

PITTSBURGH GEOLOGICAL SOCIETY

Land Snails as Paleoclimate Proxies: From Local to Global Scales

October 16, 2019

NEW MEETING TIMES

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

NEW DINNER COSTS

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

FOR RESERVATIONS

Email your name and
number of attendees to:

[pgsreservations@
gmail.com](mailto:pgsreservations@gmail.com)

You can also reserve and
pay via PayPal at:

[https://www.pittsburgh
geologicalsociety.org/](https://www.pittsburghgeologicalsociety.org/)

MEETING LOCATION

Cefalo's Banquet & Event
Center, Carnegie PA



Dr. Yurena Yanes

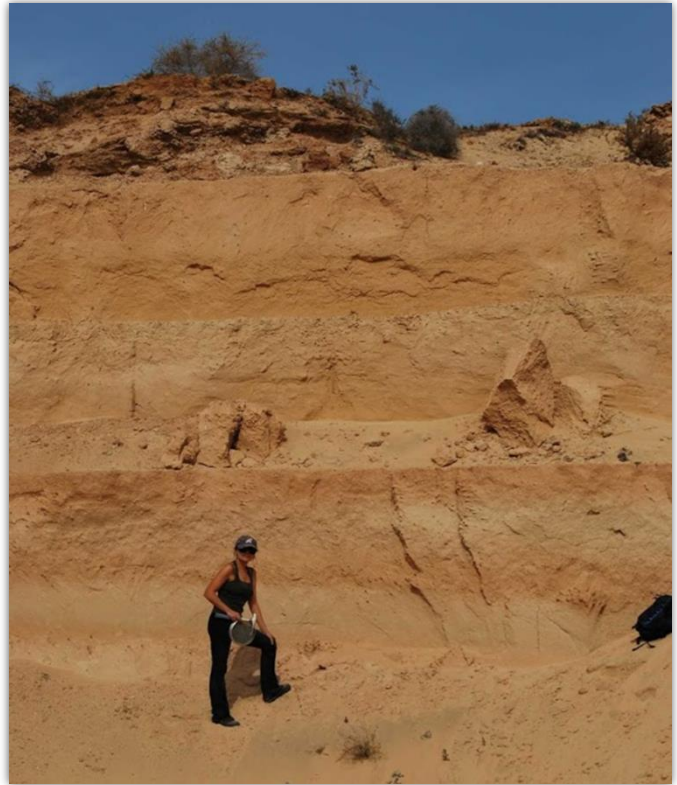
Associate Professor
Department of Geology
University of Cincinnati

Make Reservations by Wednesday, October 9

Speaker Abstract

Climate change is an urgent and societally relevant topic as it affects organisms, ecosystems and civilizations. Long-term effects of climate change can only be understood using a geohistorical perspective that goes back in time millennial to multi-millennial timescales. To achieve this goal, scientists develop, calibrate and apply paleoclimate proxies, or natural archives that record indirect evidence of climate over various temporal scales and resolutions.

In this talk, land snail shells are presented as an emerging and promising paleoclimate proxy that can complement and expand other more commonly used proxies, ranging from local, microhabitat scale studies into more global scale approaches.



Speaker Biography

Yurena Yanes is a Professor of Geology at the University of Cincinnati since 2013. She is native from the Canary Islands, Spain, where she earned her PhD at the Universidad de La Laguna in 2005. Thereafter, she has worked as a research scientist at Virginia Tech, Savanna River Ecology Lab, Southern Methodist University and Universidad de Granada before taking her professor position at the University of Cincinnati.

With her research, Yanes aims to understand the linkages between climate, organisms and humans over various spatio-temporal scales. She uses snails as proxies to address questions about climate change, biodiversity shifts and human transitions over multi-millennial timescales.

PRESIDENT'S STATEMENT

Welcome to Fall!
Even though it may not feel like it is fall, the autumnal equinox occurred on Monday, September 23 at 07:50 UTC when the Sun's center passes through the "celestial equator"—



an imaginary extension into space of Earth's equator line. The beginning of fall could also be defined from a meteorological perspective based on the average temperatures rather than astronomical events. Meteorologists define seasons based on climatic conditions and the annual temperature cycle. The length of astronomical seasons vary between 89 and 93 days, the length of the meteorological seasons is fixed; for fall it is 91 days. In the Northern Hemisphere, the meteorological fall starts on September 1 and ends on November 30.

There are many important occasions to celebrate during the fall season. One of these events is Earth Science week. Since 1998, the American Geosciences Institute has organized this event to help the public gain a better understanding and appreciation for the Earth sciences. This year it will be celebrated from October 13th – 19th, and the theme is "Geoscience Is for Everyone". The events of the week are organized to encourage stewardship for the Earth and to express the importance of the geosciences in the everyday lives of people. Events planned include: International Earthcache Day (Oct. 13th), Earth Science Literacy Day (Oct. 14), Earth Observation Day and No Child Left Inside Day (Oct. 15), National Fossil Day (Oct. 16), Geoscience for Everyone Day (Oct. 17), Geologic Map Day (Oct. 18) and International Archaeology Day (Oct. 19).

PGS will help to celebrate National Fossil Day with others from around the country by hosting Dr. Yurena Yanes from the University of

Cincinnati. She will present on using the biologic record as proxies for interpreting paleoclimates. If interested in learning more about the Earth Science Week, how to get involved and the events planned please visit <https://www.earthsciweek.org/>.

I would like to take a moment to congratulate Jenna Theis from CalU. Jenna received the 2019 PGS Frank Benacquista Scholarship Award. Jenna is a geology major and plans to use the scholarship to help with the costs of books for her courses this semester. Jenna plans to graduate in May 2020 and hopes to secure a job as an Environmental Geologist shortly after graduation.



As mentioned at the last meeting, PGS is currently looking to fill the Student Board Representative position. The Student Board Representative will be required to attend the Board meetings and communicate with the university student

liaisons. If you are interested in serving as the Student Board Representative, please email me attaching a statement of interest and resume. We are also looking for individual university student liaisons. Any student interested in serving as the University Student Liaison should submit her/his name to your University Faculty Coordinator (professor with ties to the PGS), along with a personal statement and resume. These are important positions that are meant to create better communication between our student members and the Board. Please do not procrastinate as the Board would like to fill these positions this month.

I would like to remind everyone to renew your 2019-2020 PGS membership either at the meeting or via the website.

Tamra

PGS Members receive National Geoscience Award

In May of 2018, PGS Board Members John Harper and Albert Kollar conducted a PGS field trip titled, *Geology of the Early Iron Industry in Fayette County, Pennsylvania*. To their surprise, the guidebook has been recognized with the Geoscience Information Society's 2019 GSIS Award for Best Guidebook (professional) at the 2019 GSA Annual Meeting in Phoenix, AZ. On September 23rd, Albert attended the GSIS Awards Luncheon to receive the award.

In presenting the award, the GSIS committee chair stated, "*The Geology of the Early Iron Industry in Fayette County, Pennsylvania* is well-written and well-illustrated, with both professional and popular sections. I can see local geology teachers taking students on these trips to show a chapter in the development of an important early ore industry in the United States. With the aid of detailed road logs guidebook users can see and learn about the geology, industrial development, history, and fossils in Fayette County.

Field Trip leaders can use the guidebook to expand on several topics, depending on the interests of their trip attendees. An additional benefit of the guidebook is its free availability online, so any traveler with an interest in the area can explore on their own. The Pittsburgh Geological Society has performed a great model for other local societies that are interested in spreading the benefits of their field trips to wider audiences." Congratulations to John and Albert!





CalU Wins Student Attendance Award for 2018-2019

California University of Pennsylvania once again took the crown for sending the most students to PGS meetings in the 2018-2019 program year.

Congratulations to this highly engaged group of future geologists and PGS members!



LOCAL GEOLOGICAL EVENTS

HARRISBURG GEOLOGICAL SOCIETY

October 10, 2019 4:30 – 7:30 PM

“The Grace Mine in New Morgan Borough, Berks County PA” by Ron Sloto of West Chester University.

Fiesta Restaurant and AEG Offices, 441 Friendship Rd, Harrisburg PA

EASTERN SECTION OF AAPG 2019 MEETING

October 12-16, 2019

“Energy from the Heartland” meeting hosted by the Ohio Geological Society.

DoubleTree by Hilton, Columbus OH

ACS ENERGY TECHNOLOGY GROUP

October 17, 2019 6:30 PM-8:30 PM

“Exiting Eden: Adapting to unprecedented change from a warming climate” by Jordan Fischbach of the RAND Corporation

Lombardozi’s Restaurant, Pittsburgh PA

AMERICAN SOCIETY OF CIVIL ENGINEERS – GEO-INSTITUTE

October 24, 2019 6:00 PM-9:00 PM

“Investigation of Two Recent Tailings Dam Failures” by Dr. Mark Styler of A.G.E.S., Inc.

Cefalo’s Banquet & Event Center, Carnegie PA

NORTHERN ALLEGHENIES GEOLOGICAL SOCIETY

November 19, 2019 5:30 PM – 7:30 PM

Presentation on structural geology and geophysics by Matt Carter of Allegheny College

La Fiesta Restaurant, Ebensburg PA



The Pittsburgh Geological Society welcomes two new professional members:

Brian Panetta, PG, CPG
Larry Smyers, PG

We also welcome new student members.

From California University:

Joshua S. Boss, Kayla M. Haddad, Thomas J. Merendino and Lauren J. Rockwell

From Slippery Rock University:

Alessandro Fiocchi, Kaitlin B. Karaffa, Alysa D. Hyatt, Carly N. Leventhal, Jessica L. Packer, Samantha F. Pugliese, Kayla A. Ray, Matt S. Rechenberg, and Alyssa C. Snyder

From the University of Pittsburgh:

E. Kevin Love

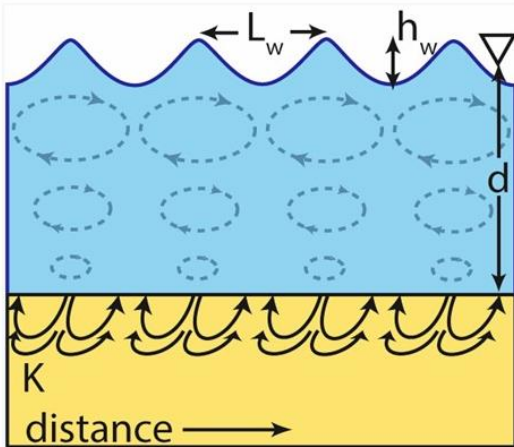


THE PITTSBURGH GEOLOGICAL SOCIETY ENDOWMENT FUND

Established May 8th, 2014 through the



UPCOMING PGS MONTHLY MEETING



**Dr. Christopher
Russoniello**

**Dynamic Groundwater
Drivers: Measuring And
Estimating Coastal Surface
Water/Groundwater
Exchange Over Diverse
Spatial And Temporal
Scales**



**Department of Geology and
Geography
West Virginia University**

The next PGS Dinner Meeting will be held on November 13, 2019.

2019-2020 PGS SPEAKER SCHEDULE

Meeting Date	Scheduled Speaker	Presentation Topic
December 18, 2019	Pat Burkhart, Slippery Rock University	Machu Picchu
January 15, 2020	Speaker TBA, Joint Meeting with ASCE and AEG	Engineering Geology
February 19, 2020	Speaker TBA	TBA
March 18, 2020	Kendra Murray, Hamilton College	Geomorphology
April 15, 2020	Student Research Night Joint Meeting with ASCE and AEG	Student Posters & Presentations
May 13, 2020	Randy Blood, DRB Geological Consulting	Energy Resources

OTHER EVENTS OF INTEREST TO PGS MEMBERS





**REGISTRATION
NOW OPEN**
Early Registration Ends Sept. 30

Alex Epstein , Author
The Moral Case for Fossil Fuels
All-Convention Luncheon

John Jordan, President
AAPG Division of Professional Affairs
DPA Luncheon

Robust Technical Program
(100+ oral and poster presentations)
See website for program & abstracts
3 Field Trips
2 Short Courses
Student Expo

AAPG EASTERN SECTION MEETING HOSTED BY THE OHIO GEOLOGICAL SOCIETY
COLUMBUS, OHIO
**ENERGY
FROM THE
HEARTLAND**
OCTOBER 12-16, 2019



Join Us in the Fall
DoubleTree by Hilton Hotel
Columbus-Worthington
\$109 meeting room rate

Sign Up Now to Sponsor / Exhibit !

AAPG Eastern Section Meeting
October 12 – 16, 2019
www.esaapg.org/annual-meeting/

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

The Borough of Edinboro, in Erie County, is named after Edinburgh, Scotland. Erie, Iroquois, and Cornplanter tribes first lived in the area and called it Conneauttee, meaning "land of the living snowflake." In 1801, William Culbertson settled in the area and built a gristmill near Conneauttee Lake. This formed the roots of the town, drawing primarily Scottish settlers who built houses and churches between 1801 and 1825. Culbertson built the first school ca. 1825, and the first post office was built and organized ca. 1837 when it was included on the Erie and Crawford counties postal routes. The local farms helped the area grow during this time, and the 500-acre area became incorporated in 1840 with a population of 232. Soon, a turnpike made of wooden planks was constructed between Erie and Meadville.



The 245-acre Edinboro Lake is drained by Conneauttee Creek, a tributary of French Creek. It is known by fishermen for its stock of largemouth bass, smallmouth bass, crappie, bluegill, sunfish, and muskellunge.

In 1857, the area's original Scottish settlers started Edinboro Academy, a private training school for Pennsylvania teachers. It is the oldest training institution west of the Alleghenies and the second oldest in the state. The academy was renamed State Normal School in 1861 and a century later became Edinboro State College. Then, in 1983, Edinboro State College joined the Pennsylvania State System of Higher Education (PASSHE) and was renamed Edinboro University of Pennsylvania. Between 1910 and 1960, Edinboro promoted itself as a resort area by Edinboro Lake, boosting tourism while the college gained enrollment. Today, Edinboro is known as a college town in the winter and lake resort during the summer.

DID YOU KNOW . . . ?

Because this program year is the 75th anniversary of PGS, we will be adding historical and biographical tidbits to **DID YOU KNOW . . . ?** over the coming months. Look for profiles of the founders, historical aspects of geology in western Pennsylvania predating PGS, and other items that you might find interesting. *[Editorial commentary on the information will be provided in brackets.]* **DID YOU KNOW . . . ?** will, of course, continue to provide more recent and relevant geological information as well.



Despite the date of 1945 on the regular PGS logo, the society actually formed in 1944 when a group of Pittsburgh-area geologists decided it was time for Pittsburgh to have its own learned organization dedicated to the geological sciences. The following is an announcement published in the May 25, 1945 issue of **Science** (volume 101, issue 2630, pages 530 and 531, in case you want to go look it up for yourself).

PITTSBURGH GEOLOGICAL SOCIETY

A regional society "to advance and disseminate geologic knowledge, and to provide a forum for geological problems" has been organized at Pittsburgh under the name of the Pittsburgh Geological Society. The first meeting was held on October 27, 1944. Details of organization have been worked out at the five successive monthly meetings, culminating at the April meeting when the constitution and by-laws were adopted. *[The founders apparently decided that PGS was not official until the constitution and by-laws had been adopted, and the officers and board members selected.]*

The organizing committee was headed by George C. Grow, Jr., who has also been selected at president of the society for the year 1945-1946. Other first-year officers are Raymond E. Birch, vice president; W. B. Robinson, secretary; and Dr. Shailer S. Philbrick, treasurer. These officers, together with the following, comprise the council: Robert S. Bayles, Hugh R. Brankstone, C. H. Feldmiller, Dr. Richard M. Foose, John T. Galey, David K. Kirk, and Dr. J. H. C. Martens. *[This list reads like a Who's Who of Pittsburgh geology in the 1940s.]*

Speakers at the first six meetings and their subjects follow: Major Raymond C. Moore, State Geologist of Kansas, now on leave in the Army, "Geology and Geomachy"; Dr. Kirk Bryan, Harvard University, "The Geological Antiquity of Man in America"; Dr. Carey Croneis, president, Beloit College, "Science and the Future"; Dr. Philip S. Smith, chief Alaskan geologist of the U. S. Geological Survey, "Alaska's Potential Oil Resources"; Dr. W. C. Krumbein, senior geologist, Beach Erosion Board, "Sedimentation and Its Relation to Oil Finding"; and Dr. Walter H. Bucher, professor of geology, Columbia University, "The Deformation of the Earth's Crust." Except for

Major Moore and Drs. Croneis and Bucher, these speakers were obtained through the Distinguished Lecturers Committee of the American Association of Petroleum Geologists.

Attendance at the first six meetings, each held in Pittsburgh, has averaged slightly more than a hundred persons. As has been hoped for by the organizers, the drawing range extends into Ohio and West Virginia as well as throughout western Pennsylvania. The cooperation of personnel of the U. S. Geological Survey and of the Pennsylvania and West Virginia geological survey groups has been of much assistance. It is planned to hold monthly meeting except for the summer months, these to be in Pittsburgh. Field conferences may be held when transportation facilities are improved. The diverse geologic interests represented in this area include petroleum and gas, coal, iron and steel, refractories and other ceramic industries, as well as academic groups and amateur geologists.

The next meeting is scheduled for 7:30 p.m., May 28, in the club rooms of the Engineers Society of Western Pennsylvania in the Hotel William Penn. This will be a symposium on the wartime activity of the U. S. Geological Survey in the Ohio-West Virginia-Pennsylvania area, particularly concerned with detailed study of the Berea sandstone. The discussion will be led by Dr. James F. Pepper, David F. Demarest and Dr. Gordon Rittenhouse.

Further information concerning the society and its activities may be obtained by addressing W. B. Robinson, Gulf Research and Development Company, Box 2038, Pittsburgh 30, Pa.

[PGS was quickly affiliated with AAPG, an honor and association it continues to this day.]



Looking back 75 years at this month

As stated above, Major Raymond C. Moore gave the talk at the first PGS meeting ever held, in October 1944. His subject was “**Geology and Geomachy.**”

[Geomachy, which is basically a synonym of geomancy, is a method of divination using markings on the ground or patterns formed by tossing handfuls of soil or rocks and interpreting their meaning].

Raymond Cecil Moore (1892-1974) was born in Roslyn, Washington, and received an A.B. degree in geology from Denison University in 1915 and a Ph.D. from the University of Chicago in 1916. After obtaining his Ph.D., he accepted a position with the Kansas Geological Survey and Kansas University where he spent his entire career. He served as both the State Geologist of Kansas and as Chairman of the Department of Geology. Although he is probably best known today as the founder and first editor of the *Treatise on Invertebrate Paleontology*, he was very active as a geologist and paleontologist who was an expert in crinoids, bryozoans, and corals.

For some of us, *Invertebrate Fossils* by Moore, Lalicker and Fischer was our first introduction to professional paleontology. Moore was also one of the founders of the American Association of Petroleum Geologists and editor of the AAPG Bulletin from 1920 to 1926 during which time he made many innovations that are still integral parts of the Bulletin today. Over the years, he

received many accolades and awards, including:

- an honorary doctorate from Denison University in 1935
- the F. V. Hayden Medal from the Philadelphia Academy of Natural Sciences in 1956
- the AAPG’s Sidney Powers Medal in 1959
- the first Paleontological Society Medal in 1963
- the Prix Paul Fourmarier Gold Medal from the Académie Royale de Belgique in 1966
- the Wollaston Medal from the Geological Society of London in 1968
- the Mary Clark Thompson Medal of the National Academy of Science in 1970
- the first Twenhofel Medal from SEPM in 1972.



Left – Professor Raymond C. Moore, the educator and State Geologist of Kansas. Right – Moore, as a U.S. Army major, gave the talk at the very first PGS meeting in 1944 while on leave from military duty.

In 1973, the main Kansas Geological Survey office building on the University of Kansas’ west campus was named Raymond C. Moore Hall in his honor, and every year SEPM presents the Moore Medal for excellence in paleontology.

Having one of AAPG’s founders speak at the very first PGS meeting must have been a huge honor for the society and the intrepid band of geologists who formed PGS 75 years ago.



An international team of researchers recently discovered approximately 100 Jurassic-age volcanoes and associated lava flows deeply buried deep within the Cooper-Eromanga Basins of South Australia and Queensland. Although the petroleum industry had been exploring and producing from these basins, the largest continental hydrocarbon-producing region in Australia, since 1963, this underground volcanic landscape went largely unnoticed.

Hydrocarbon exploration had provided a massive amount of data from the subsurface but the volcanic rocks were not previously understood. The researchers used advanced subsurface imaging techniques, analogous to medical CT scanning, to identify the many cone-shaped volcanic craters and lava flows, as well as the magma chambers that fed them.

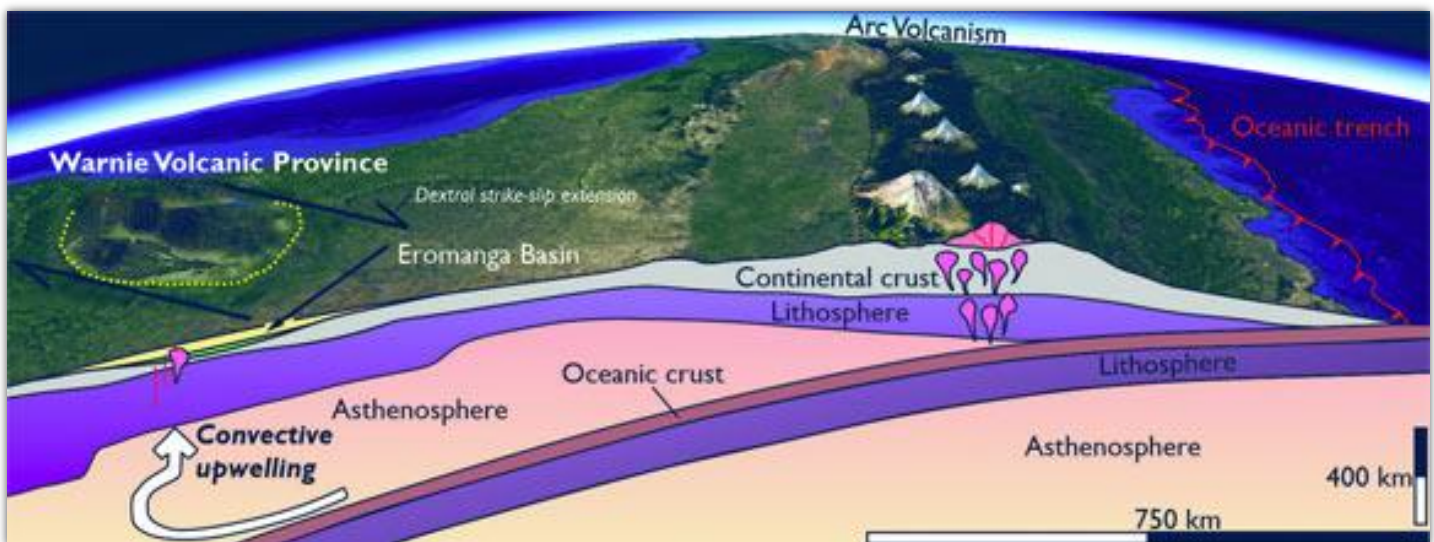
The Warnie Volcanic Province, as it has been named, covers about 2,900 square miles and was active between 180 and 160 ma, during the Jurassic. Although the basins are now a dry and barren landscape, during the Jurassic times the landscape would have been a world



Oil drilling in the Cooper / Eromanga Basin

of craters and fissures spewing hot ash and lava into the air, surrounded by networks of river channels that eventually evolved into large lakes and coal-swamps. The majority of Earth's volcanic activity occurs at the boundaries of tectonic plates and under the Earth's oceans. The Warnie Volcanic Province developed instead deep within the interior of the Australian continent. The discovery of this province raises the prospect that additional undiscovered volcanic provinces occur beneath the poorly explored surface of Australia.

<http://www.sci-news.com/geology/warnie-volcanic-province-07486.html>



Simplified geology of the Warnie Volcanic Province.

Fans of the animated *Ice Age* movies will be thrilled to know that something akin to Scrat, the “saber-toothed squirrel”, actually existed at one time. It is a new species of the Cynodontia, a group of animals that includes the long-extinct mammal-like “reptiles” and all mammals, including humans. The animal was found only as a fossilized skull in the Triassic rocks of the San Juan province of Argentina by paleontologists at the Institute and Museum of Natural Sciences at the University of San Juan.



Top – artist’s rendering of *Pseudotherium argentinus*.

Bottom – Scrat for comparison.



The skull was well-preserved when found at the Valle Pintado locality of the Ischigualasto Formation, so the researchers used high-resolution CT scans of the specimen to study its internal structure. Using the images, they could observe the developed inner ear, the loss of the post-orbital bar, and the presence of the turbinals that are like partitions that allowed this animal to heat the air entering its respiratory system, which would indicate that it was warm blooded.

Pseudotherium argentinus lived about 231 million years ago in a warm environment with abundant plantlife made up mostly of ferns and conifers. *Pseudotherium* was about 10 inches long, and had a long, flat, shallow snout with very long fangs situated almost at the tip of the snout – similar to Scrat. The long fangs could have served to nail and trap insects or prey or, if the animal was a male, they developed as a way to attract females. With only a single specimen, however, it is difficult to know for certain. **Scrat lives!**

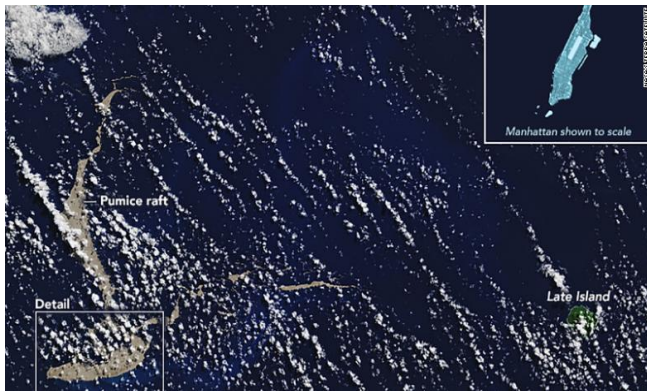
<http://www.sci-news.com/paleontology/pseudotherium-argentinus-07533.html>

Days after an underwater volcano near the Pacific island of Tonga erupted, sailors spotted a huge floating sheet of pumice on the surface of the ocean. The pumice “raft” is roughly the size of Manhattan and has been drifting towards Australia. As it has been traveling, it has been picking up hitchhikers - new marine life that could help with recovery of Australia’s Great Barrier Reef.

In 2016 and 2017, heat waves caused by climate change resulted in mass bleaching killed about half of the corals on the reef, as well as elsewhere in the world. Experts think that, if the pumice eventually gets to the Great Barrier Reef, it could help replenish some of

the marine life that has been lost. They believe the pumice raft is home to organisms like crabs and corals.

The raft is composed of pumice stones ranging in size from marbles to basketballs so close together that water could not be seen between them. Like an iceberg, about 90% of the pumice raft is below the waterline. It is moving at about 6 to 19 miles per day, its speed and direction largely the result of surface currents, waves, and wind. It is expected to drift with the current down to the Australian coast over the next 7 to 10 months where scientists hope it will have a positive effect on microorganisms.



Aerial photo of the floating pumice raft

Researchers have found that previous pumice rafts are one way the ocean can redistribute sea life. When the pumice gets to the Great Barrier Reef, the attached sea life will potentially introduce diverse new colonies of barnacles, corals, and other animals, plants, and microbiota. Millions and perhaps billions of healthy individuals representing tens of different species will arrive *en masse* along the Australian coastline where they will potentially find a new home.

Corals, of course, can't just jump off the pumice like crabs and other mobile animals. They would need to be within the reproductive age so they can spawn and release larvae to the reef. Eventually, the pumice will become waterlogged and sink to the ocean floor. When

that happens, even the sessile plants and animals will have a chance to grow and grow throughout the reef.

<https://www.cnn.com/2019/08/25/asia/pumice-stone-underwater-volcano-great-barrier-reef-intl/index.html>

Maps are an essential part of geology, so it is important to note that the first published map related to the geology of western Pennsylvania was Lewis Evan's 1755 map. Its title was:

A general Map of the Middle British Colonies, in America; Viz Virginia, Mariland, Delaware, Pensilvania, New-Jersey, New-York, Connecticut, and Rhode Island: Of Aquanishuonigy, the Country of the Confederate Indians; Comprehending Aquanishuonigy proper, their Place of Residence, Ohio and Tiiuxsoxrúntie their Deer-Hunting Countries, Couxsaxráge and Skaniadarâde, their Beaver-Hunting Countries; Of the Lakes Erie, Ontario and Champlain, And of Part of New-France: Wherein is also shewn the antient and present Seats of the Indian Nations of the Middle British Colonies.

Benjamin Franklin and his printing partner, David Hall, published the map and accompanying explanatory pamphlet in Philadelphia. The map was reprinted numerous times over the next 50 years, typically with new information and often with an updated title. There also were at least four pirated editions.

The map, which measures about 29.75 X 21.5 inches, is covered with numerous descriptive and explanatory notes. The top border shows the longitudes both east and west from Philadelphia (the American Greenwich?); standard longitude is shown at the bottom.



A portion of Evans 1755 map

Although the map is basically geographical and political in nature, it does indicate or imply several mineral resource localities in western Pennsylvania. For example, the word “Petroleum” appears on the Allegheny River between what is now Oil City and Franklin in Venango County. “Petroleum” also appears on the Ohio River near Wheeling, WV. European settlers considered petroleum, or crude oil, to be a useless substance until the Native Americans showed them it could be used for water-proofing canoes and clothing and for both internal and external medicine. Its use as a fuel came over 100 years later.

The map shows “Salt Lick Creek” (now called Indian Creek) in Westmoreland County, indicating that salt springs were available. In addition, “Redstone Creek” in Fayette County near what is now Brownsville implied the presence of coal (when coal burns in the ground, much as modern “bony” shale piles burn or smolder, the shale turns a bright red color called “clinker” or “red dog”).

To see and download Evans’ map, go to:

<https://upload.wikimedia.org/wikipedia/commons/1/18/EvansPownallMap1755.jpg>

Geologists from the Université du Québec à Montréal and the University of Florida have been taking the laws of physics and reversing them. That is, they are tracing the movement of heat backwards to see what the Earth’s interior looked like tens of millions of years ago. Using thermodynamic equations and present-day seismological data, the researchers create high-resolution, three-dimensional maps of ancient conditions deep below the Earth’s surface. They compare the result to a CT scan, with geological features in place of bodily organs.

The study is intended to reconstruct the phenomena that occurred under the North Atlantic Ocean at the Paleocene/Eocene boundary approximately 55 ma that might have led to a period of rapid global warming. At this time, the Earth was within what is known as the Paleocene-Eocene Thermal Maximum or PETM. Global temperatures have been estimated to have increased by at least 5°C (41°F), an escalation believed to be associated with a rise in greenhouse gases. At the time, little permanent ice could exist on the Earth’s surface, and sea levels rose.



Is it possible that Greenland and the Azores both looked like this 55 million years ago?

Although much hotter than today, the PETM interests many climate scientists as a possible warning of the conditions that could appear if humans continue to pump greenhouse gases into the atmosphere. Yet questions have

remained about what caused the release of gases during the PETM. Many geologists suspect that as the North Atlantic Ocean widened 55 million years ago, volcanic activity pumped lava into hydrocarbon-rich rocks that caused a rapid release of CO₂ and CH₄.

With maps generated during the study, the team believe they have reconstructed sources of this volcanic activity –two plumes of magma, one under Greenland and one under the Azores. The researchers are now interested in seeing what the Earth’s interior looked like 70 ma in other parts of the world.

https://www.researchgate.net/profile/Alessandro_Forte/publication/333771009_Two_deep-mantle_sources_for_Paleocene_doming_and_volcanism_in_the_North_Atlantic/links/5d13fb94299bf1547c821d53/Two-deep-mantle-sources-for-Paleocene-doming-and-volcanism-in-the-North-Atlantic.pdf



A team of researchers from Rensselaer Polytechnic Institute and the University of Texas at Austin is using a new technique to analyze minute amounts of gas trapped in Late Triassic rocks from the Colorado Plateau and the Newark Basin, which were about 621 miles apart on the Pangea supercontinent. The team’s results show that oxygen levels in these rocks increased dramatically by nearly a third in just a couple of million years, possibly setting the scene for a dinosaur expansion into the tropics of North America and elsewhere.

Over a period of around 3 million years, oxygen levels in the atmosphere jumped from around 15% to around 19% (today’s oxygen level is 21%). The researchers don’t know what caused this increase, but they did notice a concomitant drop in CO₂ levels at that time and suspect that these changes were global.



Artist’s rendering of *Chindesaurus bryansmalli*, one of the first dinosaurs.

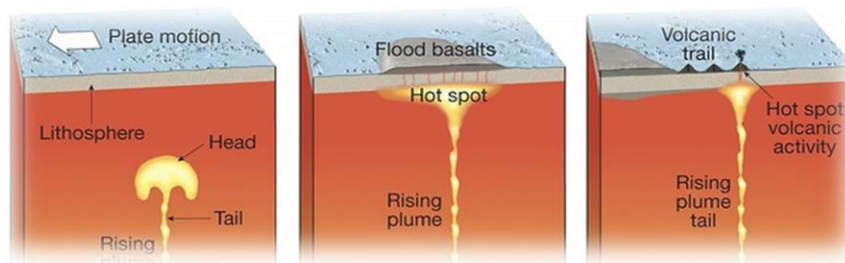
It is interesting that the first dinosaur, *Chindesaurus*, appeared in North America at the oxygen peak. *Chindesaurus* was carnivorous dinosaur about 6.6 feet long and nearly 3.3 feet high that walked upright on its hind legs. Apparently having originated in the North American tropics, it has been found extensively in North America and was an especially characteristic Late Triassic dinosaur of the American Southwest. *Chindesaurus* was soon followed by the sauropods, but it is difficult to determine if this was a global development because the dinosaurs did not rise to dominance until after the end-Triassic extinction.

Still, the changing environment 215 ma was important for their evolutionary diversification. These first dinosaurs were relatively small, but the higher oxygen levels in the atmosphere often are cited in association with larger size trends. Although dinosaurs had already achieved abundance earlier in South America, at about 232 ma, the new result is proving to add new data to the timing of oxygen rise and dinosaur appearance.

<http://www.sci-news.com/paleontology/elevated-levels-oxygen-rise-north-american-dinosaurs-07521.html>



PGS WEBSITE OF THE MONTH



<https://www.quora.com/What-is-a-mantle-plume-and-what-role-it-plays-in-plate-tectonics>

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Officer Contacts: If you wish to contact a PGS Officer, you can email Tamra Schiappa, President, at tamra.schiappa@sru.edu; Dan Harris, Vice President at Harris_D@calu.edu; Kyle Fredrick, Treasurer, at fredrick@calu.edu; or Diane Miller, Secretary, at dmiller@appliedgeology.net.

Memberships: For information about memberships, please write PGS Membership Chair, PO Box 58172, Pittsburgh PA 15209, or e-mail jharper.pgs@gmail.com. Membership information may also be found at 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 Dan Harris, Program Chair at Harris_D@calu.edu.

Newsletter: To contact the Newsletter Editor, Karen Rose Cercone, with questions or suggestions for articles, job postings or geological events, please email kcercone@iup.edu.

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

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Fun Fact Having Nothing to Do with Geology

On October 23, 1945, Jackie Robinson signed a contract with the Brooklyn Dodgers to become the first African American to play in Major League Baseball since the 1880s.



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