PITTSBURGH GEOLOGICAL SOCIETY

February 15, 2023

MEETING TIMES

Social Hour	5:30 PM
Dinner	6:30 PM
Speaker	7:30 PM

DINNER COSTS

$35.00 regular member
$15.00 student member
$40.00 non-member

RESERVATIONS

Email your name and number of attendees to: pgsreservations@gmail.com

Or reserve and use PayPal: https://www.pittsburghgeologicalsociety.org/

MEETING LOCATION

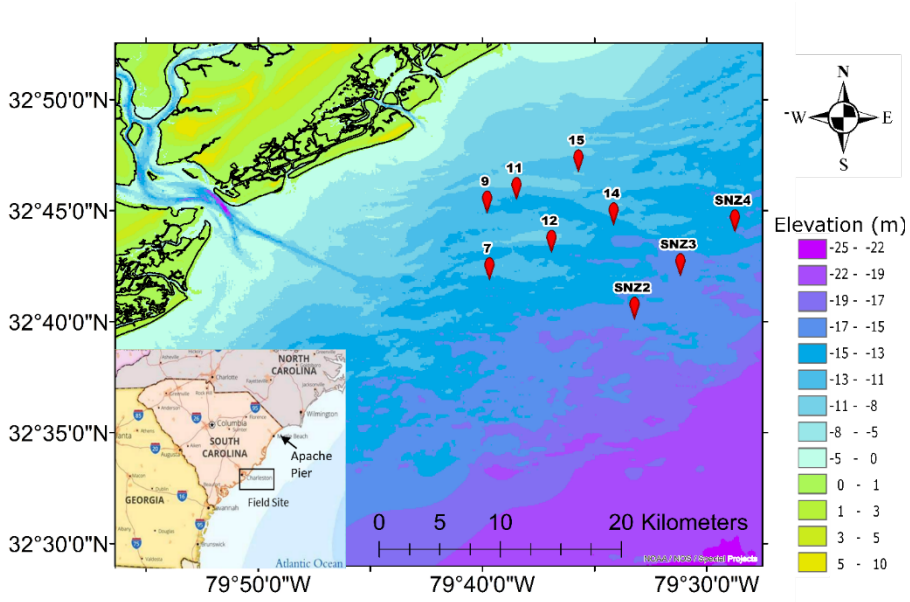
Cefalo's Banquet & Event Center, Carnegie PA

COVID19 POLICY

See page 3 for current guidance.

SUBSEAFLOOR HYDROGEOLOGY:

MOVING BEYOND WATERSHEDS



2023 NGWA Darcy Lecturer

Alicia Wilson, Ph.D.

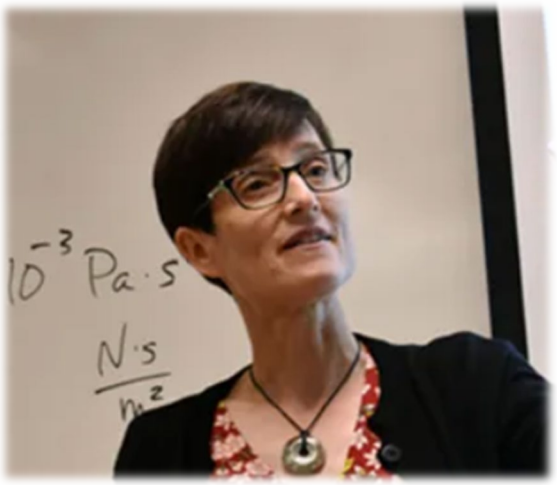
University of South Carolina

Please RSVP by Wednesday, February 8th

Speaker Abstract

The field of submarine groundwater discharge (SGD) was launched in the 1990s by the remarkable discovery, via naturally-occurring isotopic tracers, that saline groundwater was discharging to the South Atlantic Bight in very large volumes. Subsequent studies confirmed that saline groundwater discharges to the Atlantic Ocean in volumes that rival river discharge. All available evidence indicates that this saline groundwater is highly enriched in nutrients compared to river water, so the nutrient contributions of this submarine discharge exceed that of river discharge. These findings have been slow to find widespread acceptance, however, because it has been exceedingly difficult to confirm this flow by means other than the original isotopic tracers. This discharge does not occur near the shoreline, and no conceptual models for SGD far from shore existed. This changed recently when new studies using heat as a tracer identified clear pulses of groundwater discharge 10-15 km offshore in the South Atlantic Bight. This talk investigates this 20-year mystery and the recent discoveries that suggest that it may be time to rewrite chemical budgets for the coastal ocean.

Speaker Biography



Alicia Wilson is a professor of hydrogeology in the School of the Earth, Ocean, and Environment at the University of South Carolina. She specializes in coastal hydrogeology, with a particular focus on coastal ecohydrology and submarine groundwater exchange. A fellow of the Geological Society of America, Wilson has served as the chair the GSA Hydrogeology Division and the Director of the School of the Earth, Ocean, and Environment. She is a recipient of the University of South Carolina's Mungo Undergraduate Teaching Award. Wilson holds a Ph.D. from the Johns Hopkins University, an MS from Stanford University, and a BA from Dartmouth College. She held a National Research Council Postdoctoral Research fellowship at the USGS in Reston, VA, and held a postdoc at the University of California, Santa Barbara.

Please note that PGS is monitoring the COVID-19 situation closely and will continue to modify policy based on the recommendation of national and local experts. We ask that our members please consult and follow the US Centers for Disease Control and Prevention (CDC) recommendations for Allegheny County as shown here: https://www.cdc.gov/coronavirus/2019-ncov/your-health/covid-by-county.html

UPCOMING PGS MONTHLY MEETINGS

Meeting Date	Scheduled Speaker	Presentation Topic
March 15, 2023	Dr. Peter Dodson University of Pennsylvania	"Collecting Dinosaurs on Four Continents"
April 19, 2023	STUDENT NIGHT	
May 10, 2023	2021 ES AAPG Winner of PGS Best Presentation on Appalachian Geology: James McDonald	"History of Structure Contour Mapping in the Appalachian Basin: 1870 – 1917"

The Pittsburgh Geological Society welcomes our new members:

New Regular Member:

Mike E. Yamrick, PG,
Project Geologist, Triad Engineering, Inc., Greensburg, PA

New Student Members:

Kaitlyn N. Thomas,
Slippery Rock University

Wyatt L. Salmon,
Slippery Rock University

Andrew J. Holleran,
PennWest-California

Emily C. Kriner,
University of Pittsburgh

Emily C. Wallace,
University of Pittsburgh

Robert Kennedy,
Gateway High School, Monroeville, PA

PRESIDENT'S STATEMENT

Hello PGS members! Here's hoping you all had a relaxing holiday season and a successful return to business-as-usual. It was wonderful seeing the enormous participation from PGS, ASCE-GI, and AEG at our January meeting. It's not often we have to move to the larger dining space! Thanks again to ASCE-GI for organizing the talk by James R. James, P.E. I really appreciated the historic pictures of the Montgomery Lock and Dam and the description of planned work and data collection really provided insight into the engineering aspects and complications from thin coal seams in the region.

We have several special meetings coming soon so mark your calendars accordingly. Our February speaker, Dr. Alicia Wilson, is the 2023 national Darcy Distinguished Lecturer, who will be providing a talk on subseafloor hydrogeology. Our March 15th meeting is still in the planning phase but is intended to be held at the Carnegie Museum of Natural History and will include after-hours access to the "Dinosaurs in Their Time" exhibit, dinner and a talk by Dr. Peter Dodson regarding his experience collecting dinosaur fossils on several continents. Our April meeting is also exciting because it represents another joint meeting between ASCE-GI, PGS, and AEG and will be the annual student research meeting that will include a poster session and an oral session.

Our program year ends on a strong note in May, with James McDonald, the 2021 ES AAPG winner of the PGS Award for the best presentation on Appalachian Geology, who will be speaking about structure contour mapping in the Appalachian Basin.

One final thing to consider is that nominations have begun for board positions that start this summer and extend through the 2023-2024 program year or potentially longer. Please look through the board positions on the website, and if any of them seem of interest please contact Ray Follador (see announcement on page 13), use the links from the "About Us" section of the website, or contact us using the contact form, also provided on the PGS website. Committee positions are also available so if you are interested in greater involvement with the society, ***now*** is the time to reach out!

I hope to see you all at the February meeting!

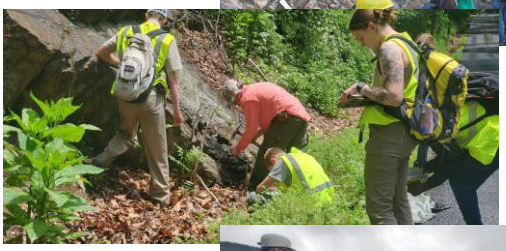
Dan

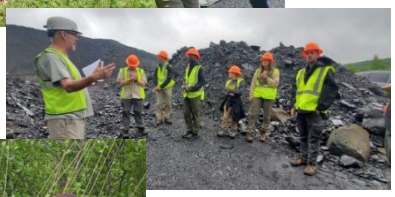
GEOLOGY FIELD CAMP

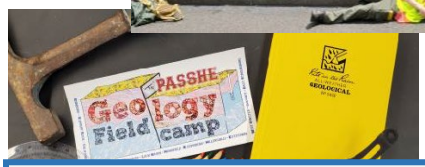
Geology Field Experience in Pennsylvania *(aka Field Camp!)*

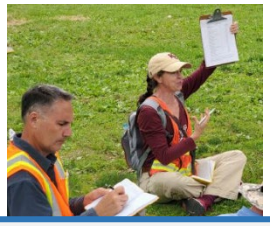
- 6 credits: Dates May 22-June 23, 2023; (Arriving at West Chester on May 21 for move-in)
- Travelling course, with stays at West Chester, Shippensburg, and Slippery Rock Universities!
- Cost: *tuition for 6 credits at your PASSHE university or at West Chester University as a visiting student.*
- Fees for lodging (campus dorms), transportation, and most meals ***covered*** by a grant from the National Science Foundation! Applications due: February 15, 2023

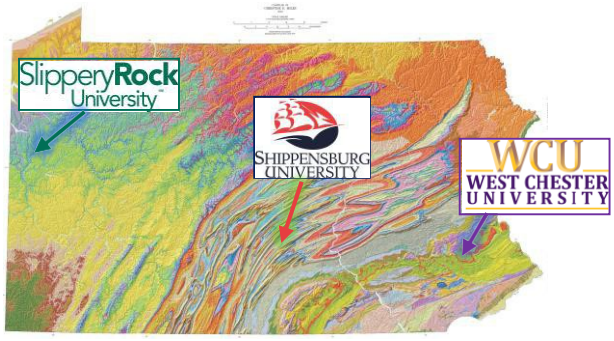
Click here to access application
https://www.passhe.edu/inside/ASA/Pages/geology-field-experience.aspx











University Contacts!

Dr. Tamra Schiappa, Slippery Rock University tamra.schiappa@sru.edu
Dr. Sean Cornell, Shippensburg University srcornell@ship.edu
Dr. Nicholas D. Deardorff, Indiana Univ. of PA ndeardor@iup.edu
Dr. Dan Harris, California University of Pennsylvania harris_d@calu.edu
Dr. Jonathan C. Lewis, Indiana Univ. of PA jclewis@iup.edu
Dr. Daria L. Nikitina, West Chester Univ. of PA DNikitina@wcupa.edu
Dr. Eric Straffin, Edinboro University estraffin@edinboro.edu
Dr. Sarah Tindall, Kutztown University tindall@kutztown.edu
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Dr. Logan Wiest, Mansfield University wiest@mansfield.edu
Dr. Dr. Joseph Zume, Shippensburg University jtzume@ship.edu

The PASSHE Geology Field Experience is an opportunity for students to apply existing knowledge and skills and gain new competencies through the investigation of Pennsylvania's unique and varied geology. Students will work independently and in groups during a 5-week immersive, 6 credit field-based course, to collect, analyze, and interpret field-based data and to develop scientific reports and presentations. Fundamental skills in Geology, such as lithologic and stratigraphic descriptions, surficial and bedrock mapping, and geophysical and environmental analyses, will be developed. The course is offered throughout Pennsylvania with field-based modules taught by experts from across the state system.

Pennsylvania's STATE SYSTEM of Higher Education

PASSHE

Application Deadline is February 15, 2023

LOCAL GEOLOGICAL EVENTS

HARRISBURG AREA GEOLOGICAL SOCIETY (HAGS)

February 9, 2023 **6:30 PM – 7:30 PM**

"Geology & History of the Chapada do Guimaraes Geopark Region – Mato Grosso, Brazil" *(geographical center of South America)* by Dr. Jay Parrish P.G. – former State Geologist of Pennsylvania

Details and registration: https://bit.ly/HAGS-Feb23

GEOPHYSICAL SOCIETY PGH / PGH ASS'N PETROLEUM GEOLOGISTS (GSP & PAPG)

February 16, 2023 **11:15 AM - 1:00 PM**

"Drones in the Oilfield: Airborne Magnetometry to Locate Legacy Wells" by Andrew Zorn, Director of Applied Research and Technology, DiGioia Gray & Associates

Details and registration: https://gsop.wildapricot.org/event-5138370

in-person at **Cefalo's Banquet and Event Center, Carnegie, PA**

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS (PCPG)

February 28, 2023 **8:30 AM - 6:00 PM**

PCPG Annual Meeting, Education Program, Networking and Barb Dunst Memorial Fund Bottle Auction (280 min)

Details and registration: https://pcpg.org/event-4882290

Best Western Central Hotel & Conference Center 800 East Park Drive Harrisburg, PA

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (AAPG)

February 21-22, 2023 **8:00 AM - 5:00 PM**

AAPG Orphan, Idle, and Leaking Well: Best Practices, Data Access, Funding Sources, and Business Opportunities Geosciences Technology Workshop (GTW)

Details and registration: https://www.aapg.org/career/training/in-person/workshops/workshop-details/articleid/64689

Hamm Institute for American Energy, 300 NE 9th St., Oklahoma City, OK 73104

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS (PCPG)

March 23, 2023 **1:00 PM - 2:00 PM**

Webinar: "Geomorphology, river incision and earthquakes in Lancaster and York Counties,PA" (60 mins) by Frank J. Pazzaglia, Ph.D., Professor, Dept. of Earth & Environmental Science, Lehigh University.

Details and registration: https://pcpg.org/event-5078525

NORTHERN ALLEGHENIES GEOLOGICAL SOCIETY (NAGS)

March 28, 2023 **5:00 PM - 8:00 PM**

Saltwater Disposal, Natural Gas Storage, NGL for Western Pennsylvania by Dan Billman of Billman Geologic Consultants, Inc.

Details and registration forthcoming in next PGS newsletter. Visit NAGS on Facebook.

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

The Borough of Mount Pleasant in Westmoreland County is one of southwestern Pennsylvania's oldest towns. It was founded at the crossroads of two Native American paths that later become major roads (now PA 31 and PA 819). The town was named for Mount Pleasant Church, a Scots-Irish Presbyterian church founded about 1779 two miles north of the crossroads. English, Scots-Irish, and German settlers, many of them Revolutionary War Veterans, arrived and established taverns, inns, and blacksmiths' shops. The surrounding territory was rich farming country, and the grain produced in the area was commonly converted to whiskey for easy transport to eastern markets. During the Whiskey Rebellion in 1794, federal troops rode into town and began arresting the "Whiskey Boys" who protested the new whiskey tax, earning the settlement the name "Helltown." Henry Clay Frick, who clerked at his Uncle Overholt's store on Main Street, later consolidated the area's coal and coke industry, and became a millionaire by the age of 30. After 1870 cheap immigrant labor attracted entrepreneurs who established two glass factories, including the Bryce Brothers in 1896, makers of hand blown crystal. Bryce Brothers eventually became Lenox Crystal. Their factory later became a warehouse for Levin Furniture, then a family-owned business that began operations in 1920 as a general sales clearance center. It is now a large furniture retailer in western Pennsylvania. Much of the character and flavor of Mount Pleasant's history remains to make the town an interesting place to visit and shop.

As a young man, Henry Clay Frick, who would go on to become a coal and coke magnate and millionaire by the age of 30, worked in his Uncle Overholt's store in Mount Pleasant, PA.

DID YOU KNOW . . . ?

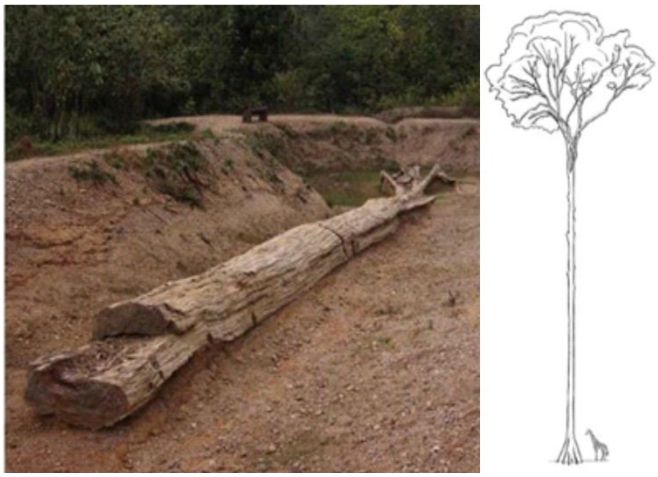
In 2009, researchers from the New York State Museum discovered what has been touted as the world's oldest known fossil forest in upstate New York. They were scouting out an old quarry near Cairo, Greene County, New York, when they noticed some oddly shaped grooves that seemed to wander over the outcrop. Although similar features are common in marine rocks, the exposure in the quarry was of non-marine sedimentary rocks of Middle Devonian age. After tracing eleven of the lines to a single point, they realized the grooves represented the root system of a very large tree from a time when forests were basically unknown. Using the root impressions, they were able to map out what is now known to be the world's oldest forest, tree by tree. This forest is known to be 2 ma older than the famous Gilboa fossil forest that was discovered a century ago just up the road from Cairo. While the Gilboa site was designated the "world's oldest forest" in the 1920s, the Cairo site is slightly older at 387 ma. Both sites preserve the root systems of individual trees within Middle Devonian paleosols, giving scientists a glimpse into

Root system of a fossil *Archaeopteris* forest site discovered in a quarry near Cairo, NY.

forest ecology. The Cairo site has since been studied by researchers from around the world and the root systems have been identified as those of *Archaeopteris*, a conifer-like tree with fern-like leaves. The site is now shielded from view, to protect it from fossil hunters and potential damage, by specialized fencing and concrete barriers. It is possible that an education center and research lab will eventually be built on the site to serve researchers and students as well as the public. Such preserved *in-situ* forest floors are very rare, so its preservation is imperative for the study of the evolution of early trees, forest ecosystems, past climates and landscapes, and even early land animals. In July 2022, the Gilboa Historical Society released a book co-written by two of the forest's discoverers called *The Catskill Fossil Forest*. The book explains the forest's scientific significance and what it might have looked like, and includes illustrations and photos of the Cairo, Gilboa, and somewhat younger Conesville localities. The three sites record different aspects of what is basically the same forest lasting several million years, potentially recording the best evidence of forests worldwide during the Devonian.

https://www.binghamton.edu/news/story/3780/the-first-trees-preserving-the-worlds-oldest-forest-in-upstate-new-york

And speaking of fossil trees and forests, Pleistocene trees that approached the heights of today's tallest redwoods have been found buried in sediments in the Ban Tak District, Tak Province, northern Thailand. The longest petrified log measured 237 feet, suggesting a reconstructed tree would stand more than 330 feet tall. As tall as that may seem (taller than most redwood trees), they are not closely related to Australia's *Eucalyptus* or California's *Sequoia*, both of which can reach about 425 feet. The Pleistocene trees from Thailand, which seem to be closely related to an extant tree called tualang in Malaysia, grew in a wet tropical forest about 800 ka ago. There are no trees living today in Thailand that approach the size of the ancients. Extant Thai trees can grow to about 200 feet, the highest yet recorded being a krabak tree (a kind of tropical oak) measured at 190 feet tall. The sediments the fossil trees were found in suggest that they lived in a wet forest at the edge of a lowland plain. They were found at an elevation of 550 feet above sea level where the climate is monsoonal, flipping between wet and dry

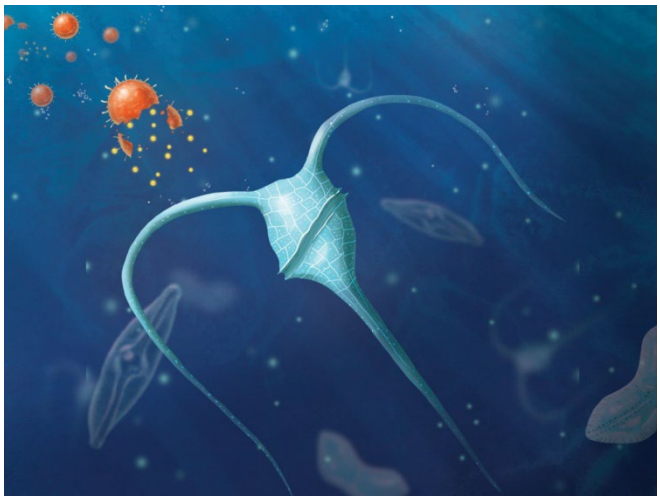


Left: Photo of what is purported to be the largest unbroken petrified tree trunk in the world, found recently in Thailand. Right: Diagram of the reconstructed tree, with an adult giraffe for scale.

seasons. It is possible some uplift of the region has occurred since the trees fell. The buried trees were discovered in 2003 when a villager found a small section of a large petrified log in the Ban Tak reserve forest and reported it to officials of the National Park, Wildlife and Plant Conservation Department. When 70 feet of the log had been excavated without reaching the end, ground penetrating radar was brought in and found that 100 feet remained unexposed. The whole trunk was excavated two years later. Nine logs have since been excavated, most in 2005. This included what is considered the world's longest piece of petrified wood at 236.9 feet. As a result, the park was renamed the Petrified Forest Park in 2006. Why were there big trees in the past that are unrelated to today's giant trees? This seems to be just another case of convergent evolution where similar environmental factors lead to similar characteristics in unrelated species. This is similar to large flightless birds – ostriches in Africa, rheas in South America, and emus in Australia. Although they all appear to be closely related, they evolved on different continents. What drives trees to grow taller? Probably dense forest and a competition for sunlight is at least a part of the answer. Over the hundreds of millions of years that land plants have existed on Earth, there have been many very tall species of tree, from many families of plant. It's just that an entire or nearly entire petrified trunk is a very rare thing to find to confirm it.

https://www.thearchaeologist.org/blog/ancient-giant-trees-found-petrified-in-thailand

The question of how to remove excess CO_2 from Earth's atmosphere has been troubling mankind for several decades. We know it is necessary, but how to achieve it quickly and efficiently is a big question. Although new technologies are emerging all the time, until now, none of them seemed to be the solution that we needed. Now? Now, an international research team led by the Department of Energy's Pacific Northwest National Laboratory is looking at some of the tiniest of Earth's inhabitants, the ocean's plankton, to help solve this long-standing problem. The team has been evaluating the possibility of using ocean plankton to store CO_2 at the bottom of our oceans. This would be achieved by feeding phytoplankton to encourage growth and CO_2 uptake. The concept is to augment existing processes. We humans have been fertilizing the land to grow crops for centuries, so why not learn how to fertilize the oceans responsibly as well. As it currently stands, rivers and wind carry nutrients derived from the land to the oceans that fertilize plankton. This spurred the research team to come up with the brilliant idea of taking that process one step further and help to remove excess CO_2 through the ocean. The team found that by adding specific combinations of carefully engineered materials, we could effectively fertilize the oceans and encourage phytoplankton to suck up carbon in large quantities, thereby acting as a carbon sink. And as they died, they would sink deep into the ocean and take the excess carbon with them. The team suggest that this proposed fertilization would simply increase the speed of a natural process, effectively sequestering carbon in a form that would be removed from the atmosphere for thousands of years. Engineered nanoparticles offer several advantages – they could be designed specifically for different types of marine environments to meet the needs of those environments, and they and their manufacture could be tightly controlled. For example, some regions might profit most from silicon-based particles, whereas other regions might find iron-based particles more beneficial. And best of all, the materials would be non-toxic. The team found several non-toxic metal-oxygen materials that could be used to enhance plankton growth in a safe manner, and the researchers plan to use them in their continuing studies. The materials are abundant, easy to create, and stable, making them practicable choices as plankton fertilizers. The cost issue is the only drawback at this point. Creating and distributing different particles can be quite expensive. But the team argues that the results of these experiments would be effective enough to warrant the price.



Fertilizing marine phytoplankton could help sequester CO_2 in the oceans.

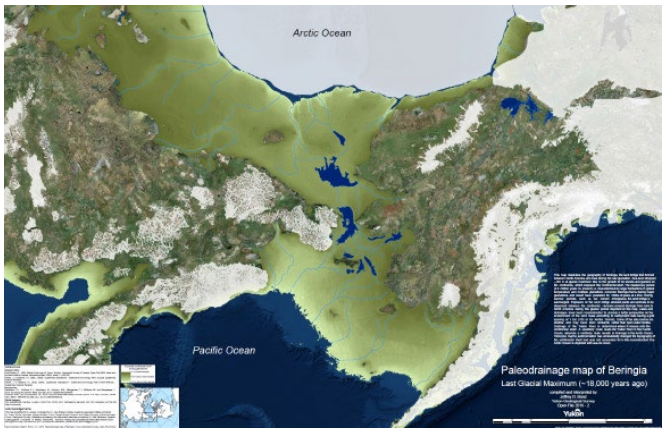
https://interestingengineering.com/science/ridding-earth-of-carbon-dioxide

Scientists have discovered that more liquid magma occurs beneath the Yellowstone supervolcano than thought. Fortunately, as much as there is, researchers say it is nowhere near enough to signify an eruption any time soon. This is based on some new seismic imaging that provides the sharpest images yet of the subsurface beneath Yellowstone National Park. Geologists at the USGS's Yellowstone Volcano Observatory in Vancouver, WA, weren't worried before the new imaging, and they are even less worried about an eruption now. The Yellowstone supervolcano has generated a lot of interest and worry because it has had some of the most dramatically explosive eruptions found in the geologic record during the past 2.1 ma alone, three cataclysmic eruptions that generated continent-wide ashfalls and disrupted global climate. The most recent eruption occurred about 631 ka ago and formed a crater about 43.5 miles in diameter. The magma chambers contain mostly hardened crystals mixed with some molten material. This is important to know because how much magma occurs relative to crystals can be used to determine how ready a volcano is to erupt. The "critical melt fraction," which occurs when the volcano could be ready to erupt, typically is around 35% to 50%. In previous studies, researchers estimated Yellowstone's melt fraction as between 5% and 15%, whereas the new research found the

Recent seismic analyses of the magma chamber beneath Yellowstone's supervolcano give a better picture of what's down there. This is a generated image of the area around Grand Prismatic Hot Spring showing that the chamber is "simmering."

average amount of liquid magma at between 16% and 20%. The new estimates don't represent an actual change, however. They are based on reanalysis of existing seismic data using full waveform tomography that required the kind of supercomputer that didn't exist when the original estimates were presented. The team recorded S waves as slow as about 1.3 miles per second occurring between 1.9 and 4.9 miles down, near the center of Yellowstone's caldera. The researchers aren't certain how the melted part of the magma is distributed, but most likely most of the liquid is tiny, isolated amounts of melt located within the spaces between hardened crystals. The team also admits that it can't rule out the possibility of larger pockets of molten magma scattered throughout the caldera. An implication of their research is that Yellowstone might be spending large parts of its life cycle with higher melt fractions than thought, rather than the classical scenario of the magma chamber being filled with cooled crystals interspersed with rapid magma injections prior to an eruption. This new interpretation suggests that Yellowstone may simply be in a long-standing simmering state. Simmering is not the same as boiling, so the prospect of an imminent eruption is unlikely. The new findings help confirm that this system is mostly solid, which is probably why it hasn't erupted even small amounts of magma in nearly 70 ka. But Yellowstone is still a hot, active volcanic system with potential hazards. Deadly steam explosions and landslide-triggering earthquakes have occurred in recent decades, for example. They don't get as much attention as the fear of a catastrophic eruption that could cover North America with vocanic ash, the kind of cataclysmic tragedy that makes for fear mongering, as well as exciting movies. Yellowstone is an interesting place to visit, and has so much to offer to earth scientists and laymen alike, but unfortunately too many people are too focused on something that is highly unlikely to happen in our lifetimes.

https://www.sciencenews.org/article/yellowstone-volcano-erupt-more-magma-found



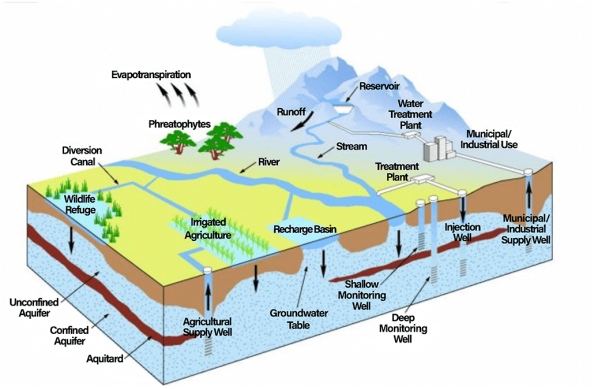
Map showing the geography of Beringia. Lakes and streams provide perspective on the environment of the land mass. Some of the lake basins may actually have been wetlands rather than lakes.

A team of U.S. researchers have reconstructed the history of sea level at the Bering Strait, which separates Asia and North America. Their research has shown that the growth of Pleistocene ice sheets, and the drop in sea level related to them, occurred unexpectedly faster and later in the glacial cycle than what had been suggested by previous research. We know that global sea levels drop during ice ages, but figuring out when and how long these processes occur has been difficult. We also know that, during the Last Glacial Maximum (about 26.5 to 19 ka), massive ice sheets covered large areas of North America, and the dramatic lowering of sea level that accompanied them exposed a large area of sea floor called Beringia. This area of land bridge extended from Siberia to Alaska and supported herds of horses, wooly mammoths, and other Ice Age fauna, including humans. As the Pleistocene came to an end and the ice sheets melted around 13 to 11 ka, the Bering Strait flooded and covered Beringia with sea water. This indicates that >50% of the global ice volume at the Last Glacial Maximum grew after 46 ka. What this implies is that there was a significant delay in the

development of ice sheets after global temperatures decreased. This new research is especially interesting in relation to human migration – there was a shortened time span between the opening of the land bridge and the arrival of humans in the Americas. Although the timing of human migration into North America is not yet certain, some studies suggest people might have started crossing the land bridge as soon as it formed, and some might have lived in Beringia throughout the height of the Last Glacial Maximum. In order to determine when the Bering Strait was flooded during the past 46 ka, the researchers measured nitrogen isotope ratios in the fossils of marine plankton collected in cores from the seafloor at three locations in the western Arctic Ocean. There are differences in the nitrogen composition of Pacific and Arctic waters, so they were able to identify an isotope signature indicating when Pacific water flowed into the Arctic. By comparing those results with sea level models that were based on different scenarios for the growth of the ice sheets, the research provided a completely independent constraint on global sea level during that time period. Some proposed histories of the ice sheet differ by quite a lot, and the team was able to compare the predicted sea level at the Bering Strait to see which were consistent with their nitrogen data. They concluded that their results support recent studies that indicate global sea levels were much higher prior to the Last Glacial Maximum than previous estimates had suggested.

https://www.sci.news/othersciences/geoscience/bering-land-bridge-11516.html

Much of the world's supply of liquid freshwater occurs as groundwater, underground water stored in soils and bedrock aquifers. These aquifers feed streams, sustain agricultural lands, and provide drinking water to large portions of the world's population. Thus, groundwater is a vital resource for both human societies and ecosystems, so researchers want to understand how quickly surface water replenishes groundwater aquifers. Measuring such a large and fluid underground resource is easier said than done, however. The rate at which precipitation replenishes groundwater aquifers is important to understand because it determines the upper limit of sustainable groundwater use. A team of researchers from Europe and the U.S. recently found that recharge rates might actually double previous estimates.



Groundwater makes up most of the world's liquid fresh water and might play a bigger role in sustaining streams and plant life than previously thought.

They produced an updated model of groundwater recharge using a recent global synthesis of regional groundwater measurements and found that a single factor, climate aridity, accurately predicted how much precipitation seeped into groundwater aquifers globally (arid locations had lower recharge rates than humid ones). The model results based on aridity closely reflected field measurements and indicated that previous models had been vastly underestimating recharge rates. As a result, more groundwater recharge must return to Earth's surface via stream flow or water use of vegetation. This finding has implications for the water cycle. For example, groundwater probably contributes more to stream flow and plant water use than previous models predicted. It's possible that it could scale up to affect the entire ecosystem. Despite the supposition that groundwater might recharge more quickly than expected, it should be acknowledged that groundwater remains overused in many places, particularly in arid regions. Groundwater depletion threatens water security in such areas, while the impacts of climate change remain unknown.

https://eos.org/research-spotlights/groundwater-replenishes-much-faster-than-scientists-previously-thought

And speaking of water, a joint mission of NASA and the French space agency Centre National d'Études Spatiales recently launched the first mission to survey nearly all of the water on Earth's surface. The two agencies have collaborated for decades to monitor Earth's oceans. Now, the international Surface Water and Ocean Topography mission (SWOT), launched in December 2022, will survey water on more than 90% of the world's surface and

measure the height of water in freshwater bodies as well as the oceans. SWOT's measurements will allow researchers to determine how oceans influence climate change, as well as how global warming impacts lakes, rivers, and reservoirs. The data will also help communities better prepare for floods and other water-related disasters that are increasing due to climate change. Water is obviously critical for the survival of life on Earth, but it also influences Earth's weather and climate as it stores and moves carbon and heat trapped in the atmosphere. SWOT will help scientists better understand the global water budget by assessing main sources, as well as how they are changing and the impacts that will have on different environments. Scientists want to know more about the heat exchange between Earth's atmosphere and global ocean and how it might accelerate global warming. SWOT will enable them to track the movement of water around the globe between ocean and land, and to really understand where water is at any given time. This is critical because we know that the water cycle is accelerating – some locations have too much water whereas others don't have enough. SWOT's Ka-band Radar Interferometer (KaRIn) will be able to detect features that are up to 10 times smaller than those picked up by sea-level satellites, which only gathers data on a few thousand of the world's largest lakes. SWOT will increase that number to over 1 million lakes. KaRIn can collect measurements through cloud cover and at night. The spacecraft will view almost all rivers wider than 330 feet and capture them in 3D, as well as

Artist's depiction of the Surface Water and Ocean Topography (SWOT) satellite orbiting Earth with its solar arrays fully deployed. SWOT will become an essential tool for surveying water data on Earth.

measure ocean features less than 60 miles across. The satellite will allow scientists to understand how water volume changes in rivers and lakes around the world, and help researchers fill knowledge gaps in understanding the ripple effects of climate change. It will help them understand how sea level is shifting in areas prone to flooding, thereby allowing them to better predict rising water levels. The satellite's instruments can monitor extreme weather patterns, including droughts and downpours, and provide essential information for disaster preparedness and water management agencies. SWOT is going to be transformative in researchers' ability to provide information that will ultimately improve the daily lives and livelihoods of almost everyone on Earth.

https://www.cnn.com/2022/12/16/world/nasa-swot-launch-scn/index.html

WEBSITE OF THE MONTH

https://www.scottishgeology.com/

Fun Fact Having Nothing to Do with Geology

Three presidents, John Adams, Thomas Jefferson, and James Monroe, all died on Independence Day, July 4. Adams and Jefferson also died the same day – July 4, 1826.

STUDENTS: GET YOUR DUCKS IN A ROW FOR PGS STUDENT NIGHT

- Come to February's PGS meeting to get a printed copy of the guidelines **https://pittsburghgeologicalsociety.org/student-night1.html**
- Student night abstract submission form **https://pittsburghgeologicalsociety.org/uploads/3/4/1/4/34142091/pgs_student_night_abstract_submission_form_2023_final.pdf**
- Student night abstract deadline = **5 pm Wednesday March 1, 2023**

CALL FOR NOMINEES

The Society is calling on the membership for interested candidates for next year's Officer and Director-at-Large positions. There are three Director-at-Large positions that need to be filled. These positions are for a term of 2 years and require regular attendance at the Board meetings held one hour prior to the Social hour of each monthly meeting. The position requires that you become involved at some level in the monthly operations of the Society by aiding the Officers and Committees in various ongoing projects.
If you are an active professional member of the Society and have an interest in being a candidate, or know of a member that you think would be a good candidate, please contact **Ray Follador**, Nominations and Elections Committee Chair, ASAP at **geodawg@comcast.net** or **(724) 744-0399**. An initial list of all candidates will be announced at the April meeting with the election to be held at the May meeting.

YOU CAN STILL ORDER YOUR OWN PGS SWAG!

Show off your PGS Membership by purchasing a hoodie, t-shirt, or bumper sticker at the new PGS merchandise store. All proceeds support geology student participation in PGS society meetings!

https://apparelnow.com/pittsburgh-geological-society-apparel

PITTSBURGH RED BED AMBER LAGER

- If you missed the release party at #mindfullbrewing you can still pick up 4 packs and drafts at the brewery!
- A portion of the proceeds from the "Pittsburgh Red Bed" release supports the Galey Fund of PGS - dedicated to supporting scholarships and professional development initiatives for our student members.

https://www.mindfulbrewing.com/

PGS 2022-2023 Officers and Board of Directors

President	Vice President	Treasurer	Secretary
Dan Harris	Peter J. Hutchinson	Kyle Fredrick	Diane Miller

Directors-at-Large (2nd year)
Albert Kollar
Wendy Noe
Nancy Slater

Directors-at-Large (1st year)
Brian Dunst
Ray Follador
Erica Love

Counselors
John Harper
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Robin Anthony

Continuing Education
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Dan Billman / Ray Follador

Webmaster
Dan Harris

Archivist
Mary Ann Gross

Student Representative
Jasmine Davis, PennWestCalU

Officer Contacts: If you wish to contact a PGS Officer, you can email Dan Harris, President at harris_d@pennwest.edu; Pete Hutchinson, Vice-President at pjh@thggeophysics.com; Kyle Fredrick, Treasurer, at fredrick@pennwest.edu; or Diane Miller, Secretary, at dianemiller123@msn.com.

Memberships: If you have not yet renewed your membership, be aware that PGS is making the entire process digital. You will no longer be receiving a membership form as in the past. Now you will only need to go to the PGS website's Membership page at https://pittsburghgeologicalsociety.org/existing-member-renewal-instructions.html and fill in the boxes with a red asterisk (*). And, as usual, you can pay your dues through the website www.pittsburghgeologicalsociety.org

If you know of anyone who is not a member who would like to become one, let them know that they just need to go to https://pittsburghgeologicalsociety.org/new-membership-instructions.html and fill in the boxes marked with that ubiquitous red asterisk. And again, they can pay through the website.

If you have any issues with the forms, you should contact Webmaster Dan Harris, at harris_d@pennwest.edu. If you have any questions about PGS membership, contact Membership Chair John Harper at jharper.pgs@gmail.com.

For more info on **PGS**, please visit our website: www.pittsburghgeologicalsociety.org.

Programs: If you would like to make a presentation at a PGS meeting or have a suggestion for a future speaker, contact Pete Hutchinson, Program Chair at pjh@thggeophysics.com.

Newsletter: To contact the Newsletter Editor, Robin Anthony, with questions or suggestions for articles, job postings or geological events, please email robanthony@pa.gov

Facebook: Follow the PGS at https://www.facebook.com/PittsburghGeologicalSociety

Twitter: PGS can be followed on Twitter by searching out the username @PghGeoSociety

LinkedIn: To join the PGS Group, click https://www.linkedin.com/groups/12018505

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www.THGGeophysics.com

Star indicates 2023-2024 Corporate Renewal