

# PITTSBURGH GEOLOGICAL SOCIETY

December 18, 2019

## MEETING TIMES

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

## DINNER COSTS

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

## RESERVATIONS

Email your name and  
number of attendees to:

[pgsreservations@  
gmail.com](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

## A Journey to Machu Picchu and the Galapagos



**Dr. Patrick Burkhardt**

**Department of Geography, Geology  
and the Environment,  
Slippery Rock University**

**Make Reservations by Wednesday, December 11**

## Speaker Abstract

Come and enjoy an adventurous travelogue! This excursion begins in Lima, commonest portal to Peru. Landscapes of the coast and marine terraces seat the vibrant modern society, albeit rich with pride in their Incan ancestry. A jumpy flight to the high Cordillera grounds near Cuzco and the ruins of Saqsawaman. Then, the Sacred Valley of the Rio Urubamba is traversed by bumpy road, rail, and the famed Inca Trail. Pachacuti's Royal Palace commands a dominant view of the approach to the fortress of Machu Picchu. The World Heritage Site Designation underscores the thrill of walking upon the stairs, temples, and terraces assembled by hand before the Spanish Conquest. Details of celestial awareness, architecture, faith and sacrifice, water supply, agriculture, and the clash of cultures will enrich the vivid photography. After immersion into pre-Incan times and the remarkable Incan people, our adventure bounds to the northern end of the Empire. Landing in Quito, set within the distinct valley that Alexander von Humbolt called the Avenue of the Volcanoes, the vibe of modern Ecuador is sure to entice a visit. In fact, the scenery might shake you, as it did with me, when a M 6.4 quake awakened me from slumber shortly after my arrival at the hotel! Nearby, we make two quick stops at both of the equators! Then, a couple short flights jump us to the Galapagos Islands. The largest airport lies on barren Baltra, just a quick ferry from Santa Cruz, where the famed tortoises roam. Rich tropical vegetation changes substantially across various biomes, with travel up the slopes of immense shield volcanoes, as well as those aspects segregated by precipitation trends so visible between windward and leeward slopes, relative to the Trade Winds. Snorkeling along the shores of Santa Fe allows one to encounter a myriad of marine life, snuggled amongst the boulders of basalt talus steeply ramped off the shoreline. Then, the famed isle of North Seymore is cluttered with iguanas and sea birds. From the time of Darwin's visit upon HMS Beagle to modern struggles for sustainability, the ongoing stories of these fabled islands are sure to enthuse everyone. Descriptions of cuisine, history, commerce, language, and environmental concerns will be woven into a tapestry of geologic wonder. Plan to capture abundant advice for your own visit!



## Speaker Biography

Dr "B" joined the faculty of Slippery Rock University in 1998, teaching Hydrology, Hydrogeology, Environmental Geology, Glacial Geology, and Geomorphology. He holds a PhD from Lehigh, '94; MSc from Washington State University, '87; and a BA from Case Western Reserve University, '85; all completed in Geology. His professional interests lie in water resources, landscape development, and environmental change. His students have examined the Badlands of South Dakota, glaciers in Alaska and Argentina, watersheds of Costa Rica, and many aspects of Pennsylvania geology. Back in the day, he worked for a time as a consulting hydrogeologist, pursuing water budget analyses, contaminant transport, and the remediation of petroleum hydrocarbon impacted aquifers. His research spans locales from the Arctic to the Antarctic, including tropical settings in between. One of his favorite activities is trekking in the footsteps of Charles Darwin, which has led to several scholarly reviews of the Master's works. He is happily married, with two fine daughters, who all enjoy pursuing adventurous discovery together. Recent destinations have include Death Valley, Machu Picchu, and the Galapagos, all told, not too shabby for a flat-lander urban lad born upon the Lake Erie shore!



## PRESIDENT'S STATEMENT

The life of a university geology professor may be different than many other professions but during the holiday season everyone feels the stress.



Before the holidays there are deadlines. For me, this deadline is the end of the semester. As this date gets closer, my anxiety increases, as final projects, assignments and exams are completed and graded.

Every semester I feel that there is so much more I want to teach my students, but I sadly have run out of time. I take the last week of classes to give them the most comprehensive knowledge, drawing all the little slices of knowledge into a cohesive dataset that they will use in their professional careers. My hope is that I have prepared them well enough to be successful in the geosciences, not only to solve problems but to be able to effectively communicate this to their client and/or the public.

This is what a university professor feels as the semester and year draw to an end. Other geologists are feeling pressures from clients and bosses as they wrap up projects before the end of the year. There can also be the stress from not having work because no one is starting new projects until after the New Year, or even from not having a job at all. Regardless of your position this time of year can be stressful.

One way to decrease anxious feelings during the holidays is to spend more time with family and friends. For many, the holiday season means sharing a meal and having long

discussions around the dinner table. The dinner table is more than just a flat surface where members of the family share a meal. It becomes the central gathering point where everyone meets to have long discussions. If your family is like mine, these long discussions range from talking about ancestry, the antics of growing up, the economy, job satisfaction or dissatisfaction, politics, weather and climate, and what is on the menu for the next meal.

There are papers written on the psychology of gathering around the kitchen table and the deeper meaning of this communal gathering. The data show that time spent around the flat wooden surface, sitting in potentially less than comfortable chairs, brings joy and much needed distractions from whatever stresses are felt as the year comes to a close.

This month's talk presented by Dr. Patrick Burkhart will be one that should be shared with others. December's program is designed for an audience of both scientists and non-scientists. We hope our members will bring family and friends, or young people who are interested in geology as a career, to enjoy the laughter and conversations over a meal. Please consider joining us for an interesting talk, good food and conversations around the table.

In closing, I want to remind you to renew your membership, and to encourage other colleagues to join and attend the monthly meetings.

Have a wonderful holiday season and I hope you find time to gather around the kitchen table to laugh a lot, cry a little and to share stories late into the night.

Happy New Year!

*Tamra*



# UPCOMING PGS MONTHLY MEETING



## ASCE-AEG-PGS Joint Meeting

I-79 Landslides near  
Pittsburgh, PA:  
A 50-year Perspective

James Hamel  
PhD PE PG

Hamel Geotechnical  
Consultants

The next PGS Dinner Meeting will  
be held on January 15, 2020.

## 2020 PGS SPEAKER SCHEDULE

<b>Meeting Date</b>	<b>Scheduled Speaker</b>	<b>Presentation Topic</b>
February 19, 2020	Barb Tewksbury, Hamilton College	Surface Features of Western Egypt
March 18, 2020	Kendra Murray, Idaho State University	Geochronology and Landscape Change
April 15, 2020	Student Research Night Joint Meeting with ASCE and AEG	Student Posters & Presentations
May 13, 2020	Randy Blood, PGS Award Winner DRB Geological Consulting	Energy Resources

The Pittsburgh Geological Society is delighted to welcome a new professional member who is a former student member from CalU, returning to the Pittsburgh area:

Michael A. Gabany

Teacher, Commonwealth Charter Academy

**We also welcome the following student members to the society.**

**From California University:**

Rachel Albert  
Stephen G. Backo  
Mathew G. Dearing Grover  
Cortney A. King  
Jennifer A. Miller

**From Clarion University:**

Jesse W. Hilliard

**From West Virginia University:**

D. Jesse Carpinello



**From Slippery Rock University:**

Lesa N. Bressanelli  
Marissa Butera  
Alexis G. Chamberi  
Joseph C. Cox  
Lance J. Fisher  
Nathan R. Goreczny  
Joanne P. Jundzilo  
Madeline J. Marshall  
Gabrielle T. Pezich  
Corinne A. Rockefeller  
Natalie E. Truini  
Keiichiro Wakabayashi  
Kaitlyn R. Whitewood  
Marissa A. Wiggins  
Corrina A. Yobp  
Ryan R. Ziegler

Register at [www.PAPGrocks.org](http://www.PAPGrocks.org)

*Annual*  
**PAPG - GSP - SPE - AADE**  
*Holiday Party*

Wednesday, December 11th, 2019  
Cefalo's - Carnegie, PA  
5-10 PM  
*\*Valet parking will be provided\**

Members: \$50/person, \$90/couple  
Non-Members: \$55/person, \$100/couple

Out of Work: \$35/person, \$60/couple  
Students: \$25/person, \$40/couple


Contact Kristin (Kutchak) DuBois @ 724.840.4596/[Kristin.Kutchak@Halliburton.com](mailto:Kristin.Kutchak@Halliburton.com) for more details!

# OTHER EVENTS OF INTEREST TO PGS MEMBERS



- HOME
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- JOIN PCPG
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- GOVERNMENTAL AFFAIRS
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- GEO LINKS
- ▶ COLLEGES & STUDENTS
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- CONTACT PCPG

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## 2-Day PG Review Course for the Practicing Geologist & ASBOG® Exam Candidate (900 mins.)

Start February 06, 2020  
7:30 AM

End February 07, 2020  
5:00 PM

Location Regional Learning Alliance, 850 Cranberry Woods Dr., Cranberry Twp., PA

Spaces left: 20

### Registration

- Member - Both Days – \$499.00  
Includes Continental and Lunch. Registration closes January 26.
- Non-Member - Both Days – \$699.00  
Includes Continental and Lunch. Registration closes January 19. To save \$200 over the cost of enrollment, return to the Home page and Join PCPG.



[Register](#)

Regional Learning Alliance  
850 Cranberry Woods Drive [DIRECTIONS](#)  
Cranberry Twp., PA

PCPG seminars quickly sell out. To confirm your seat, use our secure web enrollment and a credit card.

[Visit \*What others have said about this course.\*](#)

### Day One: Thursday, February 6

- General & Field Geology
- Mineralogy, Petrology, and Geochemistry
- Engineering Geology (Usually Day Two. Changed for 2020)
- Structure, Tectonics, and Geomorphology

### Day Two: Friday, February 7

- Seismology, Exploration Geophysics, Well Logging
- Hydrogeology
- Sedimentology, Stratigraphy, and Paleontology (Usually Day One. Changed for 2020)
- Economic Geology and Energy Resources
- About the ASBOG Test (Self-guided. Material included in the Day Two booklet.)

[Download Agenda.](#)

*Our instructors arrive wholly focused on your learning experience, and remain available via Email and telephone to answer questions after your departure.*

2-Day Format and Mock Tests  
Mock tests are a component of the seminar.



## OTHER EVENTS OF INTEREST TO PGS MEMBERS



### THE PENNSYLVANIA **BROWNFIELDS CONFERENCE**

MARCH 9-11, 2020

**The Penn Stater Hotel and Conference Center  
State College, PA**



**Call for Papers, Exhibit & Sponsor Reservations  
Opening Soon!**

Planned in collaboration between;

the [Pennsylvania Department of Environmental Protection](#) (DEP) and the [Engineers' Society of Western Pennsylvania](#) (ESWP), the conference (which is held in different cities in PA), offers high-quality educational sessions on important brownfield topics! Additional benefits include:

- Earn PDH Credits for select sessions throughout the day and a half conference!
- Conference activities, such as Mobile Workshops and Walking Tours highlighting the best of PA brownfields developments;
- An Exhibit Hall of companies and organizations who can help ensure a successful brownfields project;
- Networking reception and special guest speakers;
- a Special Grant Writing Workshop sponsored by the U.S. Environmental Protection Agency; and much more!

# THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Sometime around 1727, a French Huguenot trader named James LeTort set up a trading post on what is now Crooked Creek in the western part of what is now Indiana County. In 1784, Captain Andrew Sharp erected a cabin on the creek and cleared the ground for a farm and homestead for himself and his family. In 1822, shortly after construction of the Ebensburg and Butler Pike (now U.S. 422), Thomas and Joseph Sharp erected a house and sawmill, and later a gristmill known as Sharp's mill (which continued to grind grain until 1874). Soon, a village sprang up and took on the name Sharp's Mills.

That name remained until 1836 when Abner Kelly laid out the village lots and first offered them for sale. He called the village "Shelocta" in honor of an Indian chief who, as tradition had it, frequented "Caliposenk" (Crooked Creek). The Shelocta Post Office began operations on November 1, 1837, and the village was incorporated as a borough in 1851. Today, Shelocta is probably best known for its coal and natural gas resources, although rock-hounds may know it best as the site of a well-known fossil-collecting locality. For many years it was thought to be the Brush Creek marine zone but we now know it is actually the Pine Creek marine zone (lower Glenshaw Formation). The site is currently administered for educational field trips by the Geoscience Department at Indiana University of Pennsylvania (IUP).



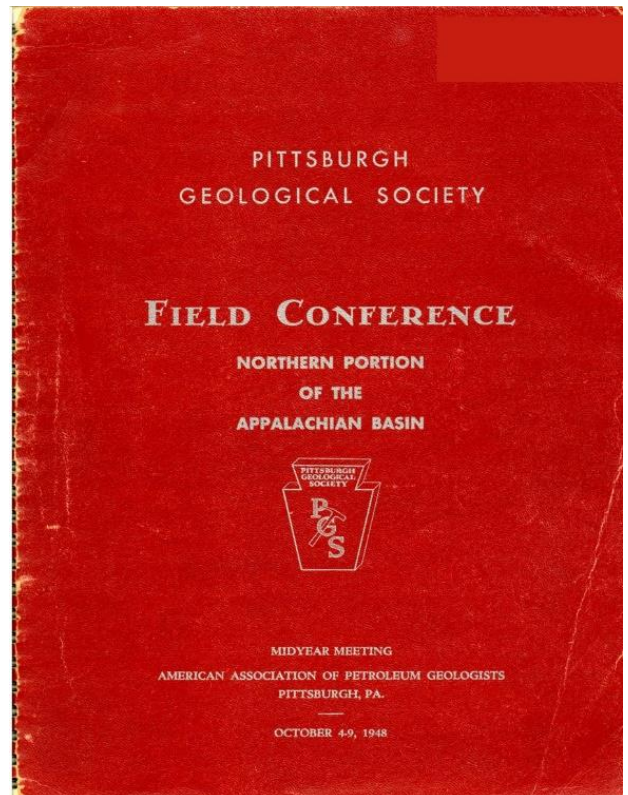
Faculty and students from the Geoscience Department at Indiana University of Pennsylvania shovel out talus from the Shelocta Pine Creek marine zone locality in the summer of 2015.

## DID YOU KNOW . . . ?



### Looking back 75 years ....

The intrepid founding members of the Pittsburgh Geological Society did not sit back and rest on their laurels after PGS was up and running. Within two years of its founding, the society had organized a symposium on the Ordovician System in the Appalachian Basin, and within three years had organized the Midyear Meeting of AAPG in Pittsburgh and published a guidebook for a field trip excursion around Pennsylvania and New York as part of the meeting. The symposium occurred on May 16, 1947 in Pittsburgh, and the speakers were encouraged to write up their reports for submittal to the AAPG Bulletin. AAPG published the papers in 1948 as most of volume 32, number 8 of the Bulletin.



Cover of the first field trip guidebook PGS published, for the 1948 AAPG mid-year meeting in Pittsburgh. The guidebook is available for downloading from the PGS website at <https://www.pittsburghgeologicalsociety.org/pgs-field-guides.html>.



The issue included:

- a foreword by John T. Galey (independent oil and gas operator who chaired the editorial committee)
- a summary of Middle Ordovician stratigraphy by Marshall Kay (Columbia University)
- descriptions of Cambrian and Ordovician rocks of the Michigan Basin and adjoining areas by George V. Cohee (USGS)
- the geology of the subsurface of New York by Ed Heck (Quaker State)
- the stratigraphy of subsurface Trenton and sub-Trenton rocks in Ohio, New York, Pennsylvania, and West Virginia by Charles Fettke (Carnegie Institute of Technology)
- a long exposition on the surface Trenton and sub-Trenton rocks of New York, Pennsylvania, and Maryland by Frank Swartz (Penn State)
- the Trenton and sub-Trenton stratigraphy of Virginia and Tennessee by C. E. Prouty (Pitt)
- the Trenton and sub-Trenton rocks of Kentucky by A. C. McFarlan (University of Kentucky) and W. H. White (California Oil Co.)
- a series of maps, a cross section, and data tables of the Kentucky subsurface by Coleman D. Hunter (Kentucky-West Virginia Gas Co.)

The AAPG Midyear Meeting was held at the William Penn Hotel on October 4-5, 1948. H. R. Brankstone (Gulf Oil Corp.) was General Chairman, John T. Galey (independent oil man) chaired the Program Committee, George C. Grow, Jr., (Peoples Natural Gas and PGS's first president) chaired the Field Trip Committee, Fordyce C. Hauber (Consolidated Natural Gas Co.) chaired the General Arrangements Committee, Sidney S. Galpin (Peoples Natural Gas) chaired the Finance Committee, and W. B. Robinson (Gulf Research and Development Co.) chaired the Publicity Committee. George Grow also compiled and edited the field trip guidebook, while Frank W. Swartz (Penn State) was the field trip leader. You can find the guidebook at:

[https://www.pittsburghgeologicalsociety.org/uploads/pubs/1948\\_Northern\\_Appalachians.pdf](https://www.pittsburghgeologicalsociety.org/uploads/pubs/1948_Northern_Appalachians.pdf).

All in all, the Pittsburgh Geological Society served the local, regional, and national geological communities very well in its early days. It has tried hard to continue that tradition throughout the past 75 years.

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Dr. Kirk Bryan, an AAPG Distinguished Lecturer, gave the second talk presented at a meeting of the newly formed Pittsburgh Geological Society in December 1944<sup>1</sup>. The talk was entitled "The Geological Antiquity of Man in America." Bryan (1888-1950) was born and grew up in Albuquerque, New Mexico. He attended primary schools there and, after spending a year at Blair Academy in New Jersey, he



**Dr. Kirk Bryan, an AAPG Distinguished Lecturer, presented the second talk ever given at a PGS meeting in December 1944.**

entered the University of New Mexico where he received his AB degree in geology in 1909, one of the first awarded at that school. He also attended Yale where he received a Ph.D. in 1920. He taught in the Geology and Geography Department of Harvard University, first as a visiting lecturer in 1924 and 1925, then as an Assistant Professor in 1926, progressing to a Full Professor by 1943.

Bryan was a geomorphologist who worked primarily in arid regions, and was one of the pioneers in explaining the forces that formed landmasses in those areas. He was an exceptional teacher whose students made important advances in geomorphology, glacial geology, and archaeology. In fact, of the four geologists who have received the National Medal of Science, three were his former students. Bryan ultimately received honorary degrees from Harvard and the University of New Mexico. Bryan's most distinguished honor, however, was being the namesake of the Geological Society of America's Kirk Bryan Award, which was established posthumously in 1951. The award is the Quaternary Geology and Geomorphology Division's only named GSA award. It is awarded annually to a young earth scientist in recognition

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<sup>1</sup> In the October 2019 issue of the PGS Newsletter, it was inadvertently stated that the first PGS talk, by Major Raymond C. Moore, was delivered in October 1944. That was the month PGS was formed, so there was no talk. Moore delivered his talk at the November 1944 meeting.

of a publication of distinction advancing the science of geomorphology or Quaternary geology. The award was established as the result of an outpouring of affection and funds from former students and associates when he died at the age of 62 in 1950. The award is richly prized, and many of its recipients salute Kirk in their acceptance speeches for his direct or indirect influence on their careers.

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We've known for a long time that a supermassive black hole sits at the center of our galaxy. Apparently, it likes to blow bubbles! Two gigantic gaseous orbs called *Fermi bubbles* stretch out into space about 25,000 light-years long each, which is roughly the distance between Earth and the center of the galaxy. Even that large, however, they are only visible using ultra-powerful X-ray and gamma-ray spectral equipment. Scientists know the Fermi bubbles are a few million years old, but it has been a mystery as to what caused them. A team of researchers recently came up with what they believe is a plausible explanation for the bubbles' origins by looking for evidence of the event in the scorched clouds of gas in one of the Milky Way's satellite galaxies.



**A pair of Fermi bubbles, shown by gamma-ray light, tower over the Milky Way, suggesting a gargantuan cosmic explosion from the center of our galaxy.**

According to the team, an epic flare of hot, nuclear energy that shot out of the galaxy's poles roughly 3.5 million years ago created the Fermi bubbles, which beamed into space for hundreds of thousands of light-years. The effect would have been similar to a light beam from a lighthouse that shone out of our galaxy's middle for 300,000 years.

Given the recent (cosmically speaking) date of the explosion that the team calculated, the blast may even have been visible to early humans. As amazing as it may seem, this occurred during the later part of the Early Paleolithic or the Middle Paleolithic Period when many of the early humans (*Homo erectus*, *Homo neanderthalensis*, early *Homo sapiens*, etc.) walked the Earth. If they had looked off in the direction of the galactic center, they would have seen some kind of giant ball of heated gas.

To date the explosion, the researchers looked to Hubble Space Telescope observations of the Magellanic Stream, a 600,000-light-year-wide arc of gas trailing behind two dwarf galaxies that orbit the Milky Way (known as the Small and Large Magellanic Clouds). From our vantage point on Earth, the Magellanic Stream spreads across half of the night sky as it surges through space some 200,000 light-years away. That's far away, but still close enough for neighboring galaxies to feel the heat of violent eruptions from our galaxy's central black hole.

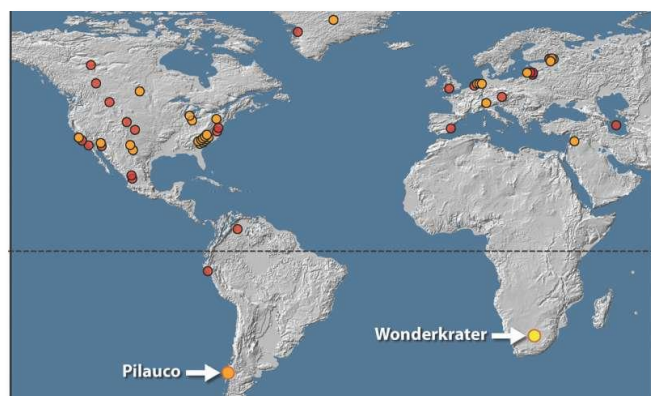
Although most of the hydrogen gas that makes up the Magellanic Stream is very cold, recent Hubble observations have revealed at least three large regions where the gas is unusually hot. Those regions align with the north and south poles of the Milky Way's galactic center, a clear sign that those hot regions were toasted by an enormous flare-up of charged particles beaming out of our galaxy and into deep space.

Mathematical models allowed the team to show how such an explosion of energy could blast out of the galactic center and reach all the way to the hottest regions of the Magellanic Stream. The calculations indicated that the explosion must have occurred between 2.5 and 4.5 ma when early humans and their ancestors were already evolving. Thanks to Earth's protective atmosphere, the kinds of flares that happened back then occur randomly in galaxies like the Milky Way, and research suggests that there may be others on the way. The researchers believe the most powerful solar bursts from our sun would be about the same power, which would be bad for satellites and space walkers but the Earth's atmosphere would protect life on the planet.

<https://www.livescience.com/seyfert-flare-blew-fermi-bubbles.html>

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A team of scientists from South Africa recently found evidence partially supporting the hypothesis that the Younger Dryas resulted from a large meteorite or asteroid that struck Earth 12.8 ka, leading to global climate change and contributing to the extinction of many species of large animals. The team discovered evidence of a platinum spike in a core sample dated at about 12.8 ka from a peat deposit at Wonderkrater in the Limpopo Province, north of Pretoria in South Africa. Meteorites are often rich in platinum, so the discovery at least partially supports the highly controversial Younger Dryas Impact Hypothesis (YDIH – see the [PGS Newsletter for May 2019](#) for additional information). Many large mammals became extinct in North America, South America, and Europe during the Younger Dryas. In South Africa, a few extraordinary large animal species, including a giant African buffalo, a large zebra, and a very big wildebeest, became extinct around 12.8 ka.



**This world map shows the locations of 12.8 ka platinum spikes discovered around the world. The Wonderkrater site in Limpopo Province, South Africa is the most recent discovery.**

Human populations may also have been indirectly affected at the time in question. In North America, stone tool technology of the Clovis people ended dramatically. Archaeologists have detected an almost simultaneous termination of the Robberg stone artifact industry in South Africa associated with humans in the area around Boomplaas in the southern Cape as well as at other localities.

Because of the controversial nature of the YDIH, the research team were cautious about suggesting that the technological changes in

North America and Africa at about the same time might have resulted from an asteroid impact that caused global climate change. It would have affected humans through local changes in environment and food resource availability. Based on pollen found at Wonderkrater, the team found evidence of temporary cooling associated with the Younger Dryas drop in temperature that is well documented in the northern hemisphere. Some scientists believe this cooling over widespread areas could potentially have been associated with the global dispersal of platinum-rich atmospheric dust.

So where did the asteroid or meteorite hit? A large crater 19 miles in diameter has been discovered in northern Greenland beneath the Hiawatha Glacier. According to the South African team, there is some evidence that it might have resulted from a large meteorite striking Earth 12.8 ka, which would have had global consequences. Younger Dryas platinum spikes have also been found in Greenland, Eurasia, North America, Mexico, and Chile. Wonderkrater is the 30th site in the world for such evidence.

Although authorities tell us that the probability of a large asteroid striking Earth in the future is low, there are thousands of very large rocks within the asteroid belt between Jupiter and Mars. One 1,115-foot-wide asteroid, called Apophis 99942, has been labeled a "Potentially Hazardous Asteroid." It will come exceptionally close to the Earth in about 10 years' time, with its closest encounter occurring on Friday, April 13, 2029. The probability of Apophis 99942 hitting the Earth at that time is only one in 100,000, but since it comes close to Earth every 10 years, the probability of an impact may be even higher at some time in the more distant future.

<https://phys.org/news/2019-10-hypothesis-asteroid-contributed-mass-extinction.html>

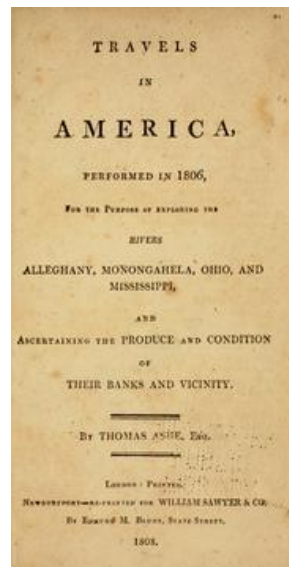
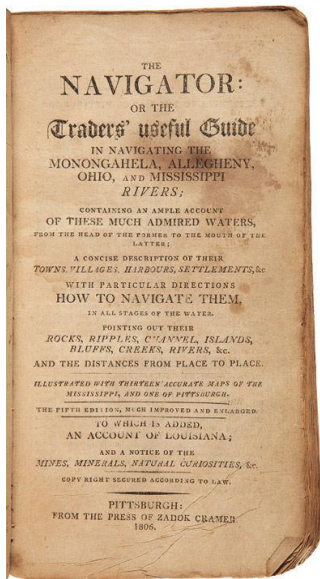
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During the 1800s, the earliest documentation of a geologic nature in southwestern Pennsylvania seems to have been Zadok Cramer's 1806 notification of an oil seep in Beaver County. Cramer (1773-1814), a Pittsburgh printer and bookbinder, began publishing the best known of



the early river guides, *The Navigator*, in 1801. Although originally intended as a handbook for western immigrants, it became the bible for early flatboatmen and keelboatmen on the rivers.

In a brief description of the little community of Georgetown, Beaver County, on the south side of the Ohio River near the border with West Virginia, Cramer wrote, “A few yards from the opposite shore, a spring rises from the bottom of the river, which produces an oil similar to Seneca oil, which is thought to proceed from a large bed of mineral coal in the vicinity of the spring.”



Left - Title page of Zadok Cramer's 1806 edition of *The Navigator*. Right – Title page of Thomas Ashe's 1808 *Travels in America*. These are the first two published reports of crude oil in southwestern PA.

Thomas Ashe (1770–1835), an Irish writer traveling through western Pennsylvania in 1806, also described the Ohio River seep in his memoirs titled *Travels in America*, published in 1808. He wrote: “The surface, about four feet in diameter, was covered over with an olive-coloured slime, here and there rising in lobes filled, but not agitated with confined air. On a more minute inspection however I perceived these globules burst and subside in gentle undulations, enclosing in a circle a matter whose colour was less deep than that prevailing on the general face of the well.

“On discovering other globules to rise in succession, I gently dipt up a gourd-full of water and globules, while in the act of rising through the surface. I spilt the whole on the blade of the paddle, and could distinguish, very plainly, the oil on which had been exposed to the air from the oil

which just rose in search of it. On sounding, I found the well to be sixty-five feet deep; that is as deep as the bed of the adjacent river. On examining the neighbourhood it was plain that coal abounded; but I could not take upon me to assert that the well or its sources had any communication with that or any other mineral.”

After analyzing the oil Ashe concluded: “From the spirit residing in the oil, the aromatic flavor and smell, it is not unreasonable to presume that it possesses medicinal virtues which, under a judicious administration, might be productive of salutary effects. . . the well was much frequented by the Indians previously to their retreat to the back countries, and that the neighbouring whites used the oil as a friction when suffering with rheumatism, and as an unction when afflicted with sores.”

Settlers learned of Seneca oil as soon as they moved into northwestern Pennsylvania and western New York in the early 1700s. It seeped into creeks and rivers and was considered a contaminant until the Native Americans taught them to collect it and use it as a lubricant, waterproofing sealant, and medication. Many settlers used Seneca Oil for medicinal purposes; it became a cure-all sold to alleviate pain and other problems as early as 1792. They also found that, when mixed with flour, it made an excellent axle grease. Eventually, settlers used it as fuel in their lamps to replace the diminishing supply and increasing expense of whale oil.

When “Col.” Edwin L. Drake proved you could get a ready supply of Seneca oil by using salt-well drilling technology, it set off a stampede of people looking to get rich quickly. The first well drilled in southwestern Pennsylvania was completed on the Ohio riverbank near the oil seep in the summer of 1860, less than a year after Drake completed his well. The oil from both the seep and the early wells came from what we now call the Homewood sandstone, the uppermost bed of the Middle Pennsylvanian Pottsville Formation, near where Beaver Creek flows into the Ohio. When the river was low the sandstone was exposed in the riverbed. Native Americans had at some point carved petroglyphs into the bedrock and these became an active tourist destination until water levels rose due to construction of the Stratton Dam in the late 1950s.

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Scientists recently found and described the 540-ma fossil of a new elongate, segmented, bilaterally symmetrical animal (bilaterian) named *Yilingia spiciformis* from near the end of the Ediacaran Period (635 - 539 ma). The animal had repeated segments on a three-lobed body, like a worm-shape trilobite. It is therefore very important for shedding light on the origin of segmentation in bilaterians. The body fossil is even preserved with the trail it produced, so it provides insights into the identity of the animals that made Ediacaran tracks and represents the oldest currently known evidence of an animal walking on Earth's surface. More importantly, it challenges the concept that animals as we know them today abruptly burst onto the scene during the Cambrian explosion.



**Like modern animals, *Yilingia spiciformis* had a distinct front and back end. Notice that the fossil tapers towards the rear (to the right).**

*Yilingia spiciformis*, which was as much as 11 inches long, appears to have been a biologically complex animal with a distinct front and rear end. The Ediacaran seas were rich in life, but many of the fossils have strange anatomical features unlike those seen in modern animals. As a result, paleontologists have had trouble relating Ediacaran creatures to those of the Cambrian Period, bolstering the concept that the Cambrian explosion represented the dramatic first appearance of “normal” animals. During the past few years, however, some Ediacaran organisms have been recognized as animals despite their peculiar anatomy, which suggests that animal life began millions of years before the Cambrian explosion.

Now *Yilingia spiciformis* pushes the concept further. Its segmented and bilaterally-symmetrical

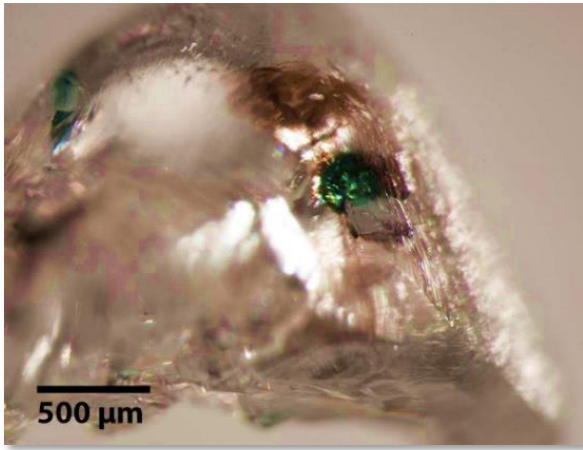
body indicates its anatomy was similar to that of Cambrian animals. Exactly which animal lineage *Yilingia* belongs to is unclear, however. It might be an arthropod because it seems to have leg-like structures. If additional study shows that those structures are only artefacts of the fossilization process, the animal might instead be some sort of primitive segmented worm. A third possibility is that it could be an ancestor to both groups. The hypothesis that segmented worms and arthropods evolved from a common ancestor dates back to the nineteenth century, but it is now controversial because most researchers currently think that arthropods are more closely related to nematodes and other creatures that grow by shedding an exoskeleton.

The team that described the new animal think the evolution of segments could have been a key event in the history of animal life. Segmented animals might have been able to evolve more or fewer segments without fatally disrupting their biology, so once a single group of segmented animals evolved, there might have been great potential to diversify into a whole range of lineages adapted to new niches. Not everyone agrees, of course (what fun would that be?). At least one paleontologist thinks segmentation probably arose several times during animal evolution. *Yilingia* might even belong to a completely different branch of the evolutionary tree of animals that has long since been extinct.

<https://www.nature.com/news/what-sparked-the-cambrian-explosion-1.19379>

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A team of geologists from the Canada, Scotland, and the US found a new mineral in a diamond that formed at great depth. The single 100- $\mu\text{m}$  grain, named goldschmidtite, was found as an inclusion in a dodecahedral diamond from the Koffiefontein kimberlite pipe in South Africa. It is a dark green mineral with an adamantine luster having density of 5.32 g/cm<sup>3</sup>. Its formula is (K,REE,Sr)(Nb,Cr)O<sub>3</sub>. Goldschmidtite has high concentrations of niobium, potassium, and the rare earth elements lanthanum and cerium, unusual in a mantle dominated by elements like magnesium and iron. The mineral must have formed under exceptional processes that concentrated potassium and niobium as a major proportion of the mineral.



**A broken and rounded dodecahedral diamond from a kimberlite pipe in South Africa. The new mineral, Goldschmidtite (green) can be seen associated with radiation damage (brown) of the diamond.**

Goldschmidtite is thought to have formed at a depth of about 106 miles below the surface. It is very unusual to find an inclusion in a diamond. It gives mineralogists a snapshot of the fluid-processes that affect the deep roots of continents during diamond formation. The name goldschmidtite is in honor of Victor Moritz Goldschmidt, the founder of modern geochemistry. Although several attempts have been made to name new minerals after Goldschmidt, all previous ones were discredited.

[www.sci-news.com/geology/goldschmidtite-mineral-earths-mantle-diamond-07624.html](http://www.sci-news.com/geology/goldschmidtite-mineral-earths-mantle-diamond-07624.html)

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The Mediterranean region is one of the most geologically complex regions on Earth. The evolutionary history of the mountain ranges and seas in the region recently was reconstructed for the first time when geologists from various countries spent 10 years studying all the mountain ranges from Spain to Iran in detail. The new research revealed how a piece of continental crust the size of Greenland that had separated from North Africa became subducted into the earth's mantle under southern Europe. Most of the mountain chains that the researchers investigated originated from a single continent that separated from North Africa more than 200 ma. The only part of the newly identified continent remaining is a strip of land that runs from Turin in northwestern

Italy down the eastern side of the country to the heel of the Italy's "boot." Geologists refer to that area as "Adria," so the lost continent is known as "Greater Adria." Most of the continent was underwater with sediment deposited in shallow, tropical seas. The resulting sedimentary rocks were scraped off when the rest of the continent subducted into the mantle. These scrapings are now the mountain belts of the Apennines, parts of the Alps, the Balkans, Greece, and Turkey.



**Reconstruction of Greater Adria, Africa, and Europe about 140 million years ago.**

While plate tectonics assumes that the various tectonic plates do not deform internally when they move with respect to each other, that is not the case in the Mediterranean region, especially in regard to Turkey. The region has been called a geological mess because everything is curved, broken, and stacked. By comparison, the Himalayas are a relatively simple system where you can follow several large fault lines across a distance of more than 1250 miles. The geologists who helped reconstruct Greater Adria made a substantial contribution to our fundamental knowledge about mountain range formation. Their research provided a large number of insights about it, as well as about volcanism and earthquakes, that they have been applying elsewhere. There are even economic aspects related to the research. Ore deposits and building stones commonly are found in mountain belts such as those in the areas investigated. The reconstruction of Greater Adria, therefore will be useful in the search for new resources.

[www.uu.nl/en/news/mountain-range-formation-and-plate-tectonics-in-the-mediterranean-region-integrally-studied-for-the](http://www.uu.nl/en/news/mountain-range-formation-and-plate-tectonics-in-the-mediterranean-region-integrally-studied-for-the)



# PGS WEBSITE OF THE MONTH



<https://www.universetoday.com/40229/what-is-the-earths-mantle-made-of/>

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## ***Fun Fact Having Nothing to Do with Geology***

In the United Kingdom, it is illegal to eat mince pie on Christmas Day.



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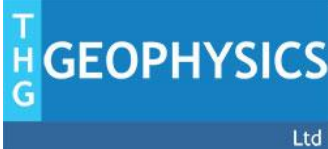
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