PITTSBURGH GEOLOGICAL SOCIETY

ASCE/PGS/AEG Joint Meeting

MONTGOMERY LOCKS AND DAM

SUBSURFACE INVESTIGATION

James R. James, P.E.

U.S. Army Corps of Engineers
Pittsburgh District

January 19, 2023

MEETING TIMES

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

DINNER COSTS

$35.00 member & gov't rate
$ FREE student member
$45.00 non-member

Prices only guaranteed thru January 9th

RESERVATIONS

Register **NOW** thru **ASCE** as space is limited::

https://www.asce-pgh.org/event-5038166?CalendarViewType=1&SelectedDate=1/29/2023

Reservations subject to availability.

MEETING LOCATION

Cefalo's Banquet & Event Center
428 Washington Avenue
Carnegie PA 15106

COVID19 POLICY

Current guidance
page 3

Please RSVP by Monday, January 9th *

get your reservations in early

* ***space is limited & subject to availability. Price goes up after Jan 9th***

Speaker Abstract

James R. James, P.E.

The U.S. Army Corps of Engineers, Pittsburgh District has embarked on a long-term effort to improve and upgrade the navigation structures on the upper reaches of the Ohio River. One of the initial goals of this Upper Ohio Navigation Project is the construction of a new lock chamber at the Montgomery Locks and Dam in Beaver County, PA, approximately 32 river miles downstream of the Point at Pittsburgh.

Geology at the site is fairly typical for western Pennsylvania. Cyclic sequences of sedimentary rock types are predominant among the relatively flat-lying bedrock units. The presence of several thin, intermittent coal seams with varying thicknesses add a complexity to the bedrock profile. Riverbed soil deposits, ranging from a few feet to more than 30 feet in thickness, overlie the bedrock.

To characterize the subsurface conditions, inform a geotechnical design model, and develop representative material parameters, the Pittsburgh District has planned and executed multiple subsurface investigation programs over the past several years. Land and water-based drilling and sampling efforts have been employed to collect data that are applicable to the design of the proposed lock chamber and several appurtenant structures.

The focus of this presentation will be the floating plant-based drilling and sampling work, including

- Multiple coring methods
- Soil profile sampling
- Pressuremeter & water pressure testing
- Optical & acoustic televiewing
- Extensive laboratory testing

Multiple coring methods and diameters were employed. Soil profile sampling was accomplished through both traditional SPT and sonic drilling methods. Pressuremeter and water pressure testing were used for in-situ assessments of bedrock strength, deformation, and transmissivity. Bedrock discontinuity conditions were evaluated through optical and acoustic televiewing of boreholes. Extensive laboratory testing schemes were executed for characterization of material type and to support determination of soil and bedrock strength parameters.

Collection and analyses of extensive subsurface information have guided the design team through foundation evaluations for the permanent structures that are part of the proposed lock, and the temporary cofferdam system as well. Data generated and provided by the investigation efforts have been used to inform critical decisions regarding treatments to be applied at or below foundation levels.

Completion of the multiple investigations has facilitated development of geotechnical parameters for final design of the new lock at Montgomery. Lessons learned from the process developed for this site will be applied for the future work proposed at two other Upper Ohio locations.

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
January 19, 2023 *	Joint PGS-AEG-ASCE mtg James R. James	"Montgomery Locks and Dam Subsurface Investigation"
February 15, 2023	Darcy Lecture: Dr Alicia Wilson	"Subseafloor Hydrogeology: Moving beyond Watersheds"
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"

* ***January PGS meeting is held jointly with AEG & ASCE – space is limited, get your reservations in early, price increase after January 9th***

The Pittsburgh Geological Society welcomes our new members:

New Regular Member:

John D. Pilewski, Compliance Engineer,
Fluor Marine Propulsion, West Mifflin, PA

New Student Member:

Brock C. O'Block,
Slippery Rock University

New Corporate Sponsor:

John P. Malizia, PG, Project Manager
The Gateway Engineers, Inc.

PRESIDENT'S STATEMENT

Hello PGS members and happy holidays! It was great seeing many of you at LeMont for our December meeting (*see page 5 for photos*). That was my first time at LeMont and I was blown away by the amazing view of the city, the wonderful food, great company, and a fantastic talk by our very own Craig Eckert! Thanks to all that brought a partner, I was amazed at how many unfamiliar faces there were, both members and non-members alike. Thanks again to Pete for putting the night together. I'm looking forward to more unique PGS experiences. Also, thanks again to Craig for sharing his experience hiking the Appalachian Trail, complete with amazing pictures. My wife took several notes regarding some of the nearby locations, so I expect we'll have some hiking to look forward to this summer.

As a final comment, PGS is continuing its 2023 Corporate Membership Drive! Along with the drive will be new changes to the website. First off, a new job postings page will soon be available where we will announce all local permanent and seasonal job postings. The space on the website currently being utilized for job postings will turn into an advertising space for our corporate sponsors to optionally provide a statement about their company or a short explanation of available services. We get a surprising amount of questions about local geologic professional resources through the "contact us" link from Pittsburgh residents, so having a space to advertise services is a great way to communicate availability. Thanks again to our current sponsors and to new sponsor Gateway Engineers. I hope to see some more new interest in 2023! I hope you all have a warm and relaxing holiday and remember that January will feature the joint meeting between ASCE-GI, PGS, and AEG on Thursday, January 19. ***Get your RSVP in early because we are anticipating a packed meeting.*** See you soon!

Dan

LOCAL GEOLOGICAL EVENTS

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

January 10, 2023 **5:00 PM - 7:00 PM**

GSP/PAPG NEW YEAR SOCIAL: Members enjoy good conversation, networking and up to two free beers

More info: https://www.papgrocks.org/

Details and registration: https://www.thegsp.org/event-5035961

in-person at **Penn Brewery, 800 Vinial St, Pittsburgh, PA 15212**

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS (PCPG)

January 12, 2023 **1:00 PM – 2:00 PM**

Webinar: "Ethics for Geoscientists" Russell Losco, P.G., C.P.S.S., Lanchester Soil Consultants, Inc.

Details and registration: https://pcpg.org/event-4972405

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

The historic Simler House, built around 1807 in Philipsburg, PA, was constructed by a Revolutionary War veteran named John Henry Simler. Over the years, it served as Simler's home, a shoe repair shop, a school, a bakery and a tavern.

Philipsburg, a borough in Rush Township, Centre County, originally was named Moshannon for a nearby creek (depending on whom you ask, the name is a corruption of a Native American name meaning either "elk water" or "black water"). Around 1794, some Englishmen named Philips and Baker, who owned a large tract of wilderness situated in what is now Centre, Clearfield, Cambria, and Indiana Counties, decided to create a settlement and contracted some surveyors to lay out town lots close to Moshannon Creek. Philips and Baker enticed some settlers to move into the area, but those that arrived found the "town" to be too rugged and soon left for greener pastures. In 1796, a state "highway" opened through the area and a Frenchman named John Henry Simler, who fought in the Revolutionary War, moved to the site and built the first house there (the historic Simler House was later built around 1807). A year later Henry and James Philips built houses and soon more settlers began arriving. Besides the "highway" and the creek, which offered access to nearby communities, the location was desirable because it was on high ground that offered flood protection. The entire region around Philipsburg developed around lumbering and, later, coal mining. Philipsburg is home to historical sites such as The Rowland Theater (built in 1917 to house live theatrical performances as well as conventions and public meetings), The Union Church and cemetery (the original log-cabin church was built in 1831), and John Henry Simler's House. Heritage Days, a week-long festival that attracts about 12,000 visitors is held every year in Philipsburg.

DID YOU KNOW . . . ?

Artist's conception of a developing Devonian forest.

Significant changes occurred in the biological, ecological, and atmospheric composition of Earth during the Devonian Period (419-358 ma ago), including the extraordinary development and radiation of land plants that transpired during that time. Numerous marine extinction events also occurred in the Devonian coincident with this evolving terrestrial biosphere, including the Late Devonian Frasnian-Famennian mass extinction, one of the "big five" that occurred during the Phanerozoic. This one was responsible for about 40% of marine families and 60% of genera. At the same time, there was a marked decrease in atmospheric CO_2 close to contemporary levels. Despite what is known about these important biological advances and global changes, there is still a lot that is unknown about precise ecological responses. Researchers have hypothesized that the two events, the Devonian mass extinctions and the evolution and expansion of land plants, were linked. It has been proposed that the evolution of plants and the development of their root systems transpired so quickly, biologically speaking, and on such an enormous scale that the amount of

nutrients derived from land and carried to the oceans would have increased significantly. This sort of situation can be seen today in places like the Gulf of Mexico and the Great Lakes where humans are responsible for flooding Earth's waters with nutrients that cause large-scale algal blooms, depleting the water of oxygen. This process, called eutrophication, if expanded to a global scale, would have fueled algal blooms large enough to have depleted most of the ocean's oxygen, a major environmental catastrophe for marine life. The basis for connecting mass extinctions with the evolution and radiation of land plants lies in recognizing nutrient flux higher than background levels, helping to link the nutrient flux to evidence of deeply rooting land plants, and determining that this occurred in multiple times and locations. The researchers used geochemical records from ancient lake deposits in Greenland, northern Scotland, and Orkney to detect elevated values of phosphorus in five separate locations during the height of Devonian land plant evolution and expansion. They discovered that, in every case, higher levels of nutrients occurred along with evidence of the presence of early trees. The evidence included fossil spores and stems of *Archaeopteris*, the earliest known deeply rooting tree. Two of these cases coincided with the Late Devonian mass extinction. In addition, the researchers were able to link the periodic wet/dry climate cycles that existed in the region during the Devonian with unambiguous episodes of plant colonization. Although they noted higher nutrient transport during both wet and dry cycles, the most significant events happened during wet cycles. This suggests that Devonian plant expansion was episodic and linked to climate cyclicity. This episodic plant expansion might help explain why at least six significant marine extinctions occurred during the Devonian. These catastrophic results of natural occurrences in the Devonian should act as a warning to us about the consequences of similar human-caused conditions today.

https://www.sci.news/paleontology/devonian-mass-extinctions-11384.html

And speaking of mass extinctions, people have been talking about a 6th mass extinction event taking place today, the result of anthropomorphic factors that have been changing Earth's environments to the point where many species of plants and animals are dying out. Now, new

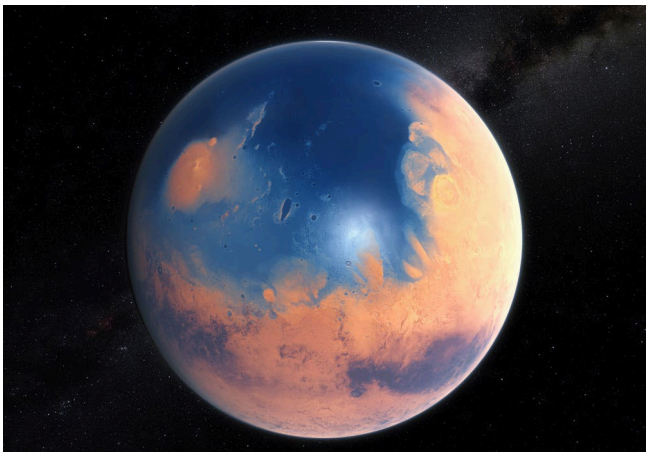
Photo of a red sandstone preserving an impression of the extinct Ediacaran fossils *Dickinsonia* in the center and the smaller *Parvancorina* on the left from Nilpena Ediacara National Park in South Australia.

evidence suggests this should be referred to as the 7th mass extinction event. A team of researchers suspects that a global drop in oxygen levels about 550 ma ago, toward the end of the Ediacaran Period, helped cause Earth's first known mass extinction. At the height of the Ediacaran, life was booming in the oceans of the world. Ediacaran animals appear strange to us because most don't look anything like the animals we know. For example, colonies of creatures called petalonamids, which were shaped like feathers, drew nutrients from the water as the predecessors of jellyfish were beginning to evolve and a slug-like animal called *Kimberella* grazed on microbial mats. Then, 80% of life on Earth just disappeared, leaving no traces in the fossil record. The new study suggests that this represents the earliest known mass extinction event on the planet, caused by a steep decline in oxygen. It's the sort of problem that suggests something similar could be happening in our modern ocean ecosystems because of threats by human activity. Whether an additional mass extinction should be added to the current list of five has been debated for years by paleontologists who have been aware of the sudden decline in fossil diversity at the end of the Ediacaran. It was unclear whether or not that resulted from a sudden mass extinction event. One potential explanation raised was that early trilobites and other arthropods began competing with Ediacaran fauna, causing the less capable Ediacaran animals to die out. Another is that Ediacaran fauna continued to thrive but the conditions necessary for them to be preserved as fossils ceased 550 ma ago. There definitely was a change in Earth's biota at that time, but there are

significant questions about what caused it. The research team compiled a database of Ediacaran fossils from the literature, sorted each entry by multiple factors like geography, body size, and mode of feeding. They cataloged 70 genera that lived 550 ma ago and found only 14 still existed 10 ma later. There were no noteworthy changes in the conditions needed to preserve fossils, and they did not find the kinds of differences in feeding modes that might suggest the animals died out because of competition with early Cambrian animals. The only common factor among the fauna that survived was having a body plan with a high surface area relative to volume, a feature that can help animals survive in low-oxygen conditions. Geochemical evidence points to an oxygen decline at the end of the Ediacaran, and the research team suggested that the organisms which could not cope with low oxygen levels were selectively removed. The reason or reasons why global oxygen levels fell toward the end of the Ediacaran has not yet been definitely determined. Volcanic eruptions, plate tectonics, and asteroid impacts are all possibilities, as are changes in the nutrient levels in the ocean. Regardless, the researchers suggest this mass extinction probably influenced the subsequent evolution of life in the Early Paleozoic. More and more animals which look like the ones that occur today began evolving following the proposed extinction, so it is possible that it paved the way for more recognizable animals. The researchers note that their study will help us recognize the long-term ecological and geological impacts of oxygen-deficiency events.

https://www.livescience.com/1st-mass-extinction-oxygen-drop

According to new research, meteorites that showered Mars early in the history of the inner solar system might have transported enough water to create an ocean nearly 1,000 feet deep on the planet. The topmost layer of Mars contains chemical signatures of carbonaceous meteorites that bombarded the planet around the time its crust became solidified about 4.5 ga ago. Carbonaceous-type asteroids have a very distinct chromium isotope composition relative to the inner solar system. Since Mars isn't subjected to plate tectonics that cause the crust and mantle to move and mix, the chemical signatures of the meteorites should be preserved in the planet's crust, whereas mantle rocks should show what Mars was like prior



Mars might have had enough water delivered to it by asteroid bombardment during the early development of the inner Solar System for the planet to have been covered in a deep ocean.

to the bombardment. The researchers analyzed the concentration of chromium-54, a rare chromium isotope, in meteorite samples found on Earth that came from Mars to estimate the amount of water that might have been deposited on the Red Planet during its early history. They also looked at the differences between the amounts of chromium-54 in samples from the crust and mantle, allowing them to estimate the total mass of the asteroids that originally collided with Mars. Based on that estimate, they suggested that, if the original bombarding asteroids contained only 10% water (which is the lower limit for carbonaceous meteorites), they would have deposited enough H_2O molecules to create a global ocean. Furthermore, if the water was spread out across the entire planet, it would form a layer 985 feet deep! Carbonaceous asteroids also contain elements essential to life, meaning that organic molecules and water, two of the most important ingredients for life, existed on Mars during a period before the Moon formed. Although the researchers cited evidence for the presence of carbonaceous meteorites in the Martian mantle, it should be pointed out that the meteorite samples they used might not actually represent the bulk of the planet's mantle material.

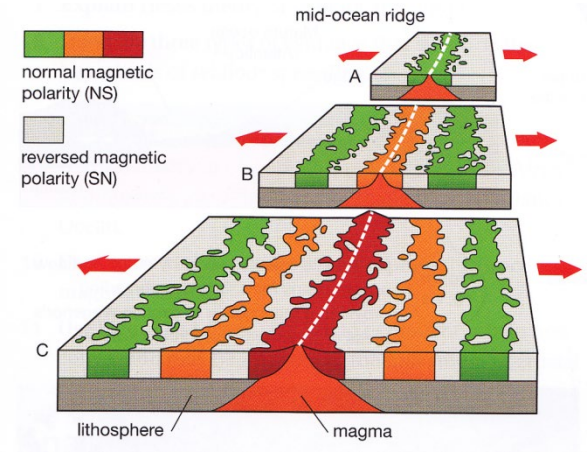
https://www.newscientist.com/article/2347333-early-meteorites-brought-enough-water-to-mars-to-create-a-global-ocean/

According to a recent report by the United Nations Educational, Scientific and Cultural Organization (UNESCO), some of the Earth's most famous glaciers, including in Yosemite and Yellowstone National Parks here in the U.S., the Dolomites in Italy, and Mount Kilimanjaro in Tanzania, might

disappear in less than 30 years due to global warming, regardless of which scenario of temperature rise occurs. UNESCO monitors about 18,600 glaciers in 50 of the UNESCO World Heritage Sites and found that about 1/3 of them will have disappeared by 2050. Although the remaining 2/3 can be saved by keeping global temperature rise below 1.5°C (2.7°F) relative to pre-industrial levels, if the world continues to do business as usual with regard to CO_2 emissions, approximately 50% of the World Heritage glaciers could be gone by 2100. UNESCO's report is a call to action to reduce CO_2 emissions. They state that only a speedy reduction in emissions can save both the glaciers and the biota that depends on them. Although UNESCO's World Heritage glaciers

Photos of a melting glacier taken in 1917 (left) and 2005 (right).

represent only about 10% of the world's glacial areas, they include some of Earth's best-known glaciers. If these are lost, it will be exceedingly noticeable because they are among the principal points of global tourism. World Heritage glaciers have been losing an average of about 58 billion tons of ice every year. That is comparable to the total annual volume of water used in France and Spain together. That much water also contributes to almost 5% of observed global sea-level rise. UNESCO is recommending that, because of the inevitable continued shrinking of many of these glaciers in the near future, local authorities should make glaciers a focus of policy, improve monitoring and research, and implement disaster risk-reduction measures. Yes, melting glaciers can cause risk. For example, if a glacial lake fills up, the water could burst out of its confinement and cause catastrophic floods downstream.
https://www.aol.com/news/major-glaciers-including-dolomites-yosemite-012722728.html?soc_src=aolapp



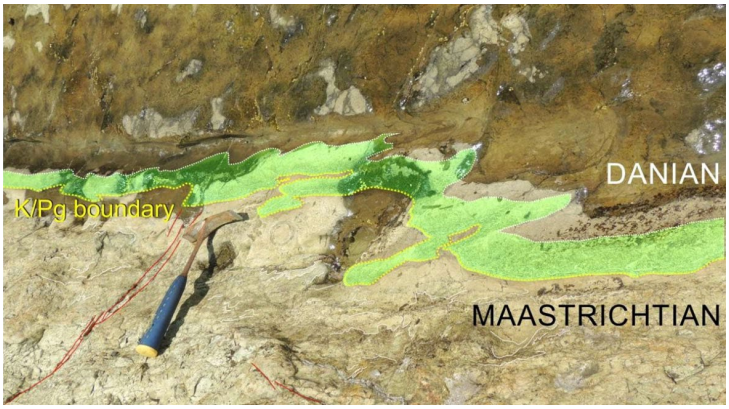
The relationship between plate tectonics and geomagnetic reversals has been known for decades. Now, new research has indicated both may have begun at least 3.25 billion years ago.

Many reports suggest that plate tectonics during early Earth history wasn't the main way the planet's internal heat was released through the shifting of plates like it is currently. Now, new research using cutting-edge technology and equipment analyzed rock from the Pilbara Craton in Western Australia, one of the oldest and most stable pieces of the Earth's crust, to show this wasn't the case. The team used magnetometers, demagnetizing equipment, and a Quantum Diamond Microscope that depicts the magnetic field of a sample and precisely identifies the nature of the magnetized particles in order to create a suite of new ways to determine the age and way the samples became magnetized. This allowed them to determine how, when, and in which direction the crust moved. As a result, they showed that plate tectonics acted in a manner similar to modern plate tectonics at least 3.25 ga ago, and provided evidence of when Earth's earliest magnetic reversal occurred. Together, the findings propose clues to how geological changes such as these might have given rise to an environment favorable to the emergence of life. Evidence of when plate tectonics began is difficult to obtain because the oldest crust typically was thrust into the mantle and never resurfaced. Only 5% of all the exposed rocks on Earth are older than 2.5 ga, and no rock is older than about 4 ga. Based on the new research, however, it seems parts of the early crust moved at a rate of 6.1 centimeters per year and 0.55° every million years, a speed more than double what the same researchers showed the ancient crust moved in a previous study. The evidence gave them more confidence to rule out non-plate tectonic

explanations. For example, they can now argue against “true polar wander” and “stagnant lid tectonics,” both of which can cause the Earth’s surface to shift but aren’t part of modern-style plate tectonics, because the newly discovered higher rate of speed is not consistent with features of these two processes. The researchers also described what they believe to be the oldest evidence of geomagnetic field reversal, which indicates a great deal about the planet’s magnetic field 3.2 ga ago. The magnetic field was probably stable and strong enough to keep solar winds from eroding the atmosphere. This, combined with the researchers’ results on plate tectonics, suggests an early Earth that was already geodynamically mature, including providing the planet with more stable environmental and surface conditions. This would have made the early Earth a more feasible place for life to evolve and develop. The researchers plan on keeping their focus on the Pilbara Craton, while at the same time looking at other ancient crust around the world. They are hoping to locate older evidence of modern-like plate motion and when the Earth’s magnetic poles flipped. They hope to be able to reconstruct not just when plate tectonic began, but also how their motions and Earth’s interior processes have changed through time.

https://scitechdaily.com/laying-geological-groundwork-for-life-on-earth-early-plate-tectonics-flipping-of-geomagnetic-poles/

More information on the meteorite that hit the Chicxulub, Mexico, area at the end of the Mesozoic has become available. We’ve been told already that the magnitude of the impact released energy equivalent to 10^{23} joules, enough to generate gigantic earthquakes, mega-tsunamis, and form a crater 112-124 miles in diameter in the Yucatan Peninsula. Evidence for the gigantic earthquakes is known from Mexico, including liquefaction caused when strong quaking makes water-saturated sediment flow like liquid, and from the U.S., where faults and cracks probably associated with mega-earthquakes occurred. Tsunami deposits have also been documented at several outcrops around the Gulf of Mexico. New research now suggests that the impact triggered a mega-earthquake so massive that it shook the Earth for weeks or even months after the collision. In 2014, researchers found spherule deposits on Gorgonilla



Interpreted photo of soft-sediment deformation created by a mega-earthquake during the Chicxulub meteorite impact.

Island off the coast of southern Colombia in South America, about 1,864 miles from Chicxulub. The deposits contain small glass beads up to 1.1 mm in diameter, as well as tektites and microtektites, that were ejected into the atmosphere during the asteroid impact. The rocks exposed on the coast of Gorgonilla Island had been deposited as sand, mud, and microbiota on the bottom of the ocean about 1.2 miles down. Layers of mudstone and sandstone as much as 30 to 50 feet beneath the sea floor experienced soft-sediment deformation preserved today in outcrop that the researchers attribute to earthquakes generated by the Chicxulub impact. Soft-sediment deformation features, as well as faults, continue up through the spherule-rich layer that was deposited after the impact, indicating that the shaking most likely continued for the weeks and months it took for the finer-grained material to reach the ocean floor. And, just above the spherule deposits, preserved fern spores indicate the first recovery of plant-life after the impact. This makes the outcrop on Gorgonilla Island an ideal place to study the Cretaceous-Paleogene boundary; it is one of the best-preserved and, since it was located deep in the ocean, it was not affected by tsunamis. The data collected by the researchers help record the end of the Cretaceous and the beginning of the Cenozoic, and they characterize one of the biggest earthquakes experienced by Earth during the Phanerozoic.

https://www.sci.news/paleontology/chicxulub-mega-earthquake-11269.html

Speaking of the Late Cretaceous, roughly 66 to 100 million years ago dinosaurs roamed the land, early species of birds as well as pterosaurs flew the skies, and sharks not much different from those we

know today swam in the oceans that covered 82% of Earth. Redwood trees, conifers, roses and other flowering plants were beginning to take over the land, while bees, termites, and ants evolved right along with them. The atmosphere was warm and humid, volcanoes spewed forth lava, ash, and noxious gases. And there were no ice sheets or mountain glaciers. Except – in the region of the South Pole, apparently. Not just a few glaciers, mind you, but probably multiple glaciers or even a large ice sheet. Evidence indicates that polar ice existed during that time, even at the height of global greenhouse conditions. Today in Antarctica there is a large exposed group of glassy igneous rocks along the Transantarctic Mountains adjacent to the Ross Ice Shelf called the Butcher Ridge Igneous Complex (BRIC). The BRIC is unusual because the composition and formation of the rocks are uncharacteristic of rock formations nearby. They have, among other things, large amounts of glass and layered alteration indicating noteworthy physical, chemical, or environmental events that changed their mineral composition. While sampling the BRIC and analyzing how it was formed, a team of researchers encountered what they considered an unusually large amount of water. Apparently the magma interacted with water, and as it cooled, incorporated the water into the glass. The team expected to find that water already in the magma caused the alteration in the rock as it cooled. What they found instead was evidence of a climate most people thought did not exist at that time. During spectroscopic analysis of the samples, they determined that only some of the water originated within the magma. They further determined that as the magma cooled into glass just beneath the Earth's surface, it also incorporated groundwater. In fact, most of the water in the rocks was externally derived. When they measured the oxygen and hydrogen isotopic composition of the water they found that it matched very well to the composition of Antarctic snow and ice. The team also conducted argon-argon geochronology to date the rock and its alteration. As it turned out, these rocks are Jurassic in age, 183 ma old, but the researchers also found a younger, Cretaceous age signature. They suggested that when the rocks cooled and were altered the argon isotope age was reset as well, and they were able to match the age of the alteration to the composition of the alteration. As it turns out, similar volcanic rocks roughly 435 miles north of the BRIC also have a Cretaceous alteration age, indicating that polar glaciation might have been regionally extensive in Antarctica during that time. The researchers would like to go to other areas in Antarctica to see if they can recover the same results and thereby determine the scale of the Cretaceous glaciation. Finding evidence of large Cretaceous ice sheets might not change our conception of a hot, humid Earth during the Cretaceous, but it would require us to think about the Cretaceous and Antarctica a lot differently than we do now.

Despite the typical conception of the Earth during the Cretaceous as hot and humid, it looks like the southern polar area was probably something like Antarctica is today.

https://www.eurekalert.org/news-releases/964058

WEBSITE OF THE MONTH

https://www.minerals.net/mineral/beryl.aspx

Fun Fact Having Nothing to Do with Geology

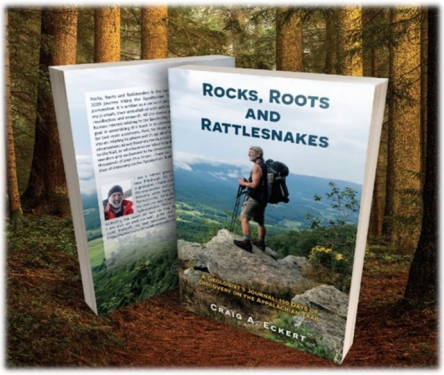
If you Google "do a barrel roll," the entire screen image will rotate clockwise. This works on both computers and cell phones.

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

READ A BOOK WITH A LOCAL GEOLOGY CONNECTION!



In *Rocks, Roots, and Rattlesnakes*, PGS member Craig Eckert reflects on the sedimentary, igneous, metamorphic and tectonic history of our favorite local mountain chain, weaving an assortment of published data with his own geologic observations. Craig Eckert's book makes a great New Year's gift for a geologist or a future trail hiker. Purchase thru Craig's website: https://www.rocksrootsandrattlesnakes.com/

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/

a collaborative effort between PGS & Mindful Brewing

PGS 2022-2023 Officers and Board of Directors

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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

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