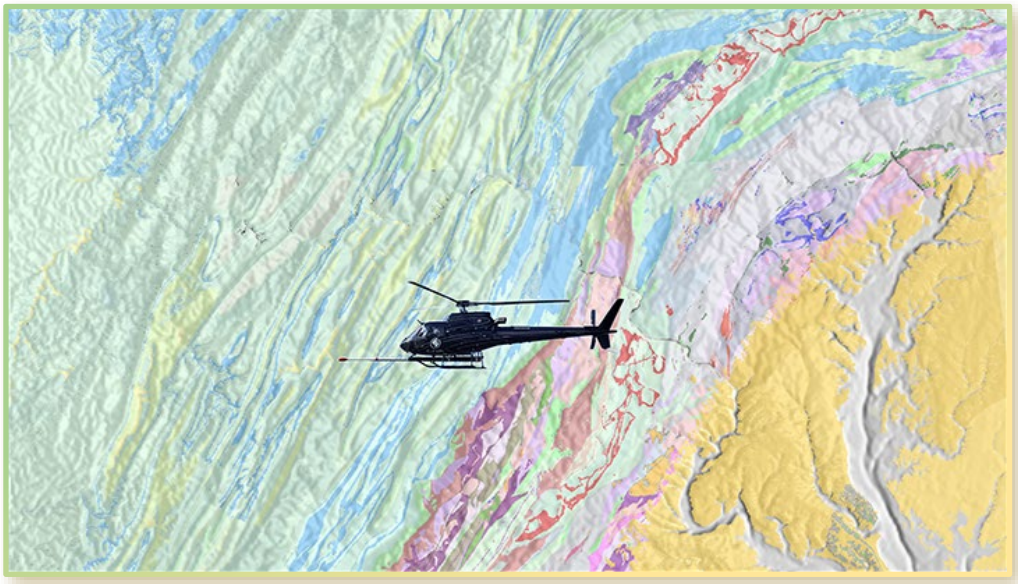
PITTSBURGH GEOLOGICAL SOCIETY



September 20, 2023

MEETING TIMES

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

DINNER COSTS

$40.00 regular member
$20.00 student member
$50.00 non-member

RESERVATIONS

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

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

THIS MONTH'S MEETING LOCATION

River's Club, 301 Grant St. Suite 411, Pittsburgh PA 15212
Parking below restaurant $7
See map on page 13

COVID19 POLICY

See page 3 for current guidance.

PIEDMONT TO PLATEAU:

An Appalachian Transect with High-Resolution Airborne Geophysics

over parts of Pennsylvania, Maryland, and West Virginia

Anjana K. Shah, Ph.D.
Research Geophysicist
U.S. Geological Survey

Please RSVP by Wednesday, September 13
NOTE NEW DINNER COSTS

NEW

Speaker Abstract

A new airborne magnetic and radiometric survey covering a ~48,000 km^2 area of Pennsylvania, Maryland, and West Virginia was flown in 2022-2023. This data collection was conducted as part of the USGS Earth Mapping Resources Initiative in collaboration with the Maryland Geological Survey, the Pennsylvania Geological Survey, and the West Virginia Geological and Economic Survey, with goals of better understanding the geologic frameworks of critical mineral resources. The survey covered all five of the major Eastern U.S. geological provinces. Prospective areas of interest include volcanogenic and mafic magmatic mineralizing systems of the Piedmont and Blue Ridge, cobalt and platinum group elements of the Gettysburg rift basin, metalliferous shales and phosphates of the Valley and Ridge, and high-aluminum underclays in the Appalachian Plateau (with potential for rare earth elements); only a small part of the Atlantic Coastal Plain was covered, but some parts of this province host heavy mineral sands. The Gettysburg basin and surrounds are also of interest because of intermittent intraplate seismicity.

Both the aeromagnetic and radiometric data highlight lithologic variations in Paleozoic crystalline rocks of the Piedmont and Blue Ridge Provinces; the magnetic data show their continuation beneath Atlantic Coastal Plain sediments. The aeromagnetic data also reveal key structural trends, including complex lineaments in the vicinity of a hypothesized Paleozoic suture zone. Thin, narrow anomalies that both cut across and are aligned with Paleozoic fabric delineate Jurassic dikes; some of these appear to connect the Gettysburg and Culpeper rift basins. Within the Gettysburg rift basin, magnetic anomalies are generally subdued, representing a deepened basin floor, except in the presence of diabase dikes and sills, which are marked by prominent highs. The new data suggest that shallow and deeper sills are more extensive than previously mapped. Localized, rounded magnetic highs are observed at some cobalt deposits near the edge of the Gettysburg basin. About 50 km south of the basin, within accreted terranes, a series of bulbous magnetic highs aligned with Paleozoic fabric represents ultramafic rocks that host known chromium deposits. West into the Appalachian Basin, magnetic anomalies become broader and more subdued, reflecting the deeper magnetic basement, but the radiometric data show dramatic variations that are well-correlated with the surficial lithology of the Valley and Ridge Province. For example, limestone generally shows elevated K, certain shales show elevated Th, and sandstone ridges are low in both. Over the Appalachian Plateau, the radiometric data are more subdued but show relations to lithology, unit age, and stream drainage patterns. Data analyses are ongoing for all parts of the survey; new insights regarding the geologic and structural history of these provinces are highly anticipated.

Speaker Biography

Anjana (Anji) Shah is a Research Geophysicist with the U.S. Geological Survey in Denver, Colorado. She specializes in using magnetic, radiometric, and gravity methods to image and better understand geology beneath vegetation and Earth's surface. She applies those results to questions regarding critical mineral resources and intraplate earthquake hazards. She is very interested in deciphering links between airborne radiometric data and rare earth element deposits, especially within heavy mineral sands. She also uses aeromagnetic and gravity data to better understand the role that deeper structural and lithologic variations play in intraplate seismicity. Dr. Shah currently leads the eastern U.S. geophysics component of the USGS Earth Mapping Resources Initiative (Earth MRI), overseeing airborne magnetic and radiometric data collection across the Appalachian terranes and Atlantic Coastal Plain. She joined the USGS in 2007; prior to that she earned a Ph.D. in Earth and Environmental Sciences from the Lamont-Doherty Earth Observatory at Columbia University and was an NRC Postdoctoral Research Associate at the Naval Research Laboratory in Washington, D.C.

UPCOMING PGS 2023-24 MONTHLY MEETINGS

Meeting Date & Venue	Scheduled Speaker	Presentation Topic
September 20, 2023 River's Club	Dr. Anjana Shah, U.S. Geological Survey	Piedmont to Plateau – Geophysical Flyover (PA, MD, WV)
October 18, 2023 Cephalo's	Dr. Jeremiah Bernau, Utah Geological Survey	Geology of the Bonneville Flats
November 15, 2023 Allegheny Observatory	Dr. Rosaly Lopes, NASA	Mega-volcanoes on Earth and Other Planets
December 13, 2023 LeMont	Priysham Nundah Global Contour	Lake Kivu Gases as Source of Energy
January 17, 2024 Energy Innovation Ctr	Dr. Andre Boehman University of Michigan	Methods of Carbon Based Fuel Conversion
February 21, 2024 Cephalo's	Dr. Drew Coleman University of North Carolina	East Coast Plutons
March 20, 2024 Cephalo's	Dr. John Kessler University of Rochester	Exotic Gas Sources, Gas Clathrates
April 17, 2024 Cephalo's/TBD	Annual Student Research Showcase	
May 8, 2024 Cephalo's/TBD	Dr. Matthew Becker Darcy 2024 Lecturer	Groundwater Impacts in South Pacific Islands

The Pittsburgh Geological Society welcomes our new members:

New Regular Members:

Lawrence P. Welsh, Division Manager
United States Steel Corporation

Linda R. Sternbach, Vice President
Starcreek Energy

Robert J. Bodnar,
University Distinguished Professor
Department of Geosciences, Virginia Tech

Chelsea A. Lyle, PG, Senior Project Geologist
GAI Consultants, Inc.

New Recent Graduate Member:

Luke J. Chileski,
Allegheny College

New Student Members:

Jonas A. Shaneman,
PennWest California

Olivia J. Zanotti,
PennWest California

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

PRESIDENT'S STATEMENT

Hello everyone and welcome to the 2023-2024 PGS program year! ***Please note that we have marginally higher dinner costs for our monthly meetings this year.*** I hope you all had a relaxing summer and are looking forward to cooler temperatures this fall. We had a great 2022-2023 program year with some exciting new meeting locations and events and I'm excited to say we have more fun surprises in store for this year. Here's a quick summary of our last program year:

Last year featured eight speakers organized by the Program Coordinator, Pete Hutchinson, with meeting locations that were more diverse, meeting a goal of providing alternate venue options to encourage broad participation of PGS membership. The venues were creative and tailored to speaker topics, including a ***Terroir*** talk at Narcissi Winery, an informal talk by PGS member Craig Eckert as a holiday gathering at LeMont Restaurant, a vertebrate paleontology talk at the Carnegie Museum of Natural History, and an end-year talk at Penn Brewery.

PGS was also able to offer a field trip in June, a collaboration with Mindful Brewing and launch party, the two-day professional development and environmental drilling workshop, and the April student research meeting, along with advertisement of the society and the student research meeting at a reserved booth during the Reston joint sectional meeting of the GSA.

The student research meeting was a huge success with more submitted abstracts than the previous year and improvements through increased advertisement strategies and reservation of posterboards for the meeting. PGS awarded the Frank Benacquista scholarship to one student and decided to increase the amount for the 2023-2024 program year.

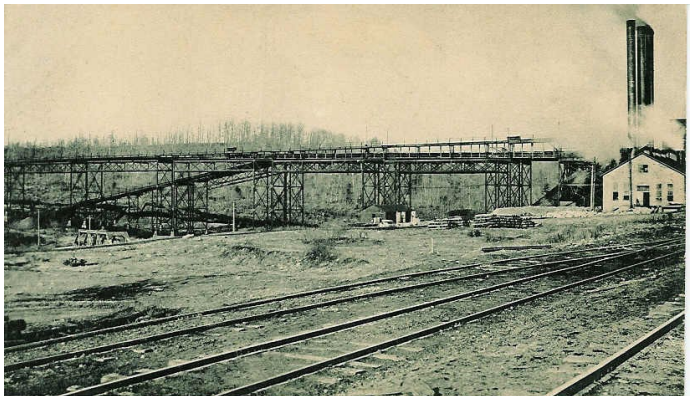
Here are some goals for the 2023-2024 program year:

- Continue to explore diverse venue options to attract membership and better advertise meeting locations and events
- Demonstrate value to membership and sponsors through social events, merchandise sales, and advertising opportunities
- Increase early-career membership participation in meeting attendance and board nominations
- Participate in the 2023 national meeting of the Geological Society of America in Pittsburgh through booth organization and development of a Pittsburgh and Appalachian region session

Don't forget to renew your membership and I look forward to seeing you all again soon!

Dan

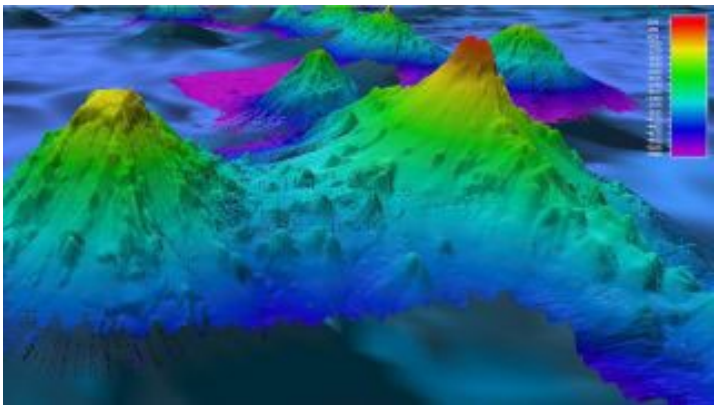
THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES



Historic photo of the Merchants Coal Co. tipple in Boswell, Somerset Co., PA.

The village of Boswell, in Somerset County, was named for Thomas Taylor Boswell who arrived from Baltimore, MD, in 1900. Boswell bought several farms in the area and formed the Merchants Coal Company of Baltimore. A small mining town sprang up that was incorporated early in 1904. At its peak, more than 900 miners worked at the Orenda Mine #1, as it was known, and produced over 3,000 tons of coal per day. The company eventually became the United Coal Company, and later the Davis Coal Company, which closed in March 1939. Two major highways pass through the town: US Route 30 (the Lincoln Highway) runs east-west and US Route 219 runs north-south. Boswell was designated as a National Historic District in 1994. Many of the original brick homes are still standing intact, and many of them have corner entrances. Boswell lends its name to a geological structure, the Boswell Dome, which was the target of drilling for Oriskany natural gas in the 1960s through the 1980s.

DID YOU KNOW . . . ?



High-resolution satellite radar image of Pao Pao Seamount in the South Pacific. Thousands of other seamounts are only now being discovered using this radar technology.

Scientists have used high-resolution radar satellites to discover an enormous number of undersea volcanoes in Earth's oceans. The satellites revealed that there are more than 19,000 such volcanoes around the planet, which has provided researchers with the most thorough catalog of seamounts ever created. The new compendium might provide us with a much better understanding of ocean currents, plate tectonics, and climate change. Before this study, only ¼ of Earth's seafloor had been mapped using sonar. A sonar census taken in 2011 found more than 24,000 seamounts, but more than 27,000 seamounts remain uncharted by sonar. The new study showed that scientists don't have to rely on sonar to survey what's happening under the ocean, however. Radar satellites are not only capable of measuring an ocean's height; they can also see what's sitting at depth in the water, offering a better representation of the seafloor topography. When the research scientists extracted data from several satellites, such as the European Space Agency's CryoSat-2, they discovered that they could detect underwater mounds as small as 3,609 feet tall. That's the lower limit of what constitutes a seamount. Scientists using this technology expect that they can now estimate the heights of small undersea volcanoes to an accuracy of approximately 1,214 feet high. So far, researchers have mapped an assembly of seamounts in the northeast Atlantic Ocean that might help explain the evolution of the mantle plume that feeds more than 100 Icelandic volcanoes. The updated maps will also offer a better understanding of ocean currents and upwellings that occur when water from the ocean bottom roils up to the surface. Scientist think this phenomenon could be concentrated at seamounts and ridges because many interesting things can happen when topography is involved.

https://www.livescience.com/planet-earth/rivers-oceans/mind-boggling-array-of-19000-undersea-volcanoes-discovered-with-high-resolution-radar-satellites

Nilpena Ediacara National Park, located in South Australia, opened to the public in late April 2023. The 148,000-acre park is located approximately 300 miles north of Adelaide among the mountainous Flinders Ranges. Although Australia is considered to be the driest inhabited continent in the world today, at one time it was covered by a shallow sea that provided a habitat for the strange soft-bodied creatures that we know today as the Ediacaran biota. The fossilized remains of these strange life-forms are plentiful within the national park, and paleontologists are working hard to carefully unearth and examine them. Ediacaran fossils have been found so far on five continents. They represent a very important advance in the evolution of life on Earth because their existence immediately predated the eruption of life forms at the beginning of the Cambrian Period 541 Ma ago. The South Australia fossils have been studied for more than 30 years, but they've been known about for a long time. The native Adnyamathanha People talked about them in their oral traditions for a very long time, but they weren't "discovered" by non-native Australians until 1946. In the 1980s, some ranchers found additional fossils and spent more than 30 years protecting them, leading tours, and enabling research missions. In 1919, the ranchers sold a lot of their property to the Australian government to make possible long-term protection and preservation. Opening the park has allowed paleontologists to gather valuable insights into how the Ediacaran organisms moved, grew, and reproduced, and what their population structure looked like. These studies, in turn, have helped support our knowledge of animal evolution. The conditions at Nilpena have allowed paleontologists to establish and improve on a new method for analyzing fossils. Rather than removing sections of rock and taking them back to a lab for study, researchers in South Australia take sections of the fossil beds, piece them together, and study them in the field, allowing the researchers to study whole communities as well as individual organisms. South Australia is striving for a UNESCO World Heritage site designation for the Flinders Ranges area; the addition of Nilpena Ediacara National Park strengthens their bid. In addition to its amazing fossils, the park hosts traditional ceremonial grounds culturally significant to the Adnyamathanha People, an important piece of South Australia's pastoral history. In addition, the region is the only place on Earth where scientists can study a nearly continuous geological record spanning 350 Ma. Travelers wishing to visit the park need to book a guided tour, allowing them to stop at a new

Photos of paleontologists (top) studying a bed of Ediacaran fossils (bottom) in part of the Flinders Ranges of Southern Australia. This area is home to some of the oldest animal fossils on Earth, just one of the Ediacaran sites that have been found on five continents.

immersive, audio-visual exhibition about the fossils, located inside a former blacksmith shop. The tour includes the Alice's Restaurant Bed, currently considered to be the most significant fossil bed in the park. Discovered in 2016, this bed, just one of 40 or so that paleontologist have discovered at the site, contains many rare species and evidence that the seafloor was once a complex habitat showing evidence of mobility, feeding, and reproduction by the Ediacaran organisms. The Alice's Restaurant Bed has been relocated to the blacksmith shop's exhibition space so that travelers can get an up-close-and-personal view of the fossils. The numerous beds at the site illustrate a chronological timeline of the dawn of animal life.

https://www.smithsonianmag.com/smart-news/the-worlds-newest-national-park-protects-550-million-year-old-fossils-180982077/

And speaking of Australia, scientists recently discovered organic compounds in Australia's Proterozoic rocks about 1.6 Ga old that are helping them shed light on the early history of eukaryotes, the diverse group of organisms whose cells have nuclei. The earliest eukaryotes are thought to date back to the middle Paleoproterozoic, about 2 Ga

Photo of Proterozoic rocks from the Barney Creek Formation in Australia. Samples of the rocks analyzed by geochemical methods have found evidence of organic compounds possibly synthesized by early eukaryotes.

ago. Although scientists consider eukaryotes became widespread only about 800 Ma ago (early Neoproterozoic), the new find suggests they were already abundant more than a billion years ago. The evidence is biogeochemical in nature, newfound traces of molecules that *possibly* were produced by eukaryotes. If so, they indicate that early eukaryotes had already been ecologically important during all that time but had been hiding in plain sight until now. The biological molecules the researchers found is a compound related to cholesterol. Modern eukaryotes produce cholesterols, naturally occurring steroids that are important components of cell membranes. They are important for many physiological functions, and since they are part of the cell membrane organisms produce relatively large amounts of them. When modern eukaryotes synthesize cholesterol, some intermediate organic compounds form. In ancient forms, these intermediate compounds probably were functional end-products of the early organisms' biosynthetic processes, but it was thought evidence for them would never be found. Now, recent advances in biochemical analyses are helping scientists identify ancient molecules preserved in the fossil record, especially in rocks that have been relatively undisturbed by geological processes. The researchers performed chemical analyses of rocks from the Barney Creek Formation of Australia, which are more than one billion years old, hoping to identify traces of ancient biomolecules. To their surprise, they found them in startlingly high abundance. In addition, everywhere they identified biomarkers preserved from this time period, they are seeing these molecules. The presence of such proto-steroids indicates that early eukaryotes were tailored to a very different world from modern Earth. The proto-steroid molecules the early eukaryotes produced required less oxygen to produce than cholesterols do. This means that, not just organisms but biosynthetic pathways as well, have been evolving. There are some scientists who remain cautious about accepting that the molecules found in this study have been made by early eukaryotes, suggesting they could have been created by other ancient organisms as well. The researchers suggest that their next step will be further study of the world these ancient life forms inhabited, by directing lasers at thin slices of rock and using the information from their reflections to map the different chemical compounds present. They are hoping that it will help them place further limits on where, when, and under which conditions the early eukaryotes thrived.

https://www.cnn.com/2023/06/12/world/organic-compounds-eukaryotes-ancient-rocks-discovery-scn/index.html

Researchers from the University of Illinois Urbana-Champaign recently published the results of a new study challenging decades-old concepts about cratons. The seeming lack of deformation within cratons since their formation makes them the longest surviving tectonic units on the planet, existing essentially unchanged through the formation and breakup of supercontinents. It has been generally accepted that the cratons are protected by their thick underlying mantle roots (keels), which are considered buoyant, strong, and stable over time. The new study, however, indicated that these seemingly stable regions of the Earth's continental plates have suffered repeated deformation below the crust since their formation. The researchers used existing density data from the lithosphere to investigate the relationship between cratons' surface topographies and the thicknesses of their underlying lithospheric layers. They found that the mantle keels, instead of being buoyant and stable, are actually dense and exposed to substantial modification over time. The team had shown in an earlier report that, whereas the established view of buoyant craton keels suggests that most cratons are situated about 1.9 miles above sea level, their elevations actually are only a few 100 feet, requiring the mantle below the crust to be of high enough density to pull the surface down by about 1.2 miles. The researchers also had used gravity field measurements to determine the density structure of the keels. They found the lower portions of the keels are probably where the high-density material resides, meaning a

depth-increasing density profile occurs beneath the cratons. The new research showed the lower portion of the keel has a high density and tends to peel away, or delaminate, from the lithosphere above it when mantle plumes initiate supercontinent breakup. These delaminated keels could then return to the base of the

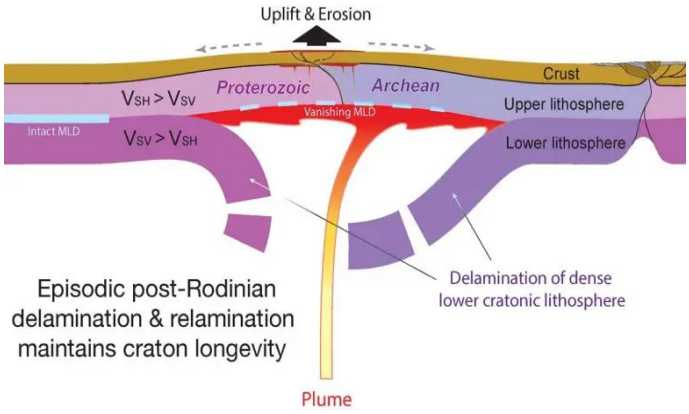


Diagram showing a hypothetical cross-section of the Earth's crust and mantle during the breakup of the supercontinent Rodinia. A mantle plume initiates the delamination of the lower mantle.

lithosphere after they warm up inside the hot mantle – sort of like what happens in a lava lamp where the cool material near the surface sinks and the warm material near the bottom rises. This history of deformation is expressed by some of the more mystifying geophysical properties seen in the lithosphere. The repeated vertical deformation in the lower keel, for example, allows seismic waves vibrating vertically to travel through the rock faster than in the upper keel, which experiences less vertical deformation. Mantle delamination causes the craton surface to rise where it is then subjected to erosion. The new study also found this is reflected in the dependence of crustal thickness on lithospheric thickness. For example, when Rodinia separated, there was a major uplift and erosion event that caused the Great Unconformity. There is no evidence of new deposition when this occurred – only deep craton erosion. Thus, the episodic deformation of the lower keel explains how craton crusts survived through geologic time and allows us to find pieces of ancient lower crust exposed at cratons' surface today.

https://scitechdaily.com/craton-deception-geologists-challenge-conventional-view-of-earths-continental-history-and-stability/

According to a new study, humans pumped enough water out of the ground between 1993 and 2010 to tilt the Earth nearly 31.5 inches east. Scientists had previously estimated that 2,150 gigatons of groundwater had been pumped out of the Earth, a number equivalent to more than 0.24 inches of sea level rise. One way to corroborate that is to use Earth's rotational pole, which moves during polar motion (when the position of the Earth's rotational pole varies relative to the crust). Since the distribution of water on the planet affects how mass is distributed, the Earth spins a little differently as water is moved around. The new study showed that, among climate-related causes, redistribution of groundwater has the largest impact on rotational pole drift. Water's ability to change the Earth's rotation has been known since 2016, but until the new study the specific contribution of groundwater to these rotational changes had been unexplored. The researchers modeled observed changes in the drift of the rotational pole and the movement of water, using only ice sheets and glaciers first. Then they added in different scenarios of groundwater redistribution. Only when they included 2,150 gigatons of groundwater redistribution did their model match the observed polar

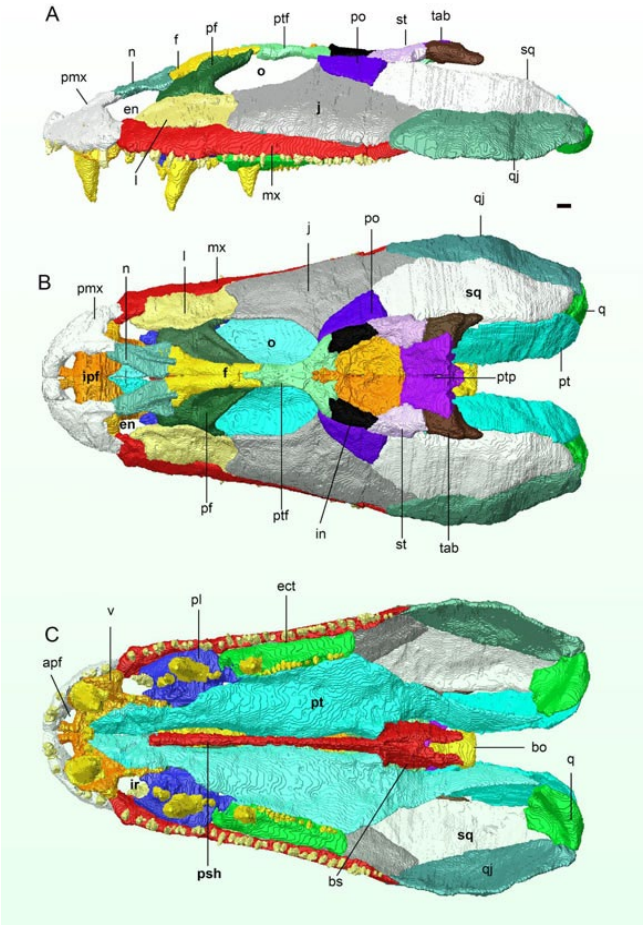
Removing and redistributing groundwater has caused the Earth's rotational pole to shift almost 32 inches between 1993 and 2010, which contributed to an increase in sea level rise.

drift. Without that data, the model was off by 31 inches, which amounts to 1.7 inches of drift per year. The researchers were surprised to see that pumping groundwater is another source of sea-level rise. It also matters where the groundwater is withdrawn because redistributing water from the midlatitudes has a larger impact on the rotational pole. From 1993 to 2010, the largest amount of water was redistributed in western North America and northwestern India; both are located at midlatitudes. Attempts to slow groundwater depletion rates, particularly in such sensitive areas, theoretically could alter the change in drift, but only if those conservation methods are maintained for decades. Inasmuch as the rotational pole changes normally by several feet during a year, changes due to groundwater pumping probably won't shift the seasons.

Polar drift CAN have an impact on climate on the scale of geologic time, however. The researchers realize that observing changes in the rotational pole is useful for understanding continent-scale water storage variations, and since polar motion data are available from as early as the late 1800s they have the potential to use those data to understand continental water storage variations during the last 100+ years. In addition, if there were any hydrological regime changes resulting from the warming climate, continued study of polar motion could help in the determination.

https://scitechdaily.com/earth-tilted-weve-pumped-so-much-groundwater-that-earths-spin-shifted/

Crassigyrinus scoticus, a large, aquatic predator, lived in coal swamps in what are now Scotland and Canada during the Lower and Middle Mississippian, between 350 and 330 million years ago. The animal would have been around 6.5 and 10 feet long, which was quite big for a tetrapod at that time. In behavior, it probably would have been similar to modern crocodiles, lurking below the surface of the water and waiting to bite and grab prey. First described in 1929, *C. scoticus* is one of the more peculiar and perplexing of the early tetrapods. Its morphology was unusual, featuring a mixture of primitive and derived characters, so it was the perfect subject for a new study. Previous reconstructions, which were based on incomplete and deformed specimens, suggested it had a tall skull with a short, broad snout, large eye sockets, external nasal cavities, and an extended postorbital region. In the new study, the researchers used computed tomography (CT) scans and segmented imaging data of four specimens to separate bone from matrix and individual bones from each other. Based on these new data, they provided a revised description of the upper and lower jaws, including morphological and abundant new anatomical information. They were able to create a hypothetical 3D reconstruction of the animal's skull, indicating that it was flatter than in earlier reconstructions, but was still unique morphologically among early tetrapods. The study suggests that *C. scoticus* could have been a powerful aquatic predator capable of hunting and subduing large prey. Older reconstructions, based on the type specimen that had been flattened from side-to-side, indicated the animal had a very tall skull, similar to a Moray eel. When the new team attempted to mimic that shape using the digital surface from their CT scans, it didn't work. They determined that an animal with such a wide palate and narrow skull roof could not have had a head like that. It would have had a skull similar in shape to a modern crocodile instead, with huge teeth and powerful jaws allowing it to eat anything it wanted.



A 3D reconstruction of the skull of *Crassigyrinus scoticus*, a Mississippian aquatic predator from Scotland and Canada. Individual bones are shown in different colors. Scale bars = 1 cm.

https://www.sci.news/paleontology/crassigyrinus-scoticus-skull-11904.html

Scientists recently identified a conspicuous correlation between global seismic activity and changes in the intensity of cosmic radiation measured on Earth's surface, which could theoretically help in earthquake predictions. Human and economic loss due to earthquakes is enormous, and the ability to foresee them could greatly mitigate their aftermaths. In order to substantiate this predictive possibility, the Cosmic Ray Extremely Distributed Observatory (CREDO) project is attempting to find a potential link between cosmic radiation fluctuations and earthquakes. CREDO, a project launched in 2016 by the Institute of Nuclear Physics of the Polish Academy of Sciences (IFJ PAN), is an international, virtual cosmic ray observatory accessible to all. It combines and manages data from many detectors of different sizes, including smartphone

sensors that have been transformed into cosmic ray detectors via a simple app. One of CREDO's essential responsibilities is to track worldwide alterations in the flux of secondary cosmic radiation originating in the stratosphere that reaches Earth's surface. These primary cosmic radiation particles collide with atmospheric gas molecules, creating cascades of secondary particles. The idea that there is a link between earthquakes and cosmic radiation may seem difficult to imagine, but it is physically possible. The Earth's magnetic field, which results from eddies in the liquid core, alters the trajectory of primary cosmic radiation's charged particles. Therefore, any substantial earthquake linked to a disturbance in the Earth's dynamo flows would alter the magnetic field, thus impacting the path of primary cosmic radiation that would show up as changes in the counts of secondary cosmic ray particles recorded by ground-based detectors. In order to test this hypothesis, the CREDO researchers used cosmic ray intensity data from two different stations, the Neutron Monitor Database project (half-century data) and the Pierre Auger Observatory (data since 2005). These two observatories are located on opposite sides of the equator and employ distinct detection techniques, thus offering a balanced representation. The researchers also incorporated data on changes in solar activity from the Solar Influences Data Analysis Centre and seismic activity data from the USGS. Statistical techniques revealed a distinct correlation between changes in the intensity of secondary cosmic radiation and the collective magnitude of all earthquakes of 4 or more on the Richter scale. Of greatest significance is the fact that this correlation became evident only when the cosmic ray data was advanced by 15 days relative to the seismic data, indicating there is potential to predict

Scientists have identified a noticeable correlation between global seismic activity and changes in cosmic radiation intensity that could aid in earthquake prediction.

imminent earthquakes. Unfortunately, the feasibility of predicting specific locations of seismic events is unclear at this time. The cosmic ray/earthquake correlation emerges when global seismic activity is considered, which might imply that cosmic ray intensity changes only expose incidents that affect Earth on a broader scale. The researchers are continuing to investigate. They've found numerous other phenomena in the data that might be explained by solar activity cycles or possibly even dark matter. Regardless, the most important thing at this stage is that the team has demonstrated a link between cosmic radiation and seismic activity. And their observations point to entirely new and exciting research opportunities as well.

https://www.earth.com/news/breakthrough-surges-of-cosmic-radiation-from-space-directly-linked-to-earthquakes/

WEBSITE OF THE MONTH

https://www.space.com/47-mars-the-red-planet-fourth-planet-from-the-sun.html

Fun Fact Having Nothing to Do with Geology

The platypus doesn't have a stomach.

Its esophagus goes straight to its intestines.

GSA Annual Meeting in Pittsburgh

The Geological Society of America (GSA) will be holding their annual meeting at the David L. Lawrence Convention Center in Pittsburgh during October. **GSA Connects** is the premier international geological science meeting, attracting thousands of participants annually. This is the first time GSA's annual meeting will have been held in Pittsburgh since 1959, and it will be a great opportunity to show off our city. Pre-conference events such as field trips and short courses will be held Thursday, October 12 through Saturday, October 14, with technical sessions running from Sunday, October 15 through Wednesday, October 18, and post-conference field trips running from Wednesday, October 18 through Thursday, October 19. Other events include an ice breaker/reception, social gatherings, business meetings, and an exhibits hall where **PGS** will have a booth, and needs volunteers to help staff. Please contact Dan Harris at harris_d@pennwest.edu if interested.

REGISTRATION

Pre-registration will end on September 13. If you are planning on attending you should register now before the price increases.

- **PGS** is a co-sponsor of the meeting and will be co-hosting one of the technical sessions titled ***T55. Geologic History, Resource Development, and Environmental Challenges of the Pittsburgh and Appalachian Regions*** to be held on Monday, October 16 in the afternoon. There will also be a poster session with the same title.

- For more information, see https://community.geosociety.org/gsa2023/home

We hope to see you there!

LOCAL GEOLOGICAL EVENTS

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS (PCPG)

September 12, 2023 **8:00 AM – 5:00 PM**

"Hydrostructural Methods in Bedrock Aquifer Characterization and Remedial Decision Making" (435 mins) by Thomas D. Gillespie, P.G., Senior Professional Geologist, Professor, Gilmore & Associates.

Details and registration: https://pcpg.org/event-5200807

RLA Learning and Conference Center, 850 Cranberry Woods Drive, Cranberry Township, PA

AMERICAN GEOSCIENCES INSTITUTE (AGI)

September 13, 2023 **1:00 PM – 2:00 PM**

AGI & USGS NCGMP's Early Career Professionals in Mapping webinar series, "Mapping Oklahoma: From the Ouachitas to the Wichitas" by Carla Eichler, Field Geologist, Oklahoma Geological Survey

Details and free registration: http://www.americangeosciences.org/webinars/early-career-mapping-sep2023

HARRISBURG AREA GEOLOGICAL SOCIETY (HAGS)

September 14, 2023 **6:30 PM – 7:30 PM**

"Constraining the vertical and lateral components of the southeastern Laurentide Ice Sheet using surface exposure dating" by Aaron M. Barth, Assistant Professor & lead of the Rowan Cosmogenic Nuclide Laboratory *(studying past ice sheets and glaciers)*, Rowan University.

Details and registration: https://bit.ly/HAGS-Sept23

Virtual via Microsoft Teams *or in-person at* 3420 Schoolhouse Rd, Middletown, PA 17057

Optional networking dinner at **Tattered Flag Brewery, 1 S Union St., Middletown** *from* **4:30-6:15 PM**

WOMEN'S ENERGY NETWORK GREATER PITTSBURGH (WEN)

September 15, 2023 **11:00 AM – 1:00 PM**

"Leading Courageously" with Dr. Kathy Wilson Humphrey, President of Carlow University

Details and registration: https://womensenergynetwork.glueup.com/event/greater-pittsburgh-leadership-series-85063/

Fifth Floor of University Commons Building. Carlow University, 3333 Fifth Ave, Pittsburgh, PA 15213

PENN STATE EXTENSION (PSU)

September 20, 2023 **12:00 PM – 1:00 PM**

"Potential Lithium Resources in Produced Fluids of the Appalachian Basin"

Details and free registration *(registration deadline 11:59 PM September 19th)*: https://cvent.me/N5yMYM

CNRAC Conversations – Below & Above: Storing Carbon in the Pennsylvania Landscape

September 21, 2023 Part I - Below **12:00 PM – 1:30 PM**

Panelists Kristin Carter, PG, CPG, Assistant State Geologist, Pennsylvania DCNR, Jacqueline Fidler, Vice President, Environmental & Sustainability, CONSOL Energy, Inc., and Perry Babb, CEO, KeyState Energy, will discuss Pennsylvania's unique geologic resources and underground gas storage capabilities, what it takes to store CO_2 underground and the current status of CO_2 injection projects.

This Conservation & Natural Resources Advisory Council webinar series is free and open to the public

Details and free registration: https://weconservepa.org/wp-content/uploads/asgarosforum/5219/CNRAC-Conversations_Carbon.pdf

ASCE Geo-Institute

September 21, 2023 **5:30 PM *social hour* – 6:30 PM *dinner* – 7:30 PM *speaker***

"Investigating Recent Massive Pillar Collapses in the U.S." by Gregory M. Rumbaugh, P.E., Chief of Roof Control Division, U.S. Mine Safety and Health Administration (MSHA)

Details and registration: https://www.asce-pgh.org/event-5386738

in-person at **Hofbräuhaus, 2705 S Water Street, Pittsburgh, PA 15203**

GET INVOLVED

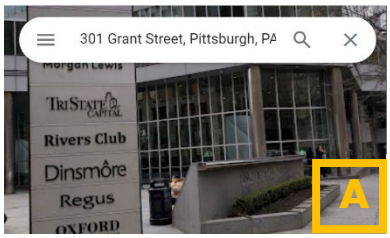
AAPG Eastern Section

Eastern Section of the American Association of Petroleum Geologists is looking for your ideas, presentations, organizational and volunteer skills

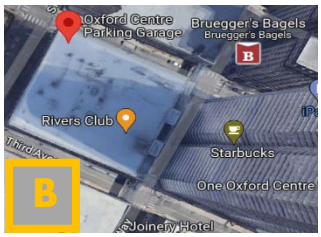
CONTACT: Dan Billman at danaret@comcast.net on the Eastern Section Annual Meeting planned for Spring 2024
Autumn Haagsma at autumn.haagsma@gmail.com for Tech Talk webinar series
Ian Thomas at ithomas@olympusenergy.com for short courses, symposiums, field trips, webinars, online talks & training
http://esaapg.org/ Eastern Section AAPG website for meetings & events. *PGS is affiliated with AAPG*

PGS ANNOUNCEMENTS

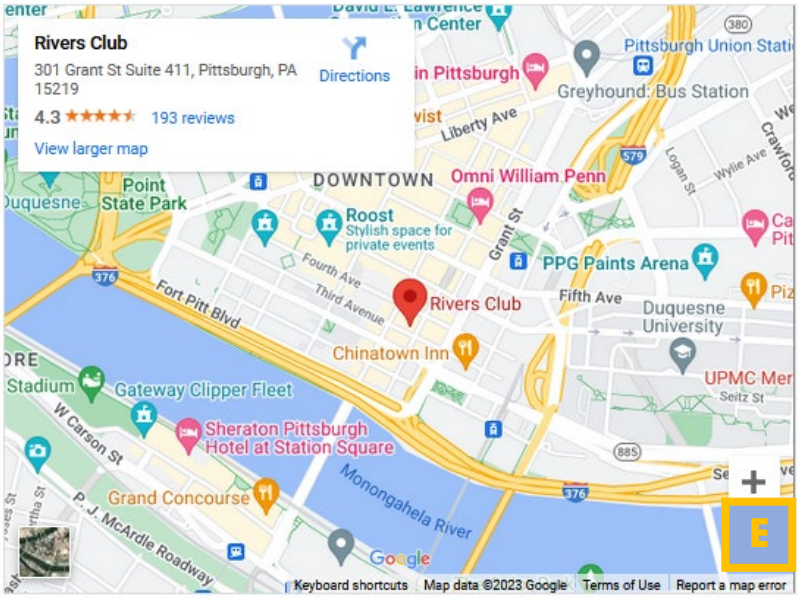
How do I get to the PGS September Meeting at the Rivers Club in Downtown Pittsburgh?

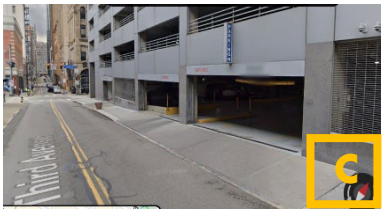


A). Kiosk at Oxford Center



B). Satellite view of Oxford Center parking garage & Rivers Club





C). Parking garage from 4th Ave.

D). Parking garage from 3rd Ave.

E). Pittsburgh street map

*note: Rivers Club is NOT the Casino!

PITTSBURGH RED BED AMBER LAGER

- **Mindful Brewing** #mindfullbrewing will re-release the **PGS/Mindful** collaborative beer in early October before the **GSA** (Geological Society of America) national meeting in Pittsburgh! PGS plans to have a limited edition of commemorative glasses *(photo, left)* at our GSA booth *(see page 11)* and you can sample 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/

YOU CAN STILL ORDER YOUR OWN PGS SWAG!

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

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

STUDENT REPRESENTATIVE

Students, becoming involved in your local geological organization is a good way to network with professionals in the field. One way is to serve as PGS student representative for the upcoming year. Are you interested? Contact one of our officers or directors *(page 14)* or come to the September monthly meeting to talk with our officers and directors in person, to let us know if you'd like to be considered for this position.

PGS 2023-2024 Officers and Board of Directors

President	Vice President	Treasurer	Secretary
Dan Harris	Peter J. Hutchinson	Kyle Fredrick	Wendy Noe

Directors-at-Large (2nd year)
Brian Dunst
Ray Follador
Erica Love

Directors-at-Large (1st year)
Albert Kollar
Diane Miller
Nancy Slater

Counselors
John Harper
Charles Shultz

Newsletter Editor
Robin Anthony

Webmaster
Dan Harris

Continuing Education
Brian Dunst

Archivist
Mary Ann Gross

AAPG Delegates
Dan Billman / Ray Follador

Student Representative
TBD (see page 13)

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 Wendy Noe, Secretary, at wnoe3556@gmail.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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