Fahrenheit home 1.8 miles underground — and a polycrystalline diamond compact (PDC) drill bit replica courtesy of NOV ReedHycalog. Because drilling costs are the main barrier to developing geothermal plants, Utah FORGE’s reduction of drill times by 50% is a great source of optimism.

Before leaving the exhibit, visitors pass through a final “Connect Around Climate” area that calls to action those who might not know how to engage with climate issues. It shows that each of us have opportunities at the community scale to create real change, whether it’s through having conversations with those around us, communicating with our representatives, volunteering our time or aligning with advocacy groups. The outro guarantees that no one walks away from “A Climate of Hope” without a little more inspiration for involvement.

Although climate change is an unfortunate reality of our time, we can’t afford to have people mull in hopelessness. Settling for defeat does nothing for modeling the kind of clean energy future we can still create — and are in the process of creating. Utah FORGE is honored to be a part of NHMU’s efforts to advance climate solutions, and we’re sure that many “A Climate of Hope” visitors will join us in the cause.



Photo: © Natural History Museum of Utah



Photo of Liberty Park Pond - from the Utah State Historical Society



UTAH FORGE POSTER AND SONG PARODY CONTESTS – EXPANDING GEOTHERMAL LITERACY

Left to right: Alejandro Moreno, Associate Principal Deputy Assistant Secretary, Energy Efficiency and Renewable Energy (EERE); Lauren Boyd, Director, Geothermal Technologies Office, U.S. Dept. of Energy; Courtney Grosvenor, Chief of Staff for Renewable Energy at the U.S. Department of Energy; Christina Stowers, Deputy Communications Director, EERE; Julie McAdams, Associate General Counsel, University of Utah

By: Sarah Buening

This year, the Utah FORGE team conducted two annual contests for elementary, middle and high school students to learn more about geothermal energy in creative ways. One was a geothermal poster contest where elementary students were asked to make posters including artwork and a few short paragraphs explaining an aspect of geothermal energy. The second was a song parody contest where students remade well-known songs with original lyrics about geothermal energy. Both contests aimed to channel learning through art engagement – an effort exemplified by the STEAM movement. While educational systems traditionally prioritize STEM funding and research, participation in the arts yields many emotional, physical and social benefits. By turning STEM into STEAM, we can incorporate creative thinking into STEM teachings. Like seen in the contests, that simple change can offer students a refreshing new way to look at the energy problems around them.

For the younger generations, becoming energy literate is particularly important. The average child born today needs to emit about eight times less carbon dioxide than their grandparents to comply with Paris Climate Agreement goals. As energy needs evolve, today's young people will witness and become responsible for overseeing drastic changes to our energy portfolio. Any optimized clean energy palette should include geothermal as a viable energy source. Because of these inevitable changes, we aim to prepare young people now with a greater understanding of alternate energy sources. In addition, providing creative outlets effectively helps to relieve eco-anxiety and optimize learning about topics that, as the contests showed, students are receptive to.

Poster Contest

Even at their young age, the students did a remarkable job comparing and contrasting the benefits of one form of energy versus another. They referenced geothermal energy's benefit of constant availability, since it doesn't rely on variable availability like wind or solar do. Whitlee from Milford Elementary remarked that, "Geothermal energy works 24/7 even when the sun is not shining and wind isn't blowing." The students' marvel extended to the history and unique uses of the earth's heat. Delaney at Belknap Elementary reported that cultures like the "Ancient Romans, Chinese and Greeks used [hot spring] water for therapeutic bathing," as well as for "cleaning, warmth and cooking." Some researched the ways that other animals have adapted to use geothermal heat for their specie's growth and evolution, and others studied geothermal applications like using it to heat greenhouses, pasteurize milk or dehydrate food.

After the poster contest concluded, one teacher remarked that they had "never seen the students so engaged for something like this before." Students sparked interest in geothermal for a number of reasons, with many posters citing that near their home in Beaver County, three geothermal power plants produce enough energy for approximately 66,000 homes. Some of these students have had parents working at the Utah FORGE or other geothermal sites, making it a personal and proximal issue for them.



Song Parody Contest

As song submissions shuffled in, each participant's spunk and creativity was put on clear display. We at Utah FORGE were happy to see the students enjoying the contest and having fun working together with their groups. Teachers noticed higher levels of engagement from students in this contest as well. This year's contest winners, students Allie Willden and Alexia Joseph from Beaver High School, parodied the song "You Belong With Me" by Taylor Swift — including remakes of popular lyrics like "Did you know that the earth is a geothermal battery with vast geothermal resources? And it has enough power that could light up this whole town." Students remade other songs like "Gorgeous" by Kanye West, with the winning Elk Meadows team transforming "Somewhere Only We Know" by Keane into "Somewhere Only Heat Flows."

The songs were even more enjoyable when performed, but they each demonstrated an attitude that we want to cultivate in today's young people. That is, to learn about and bolster the solutions that we have available to us. We're glad to see students embrace learning and fun in the same effort and only hope to foster more of it in the future.





EGI & UGS RESILIENT ENERGY GEOSCIENCE & ENGINEERING FIELD TRIP | MAY 11-17, 2024

Registration closes soon.

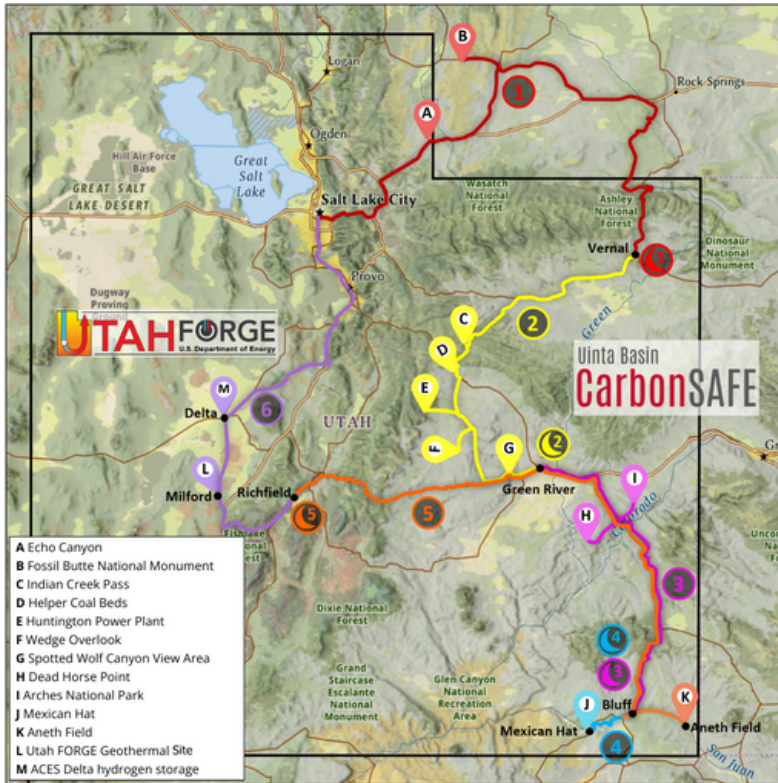
Discover a unique opportunity for energy professionals, engineers, and geoscientists to explore the intersections of geology, engineering, and energy innovation. Led by eminent scientists and engineers at the University of Utah's Energy & Geoscience Institute and the Utah Geological Survey, including Utah's State Geologist Bill Keach, this field trip presents an in-depth exploration of key geological and energy sites, offering valuable insights and networking opportunities.

Participants will delve into the Overthrust Belt and Echo Canyon, regions critical for understanding Earth's tectonic movements and their impact on natural resources. The journey includes Fossil Butte National Monument, a paleontological haven, and Flaming Gorge, known for its hydroelectric significance and stunning landscapes.

The Uintah Basin, a focal point for oil and gas, offers a practical look at energy production. Similarly, the San Rafael Swell and Arches National Park provides an exceptional case study in unique geological formations, essential for understanding regional geology.

The tour also includes Aneth Field, a prominent CO₂ oil production area, a rafting study of the San Juan River, and a visit to Utah FORGE and Blundell, highlighting advancements in geothermal energy technologies. The journey concludes with a stop at ACES Delta, a state-of-the-art salt cavern, refined products and hydrogen storage facility, demonstrating the latest in energy innovation.





PRICING AND WHAT'S INCLUDED

Contact Carol Smith to reserve your spot:
carol.smith@egi.utah.edu | Phone: 801-587-8538

Priced at \$4,550 for participants and \$3,300 for members of EGI's Corporate Associate Program, the tour includes accommodations and meals, making it a comprehensive, educational, and networking experience for professionals in the energy and geoscience sectors. Read our refund policy and price breakdown.

This field study is an invaluable opportunity for professional enrichment, offering a unique blend of hands-on learning and expert insights, ideal for those seeking to deepen their understanding and engage with the forefront of geological and energy research.



REFUND POLICY AND PRICE BREAKDOWN

The price includes:

- Five nights lodging May 12 to 16, single occupancy
- Icebreaker dinner buffet on Saturday, May 11 at EGI
- All meals and snacks starting Sunday, May 12 at breakfast through dinner on Friday, May 17
- Transportation (guide plus five guests per SUV) beginning at 8:00 am May 12 through 6:00 pm Friday, May 17
- Safety PPE, except safety shoes (EGI needs cover-all sizes)
- Study guide and educational materials
- Admission to Fossil Butte National Monument, San Rafael Swell, Arches National Park, Dead Horse Point State Park
- San Juan River Hydrology and Paleontology Study to include guides, powered rafts, lunch on the river, permits, safety equipment, and transportation to Sand Island launch and from Mexican Hat back to lodging
- Long days of study and travel, usually 8:00 am to 6:00 pm

Not included:

- Airfare and transportation to EGI. EGI staff can assist with pickup and drop off at SLC airport.
- Lodging on Saturday, May 11, and Friday, May 17. The Marriot University Park is across the street from EGI.
- Safety shoes are required at field and plant operations

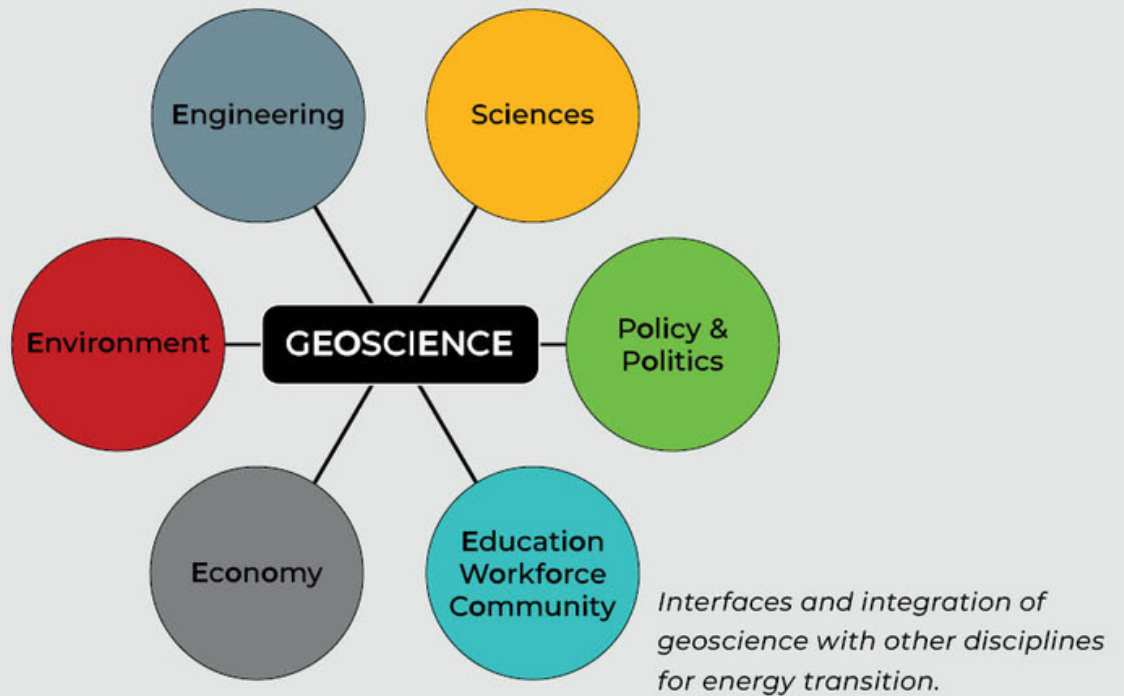
Registration and cancellation:

- The registration deadline is April 1, 2024. Payment is due with registration and attendees can change without issues.
- Full refund if cancelled before April 10.
- \$605 is non-refundable after April 10. (two nights at Bluff Dwelling)
- \$1,145 is non-refundable after May 1. (five nights lodging and raft trip)



SEARCHING FOR A GREENER FUTURE

EMPOWERING GEOSCIENCE AND ENGINEERING EDUCATION FOR THE ENERGY TRANSITION



Dr. Rasoul Sorkhabi, a CvEEN Research Professor, and Milind Deo, a Professor in the Department of Chemical Engineering and Director of the Energy & Geoscience Institute, have developed an innovative approach to geoscience and geoengineering education. Their work, which has recently been featured in the prestigious *Issues in Science and Technology* magazine by the U.S. National Academies of Science, Engineering, and Medicine, aims to position geoscience and petroleum engineering departments at the forefront of the energy transition movement.

As the energy landscape continues to shift, the demand for petroleum engineering and geoscience professionals has decreased, leading to concerns about program closures. However, Dr. Sorkhabi and Dr. Deo emphasize the critical role that subsurface geoscientists and engineers play in the transition towards a low-carbon future.

Universities can promote energy sustainability by designing curricula that focus on energy transition research. Geoscientists and engineers can play a pivotal role in shaping the future of energy by exploring Earth's interconnected systems. These programs can foster collaborations between academia and industry, embracing diversity and interdisciplinary work to address societal and environmental challenges.

To learn more, read Drs. Sorkhabi and Deo's publication in *Issues in Science and Technology* [here](#).

EGI'S CARBON MANAGEMENT TEAM UPDATE

Over \$10 Million from Department of Energy to Support Reducing CO₂ Emissions in Uinta Basin

Dr. Ting Xiao and Dr. Brian McPherson are currently engaged in a comprehensive project focused on carbon capture, utilization, and storage (CCUS) hubs. Their work is part of the CarbonSAFE II: Storage Complex Feasibility initiative, which aims to determine the viability of commercial CO₂ storage in Utah's Uinta Basin.

The \$ 10,033,232, granted in large part by the Department of Energy, will support an extensive range of activities, including high-resolution societal analysis, geological characterization, technical assessments, economic evaluations, and environmental analyses.

The main goal of CarbonSAFE II is to expedite Deseret Power's evaluation of large-scale CO₂ capture capabilities. By pooling additional sources of CO₂ storage hub development in the region, the project is a significant step towards cleaner energy production. By capturing and storing substantial amounts of CO₂ generated by industrial processes, especially those linked to fossil fuel combustion, the initiative actively contributes to shaping a safer environment.

The contract is expected to be finalized in October, with a start date of October 1, 2023.

Dr. Xiao's and Dr. McPherson's work, along with the many others involved in the CarbonSAFE II initiative, holds great environmental significance:

"By directly tackling the urgent problem of carbon emissions by promoting the capture and storage of CO₂, it supports the adoption of cleaner energy sources, emphasizes meticulous environmental analysis, and drives community development efforts."

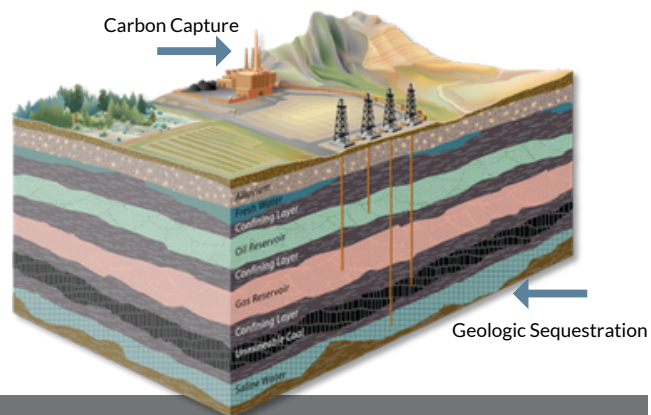
These combined endeavors will work to combat climate change, enhance air and water quality, and stimulate sustainable economic growth. All these facets are crucial for fostering a healthier, more environmentally responsible future.

Published by civil.utah.edu.



EGI's Carbon Science Initiative

EGI conducts numerous projects in carbon sequestration wherein large amounts of anthropogenic CO₂ emissions are targeted for injection into deep saline aquifers or other suitable geologic formations. EGI's research portfolio on low-carbon technologies includes work in carbon capture, utilization and storage.



Enormous CO₂ storage capacity lies underground. CO₂ may be captured from power plants and industrial sources, and then sequestered or used for EOR.

EGI CARBON MANAGEMENT TEAM CONT.

On January 23, 2024 a mini field trip was provided by UGS in Vernal before the kick-off meeting of the Uinta Basin Carbon Safe Project.

Below are some of the photos shared by the team.



EGI SPRING WEBINAR LINEUP

DISCUSSIONS AND INSIGHT FROM EGI

MARCH 7, 2024

PANGAEA – ASSEMBLY AND
FRAGMENTATION OF A SUPERCONTINENT
WITH TONY DORE | 9 AM MST

RECORDING NOW AVAILABLE

APRIL 18, 2024

PETROPHYSICS, GEOCHEMISTRY AND
DATA-SCIENCE. ENHANCING
GEOMODELLING AND SOURCE ROCK
ANALYSIS

WITH CARLOS VEGA-ORTIZ | 9 AM MST

JOSEPH MOORE, PH.D.

TO BE DETERMINED

WITH JOSEPH MOORE | 9:00 AM MST

For more info email: contactegi@egi.utah.edu
Or call: 801-581-5126
egi.utah.edu



Tony Dore, Ph.D.

GLOBAL CHIEF SCIENTIST
– SENIOR ADVISOR TO THE
DIRECTOR



Carlos Vega-Ortiz, Ph.D.

CARBON RESEARCH
SCIENTIST



**Joseph Moore,
Ph.D.**

RESEARCH PROFESSOR

BRIEF NEWS FROM EGI



Endowed Professorships

University of Utah's John and Marcia Price College of Engineering has announced the naming of three new Endowed Professorships, providing their recipients the solid foundation they need to conduct their world-changing work.

On November 3, Richard Brown, the H. E. Thomas Presidential Endowed Dean of the Price College of Engineering, appointed **Masood Parvania** (far right) to the Roger P. Webb Endowed Professorship in Electrical & Computer Engineering, **Kody Powell** (far left) to the John A. and Amy B. Williams Endowed Professorship in Chemical Engineering, and Florian Solzbacher (middle) to the Gerald B. and Barbara F. Stringfellow Endowed Professorship in Electrical & Computer Engineering.

[Read more here.](#)



Utah FORGE is Building Relationships and Geothermal Understanding in Beaver County

As the Utah FORGE site continues to grow toward its technical goals for EGS, the staff also educate and engage with local Beaver County residents and students to increase awareness about the clean energy that can be harnessed through the heat beneath their feet.

Their outreach work in this area is proving valuable to help local officials, residents, and businesses understand geothermal energy, and in forging substantive relationships and understanding with the community as they've expanded the technical capacity of their site.

[Read more here.](#)

BRIEF NEWS FROM EGI CONT.



The SIES leadership team, representing research and implementation partners from across Utah, Arizona and Nevada.

EGI Director Dr. Milind Deo is part of SIES leadership team

The National Science Foundation (NSF) announced the University of Utah along with six core academic partners will be part of a multi-institutional enterprise to confront the climate challenges facing the desert Southwest and spur economic development in the region.

On the Regional Innovation Engine (RIE) leadership team, EGI's Director Dr. Milind Deo serves as co-lead of Carbon Innovation within the Co-Innovation working group. [Read more here.](#)



Pictured: EGI Research Professor Rasoul Sorkhabi

EGI attends 2024 NAPE Summit

In February, EGI attended the 2024 NAPE Summit in Houston as an exhibitor.

NAPE (North American Prospect Expo©) brings together top executives, investors, and professionals from the upstream energy sector.

Those representing EGI consisted of EGI Director Dr. Milind Deo, Research Professor Dr. Rasoul Sorkhabi, Research Scientist Dr. Eiichi Setoyama, EGI Software Developer Thomas Cook, and Technology Outreach Marketing Manager Brooke Parker.

The EGI team appreciated the opportunity to engage with attendees at the event, where we had the chance to share insights into our recent projects, real-world geoscience applications, and innovative engineering solutions.

A Celestial Symphony Over Stone: The 2023 Annular Eclipse at Bryce Canyon

BY BRYONY RICHARDS, Ph.D.

Photo: Progression of the annular eclipse over the Pinnacles of Bryce Canyon's Claron Formation.

On Saturday, October 14, 2023, skywatchers across a swath of the Americas were treated to a celestial spectacle: an annular solar eclipse. This astronomical event occurs when the Moon, passing directly between Earth and the Sun, is too far from Earth to completely cover the Sun's disk. The result is a dazzling "ring of fire" surrounding the dark silhouette of the Moon.

We decided to head to Bryce Canyon National Park to try to get close to the path of full angularity (the point at which the ring of sun surrounding the moon is symmetrical) but to also have a spectacular geological foreground for photos. We chose an area of the canyon a little off the beaten path, with spectacular sandstone pinnacles and a hill of sandstone to frame the eclipse. You can see in the photo that we just missed the exact path of annularity.

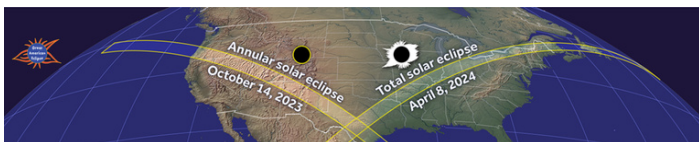
Bryce Canyon, a natural amphitheater located in southern Utah, is renowned for its striking geological features, including spire-shaped rock formations known as hoodoos. The story of Bryce Canyon begins during the Cretaceous period, approximately 50 to 70 million years ago, when the area was situated near the edge of a large ancient lake. Over millions of years, layers of sediment from the surrounding highlands accumulated, compressing into limestone, siltstone, dolomite, and mudstone. This layering created the Claron Formation, the primary rock layer visible in the canyon today.



Photo: Major stages of the annular eclipse.

The uplift of the Colorado Plateau, starting around 10 million years ago, elevated these rock layers, exposing them to the forces of erosion. The unique geological formations of Bryce Canyon, including its hoodoos, arches, and natural bridges, are the result of differential erosion. This process is driven by the region's extreme temperature fluctuations (on average ranging from ~20-80 degrees Fahrenheit), where water seeps into rock cracks, freezes, and expands, breaking the rock apart over time. The freeze-thaw cycle is particularly effective in an environment like Bryce Canyon, where more than 200 freeze-thaw cycles occur each year. Additionally, rainwater, slightly acidic due to absorbed carbon dioxide from the atmosphere, further dissolves the limestone, carving intricate formations and widening the crevices between rocks.

But, don't worry if you missed this last eclipse! The next annular eclipse will be on October 2nd, 2024 when the solar ring of fire will be seen from Earth's ring of fire along the coast of Southern Chile and Argentina. The next total eclipse will be visible across the eastern United States through Texas, Arkansas, Tennessee, and Missouri.



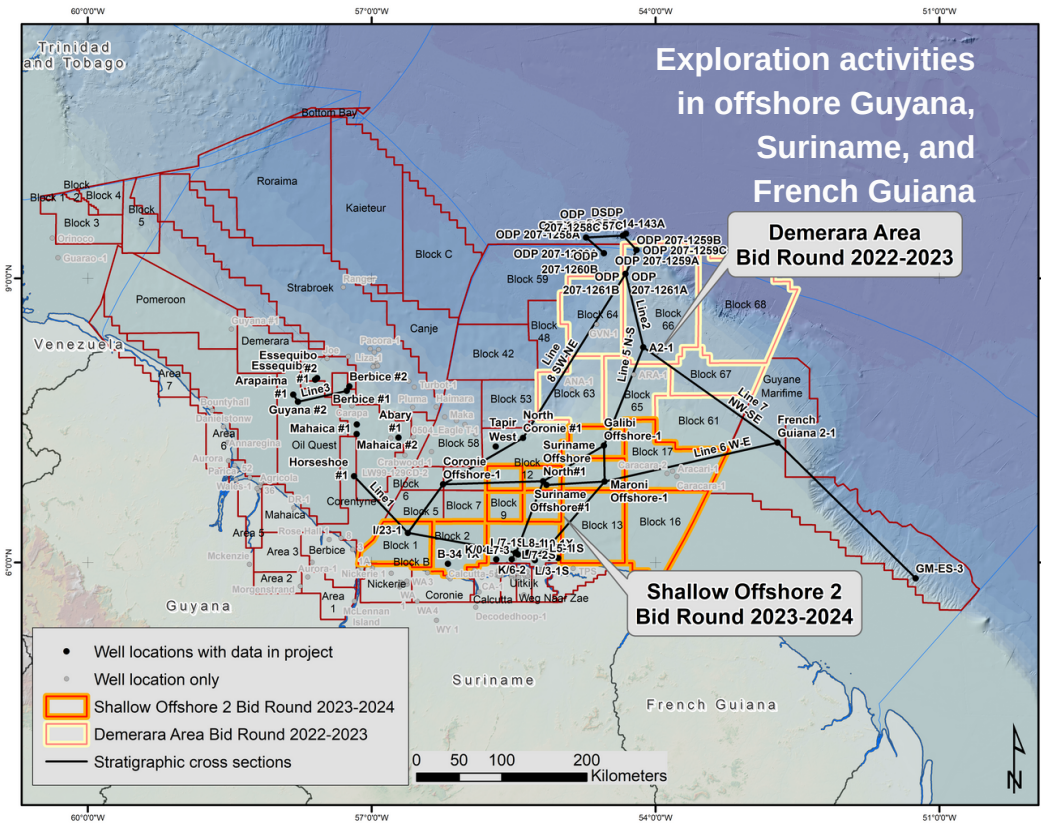
The Great American Eclipses of 2023 and 2024



Photo 4: Eclipse tree showing the pinhole projection effect. Pinhole projection is a phenomenon where sunlight filters through small gaps between leaves of trees, acting as numerous pinhole cameras. Each gap projects an image of the Sun onto the ground, and during an eclipse, these images take on the shape of the eclipse phase occurring at that moment, typically crescents during a partial eclipse and rings during an annular eclipse.

GUYANA - SURINAME BASINS DATABASE

DEMERARA BID ROUND 2022/2023



KEY DELIVERABLES

ArcGIS integration and display of stratigraphic, geochemical, and well data and maps, including access to publicly-available seismic images.

Characterization of the offshore petroleum systems in the region by new geochemical and paleofacies data.

Rasoul Sorkhabi, Ph.D. | Eiichi Setoyama, Ph.D. | Christopher Kesler

Recent discoveries offshore Guyana-Suriname have placed this petroleum province in the spotlight. These discoveries indicate massive occurrence of oil and gas in the region and the need for regional synthesis and quantitative geologic and geochemical data on petroleum systems for further exploration.

This EGI study report is designed to:

- (1) Integrate all of data from EGI reports as well as research papers in a coherent schema.
- (2) Compile geochemical data and add new geochemical analyses on select samples.
- (3) Construct new paleofacies maps for key stratigraphic horizons from onshore to deepwater.
- (4) Construct litho-chrono-bio-stratigraphic columns for the wells.
- (5) Assemble structural and geophysical data on a unified, easy-to-use platform.

The study report is delivered on the ArcGIS platform.

CONTACT

Rasoul Sorkhabi, Ph.D. | rsorkhabi@egiwpadmin | 801-581-5126

A TRANSFORMATIVE OFFSHORE EXPLORATION TOOL

Your Gateway to Modern Geoscience

iCORDS™ Offshore

We are pleased to announce the recent advancements in EGI's iCORDS Offshore data platform, a robust solution designed with the core understanding that Big Data provides the competitive advantage in contemporary geoscience and exploration technologies.

With over a decade of development by top university research scientists, iCORDS 2 now offers online access to an extensive and meticulously curated database encompassing approximately 14 million samples from thousands of offshore wells. The integration of subsurface geochemical, geologic, and petrophysical data, paired with supportive ocean-floor maps, heat flow data, and seismic lines, delivers a streamlined experience for our global subscribers.

The easy-to-use query and graphical plotting functionalities amplify the value of this cloud-based data-analytic platform.

Schedule an iCORDS 2 Demo

Recognizing the unique needs of professionals engaged in offshore and deepwater exploration, we extend an invitation for a personalized demo of iCORDS 2 at a time convenient for you and your team. EGI's rich history of over 50 years in energy resource exploration across the globe uniquely positions us to augment your knowledge base and support your new ventures in oil and gas exploration.

Please reach out to Rasoul Sorkhabi at rsorkhabi@egi.utah.edu for a Zoom or in-person meeting at your company to explore this and other tailored solutions by EGI.

Please visit the iCORDS website for more information.

iCORDS™ Offshore Module is offered on Google Cloud with an annual subscription.

CONTACT

Rasoul Sorkhabi, Ph.D. | rsorkhabi@egiwpadmin or contactegi@egi.utah.edu



RECENT EGI SCIENTISTS' PUBLICATIONS OF 2023 - 2024

Ahmed, W., McLennan, J., Bhat, G. M., Kanungo, S., Richards, B., Tran, T., Thusu, B., Hakhoo, N., Hafiz, M. (2023). Geomechanical characterization of the Barren Measure Formation in the Raniganj sub-basin of Damodar Basin, India. *Journal of the Geological Society of India*, JGSI-D-23-00349R3.

Bakelli, O., Xiao, T., McPherson, B., Doghmane, M. Z. (2023, October). *Geomechanical Characterization of the Broom Creek Reservoir for Geologic Carbon Storage in the Williston Basin, North Dakota, U.S.* Paper presented at the International Geomechanics Symposium, Al Khobar, Saudi Arabia. doi: <https://doi.org/10.56952/IGS-2023-0042>

Bakelli, O., Kegang, L., Nesheim, T., Mahmood, T., Khetib, Y. (2023, June). *Spatial Data Analysis of Water Production from Unconventional Reservoirs, Case Study from the Williston Basin, North Dakota.* Paper presented at the 57th U.S. Rock Mechanics/Geomechanics Symposium, Atlanta, Georgia, USA . doi: <https://doi.org/10.56952/ARMA-2023-0859>

Bakelli, O., Chellal, H. A. K., Aoun, A. E., Khetib, Y., Mellal, I., Kegang, L. (2023, June). *Integrated Reservoir Simulation and Discrete Fracture Network Modeling for Produced Water Source Identification in Tight Reservoirs, Case Study from the Bakken Formation, Williston Basin.* Paper presented at the 57th U.S. Rock Mechanics/Geomechanics Symposium, Atlanta, Georgia, USA. doi: <https://doi.org/10.56952/ARMA-2023-0864>

Davis, R., Palash P., McLennan, J. (2023). Integrated Workflow for Interpretation of Satellite Imageries using Machine Learning to Predict Algal Bloom in Utah Lake, USA. *Ecological Informatics*, 75, 102033. <https://doi.org/10.1016/j.ecoinf.2023.102033>

El-kaseeh, G., & McCormack, K. L. (2023). Multi-Scale Seismic Measurements for Site Characterization and CO₂ Monitoring in an Enhanced Oil Recovery/Carbon Capture, Utilization, and Sequestration Project, Farnsworth Field, Texas. *Energies*, 16(20), 7159.

Hart, M. B., Gebhardt, H., Setoyama, E., Smart, C. W., Tyszka, J. (2023). Triassic and Jurassic possible planktonic foraminifera and the assemblages recovered from the Ogodzieniec Glauconitic Marls Formation (Uppermost Callovian and lowermost Oxfordian, Jurassic) of the Polish Basin. *Journal of Micropalaeontology*, 42(2), 277–290. <https://doi.org/10.5194/jm-42-277-2023>

Mellal, I., Latrach, A., Rasouli, V., Bakelli, O., Dehdouh, A., Ouadi, H. (2023). Water Saturation Prediction in the Middle Bakken Formation Using Machine Learning, *Eng*, 4(3), 1951-1964. <https://doi.org/10.3390/eng4030110>

Panja, P., Manankandayalage, C., Alam, M., Deo, M. (2023). Understanding the performance of membrane for direct air capture of CO₂, *Journal of Applied Polymer Science*, e54802

Saha, D., Bhasin, V., Khalid, S., Smeriglio, N., Cuka, S., Bhattacharyya, D., Rodgers, J., Panja, P., Deo, M., Apple, T. (2023). Adsorption of Rare Earth Elements in Carboxylated Mesoporous Carbon. *Separation and Purification Technology*, 314, 123583, <https://doi.org/10.1016/j.seppur.2023.123583>

- Sorkhabi, R., Panja, P., Deo, M. (2023, June 13-15). *Production Sweetspots of Eight US Shale Plays Constrained by Data Analytics of Normalized Production Index, Payzone Depth, and Initial GOR*, Unconventional Resources Technology Conference (URTeC), Denver, Colorado. <https://doi.org/10.15530/urtec-2023-3866019>
- Sorkhabi, R., & Koppes, S. (2023, February). Robert Dietz: From ocean floor mapping to chasing meteorite impacts. *GSA Today*, 33(2), 18-19.
- Sorkhabi, R. (2023, March). Max Steineke: California geologist who awakened the Arabian “elephants.” *AAPG Explorer*, 22(3), 16-21.
- Sorkhabi, R. (2023, April-June). Place-based education in geoscience. *Professional Geologist*, 60(2), 58-61.
- Sorkhabi, R. (2023, July-September). All geology is regional geology: Case-based education in geology. *Professional Geologist*, 60(3), 40-41.
- Sorkhabi, R., & Deo, M. (2023). Finding a greener future beneath the surface of petroleum science and engineering. *Issues in Science and Technology* (National Academy of Sciences), 40(1), 60-62.
- Sorkhabi, R. (2023, October). Geoscience education and workforce development in the Energy transition. *First Break*, 41(10), 83-86.
- Wu, Z., Edelman, E., Smith, P., Smith, S., Irons, T., McPherson, B. (2024). Framework for Bayesian Assessment of Factors that Impact Rock Mechanical Response. *Rock Mech Rock Eng.* <https://doi.org/10.1007/s00603-023-03552-4>
- Wu, Z., Simmons, J.D.; Otu, S., Rinehart, A., Luhmann, A., Heath, J., Mozley, P., Majumdar, B.S. (2023). Control of Cement Timing, Mineralogy, and Texture on Hydro-chemo-mechanical Coupling from CO₂ Injection into Sandstone: A Synthesis. *Energies*, 16(24), 7949. <https://doi.org/10.3390/en16247949>
- Wu, Z., Edelman, E., Smith, P., Smith, S., Irons, T., McPherson, B. (2023, June). *Uncertainty Quantification of Young's Modulus on Core Scale: A Bayesian Analysis on a Comprehensive Geomechanical Model*. Paper presented at the 57th U.S. Rock Mechanics/Geomechanics Symposium, Atlanta, Georgia, USA. doi: <https://doi.org/10.56952/ARMA-2023-0367>
- Xiao, T., Chen, T., Ma, Z., Tian, H., Meguerdijian, S., Chen, B., Pauer, R., Huang, L., Xu, T., McPherson, B. (2024). A review of risk and uncertainty assessment for geologic carbon storage. *Renewable and Sustainable Energy Reviews*, 189, 113945.

The logo for the Energy & Geoscience Institute (EGI) is displayed in large, bold, red capital letters. The background of the entire page is a photograph of a snow-dusted mountain range with evergreen trees, viewed from a campus perspective with buildings and utility poles in the foreground.

Energy & Geoscience Institute

AT THE UNIVERSITY OF UTAH

ADDRESS:

**Energy & Geoscience Institute
423 Wakara Way, Suite 300
Salt Lake City, UT 84108**

PHONE:

801-581-5126

ContactEGI@egi.utah.edu

The EGI logo is shown in large, bold, red capital letters, identical to the one at the top of the page.