PITTSBURGH GEOLOGICAL SOCIETY

October 17, 2018

Social hour	**6:00 PM**
Dinner	**7:00 PM**
Program	**8:00 PM**

Dinner costs
$30.00 per person
$10.00 student member

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

You can also reserve and pay via PayPal at:
https://www.pittsburghgeologicalsociety.org/

Location
Foster's Restaurant
Foster Plaza Bldg. 10
Green Tree PA

Flow or Blow? Why the Deformation of Magma is Critical to Understanding Volcanic Eruptions

Dr. Graham Andrews

West Virginia University

Deadline for reservations is noon on Monday, Oct 15.

Speaker Abstract

How magma flows is a key constraint on whether a volcano will erupt lava or erupt explosively: one of the ultimate questions in volcanology. Due to the difficulty of imaging the volcanic conduit, and the danger of examining volcanic eruptions up-close, volcanologists rely on a combination of experimental modeling and the examination of ancient deposits. In this presentation I will highlight some of the projects I have been involved in where an understanding of flow and deformation in volcanic rocks, often in collaboration with experimental petrologists, elucidates the processes, magnitudes, and timescales of magma flow and deformation. My PhD research in Idaho examined unusual volcanic deposits that were so hot that they welded themselves back together after being erupted explosively, and flowed across the inundated landscape for weeks to months after the eruptions ceased. Structural studies there and in other deposits and lavas in California show that complex flow histories can be unraveled and quantified allowing for the construction and testing of sophisticated thermo-rheological models. These models, in turn, can be used to predict how magma flows below and within volcanoes, and whether or not that flow will cause or inhibit explosive eruptions. I will also demonstrate some of the new technologies we use to characterize volcanic rocks better than ever before.

Speaker Biography

Dr. Graham Andrews is a volcanologist at West Virginia University interested in the physical processes during and after volcanic eruptions. Dr. Andrews teaches mineralogy, petrology, volcanology, and fieldschool, and currently has several students working in volcanology and geomorphology.

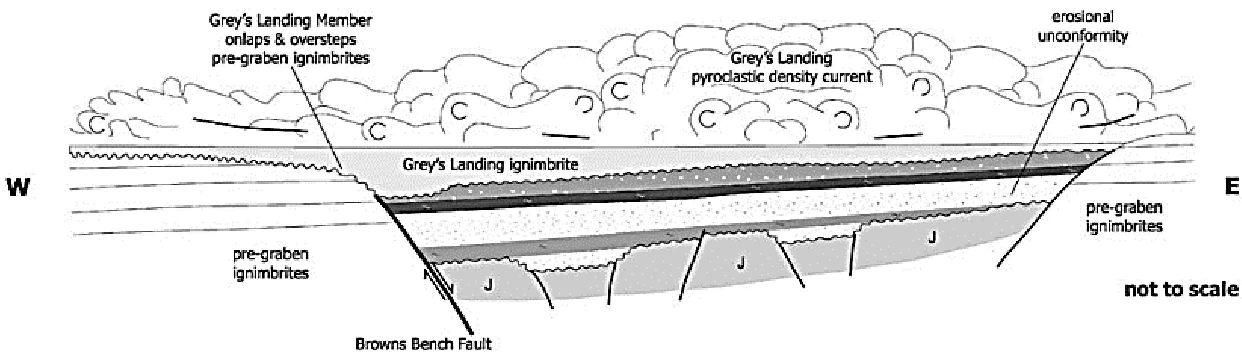
A graduate of the University of Leicester, UK, Dr. Andrews and his students use extensive fieldwork and textural descriptions of rock samples to understand how magma flows within volcanic plumbing systems and how lava flows on the Earth's surface. His PhD research focused on the eruption and deposition of pyroclastic flows from ancient supereruptions in Idaho, and this has developed into several studies of how volcanic materials flow and deform, and in particular, understanding how structural geology can reveal the magnitude of deformation. This line of research requires collaboration with experimental petrologists to build sophisticated thermo-rheological models of how and for how long, magma or lava will flow.

Dr. Andrews' research has taken him to academic positions in British Columbia and California before West Virginia, and fieldwork throughout the western US, and northern Mexico, Namibia, a research cruise off Japan, and most recently Long Valley caldera.

About the Cover Image

The Miocene Grey's Landing ignimbrite of southern Idaho is part of the southern Snake River Plain volcanic province. Rhyolite magma erupted as a pyroclastic density current and travelled as a dispersed cloud of hot ash and gas for tens of kilometers across the Earth's surface. After it deposited, the ash welded back together into a solid mass that remained hot enough to flow downhill like a lava.

To learn more about this ignimbrite, check out: https://graham-andrews-geologist.squarespace.com/s/Andrews-et-al-2008_Rogerson-Graben-stratigraphy.pdf



Next month's PGS Dinner Meeting will be held on November 14, 2018.

Dr. Shannon Kobs-Nawotniak

My life as a faux astronaut

How exploring Earth's lavas help us search for extraterrestrial life

Assistant Professor

Idaho State University Geosciences

PRESIDENT'S STATEMENT

Fall is my favorite season. It is a transition period that prepares us for the winter months. The sun sets earlier, the nights are cooler and the mornings are dark and cool with dew covering the landscape.

Fall is also my favorite time for field work or running field trips as the vegetation begins to die back exposing the rock and its hidden treasures. Field work is a vital part of geology and perhaps the reason most of us have chosen geology as a career. Fall happens to be the time when PGS begins to plan our spring field trip. Please let us know if you have suggestions for a field trip or would like to run a field trip for PGS. You can either email me or one of the Board members or talk to us at the next meeting.

Slippery Rock students on a fall field trip.

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 (usually a 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.

PGS purchased new computer equipment over the summer to improve the quality of the monthly presentations. We are also looking to improve our sound quality and will be upgrading to a new system sometime within the next few months. September's meeting was very well attended and I would like to thank Dr. Stephen Marshak for taking time out of his travel schedule to present at our meeting.

This month, guest speaker, Dr. Graham Andrews from WVU Volcanology and Petrology Lab will be presenting on new technologies to examine volcanoes and their eruptive history. Please plan on attending to gain a better understanding of semi-molten flow processes related to volcanism and the resulting rock types.

I would like to remind everyone to renew your 2018-2019 PGS membership either at the meeting, via the website, or by mail.

Tamra

LOCAL GEOLOGICAL EVENTS

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS EASTERN SECTION MEETING

October 7-11, 2018
Numerous scientific presentations, workshops, posters and field trips throughout the week.
Wyndham Grand Hotel, Pittsburgh PA

GEOPHYSICAL SOCIETY OF PITTSBURGH

October 11, 2018
"Seismic reservoir characterization of Utica-Point Pleasant shale" by Satinder Chopra, TGS
Cefalo's Banquet & Event Center, Carnegie PA

HARRISBURG-AREA GEOLOGICAL SOCIETY

October 11, 2018
"Rare Earth Elements in Coal" by Tom Gray, P.E., of TetraTech, Inc. (location TBA)

SOCIETY OF WOMEN ENVIRONMENTAL PROFESSIONALS – THREE RIVERS CHAPTER

October 17, 2018
"Meet Ellen Shultzabarger, Director of the Bureau of Forestry for the PA DCNR"
Tree Pittsburgh, 32 62nd St, Pittsburgh, PA

SOCIETY OF MINING ENGINEERS & PITTSBURGH COAL MINING INSTITUTE OF AMERICA 2018 ANNUAL JOINT MEETING

October 18-19, 2018
Keynote Luncheon: "The Future of Coal" by James A. Brock, President and CEO, Consol Energy.
Hilton Garden Inn-Southpointe, Canonsburg, PA

PITTSBURGH ASSOCIATION OF PETROLEUM GEOLOGISTS

October 25, 2018 (lunch meeting)

"Lowering the Cost of Obtaining Borehole Images and Caliper Measurements in Lateral Wells"
Cefalo's Banquet & Event Center, Carnegie PA

The Pittsburgh Geological Society is happy to welcome the following new members:

Daniel J. Bain
Assistant Professor, University of Pittsburgh
2004 PhD in Geography and Environmental Engineering from Johns Hopkins University

Russell J. Kanith
Geologist, HDR Engineering, Inc.
1993 BS in Geology, Edinboro University of PA

Robert J. McGinnis
2018 MS in Geology from the University of Akron

David O. S. Oakley
Instructor, Slippery Rock University of PA
2017 PhD in Geosciences from Penn State.

William K. Vincett, III, GIT
Carnegie Museum of Natural History
2017 BS in Geology from University of Vermont.

New Student Member from Allegheny College
Lauren A. Kanavy

New Student Members from California University of Pennsylvania
Patrick E. Creek
Makayla R. Froseth
Hayden A. Heinrich
Bradley M. Mann
Khang Q. Nguyen
Rebecca R. Randall

New Student Members from Slippery Rock University of Pennsylvania
Colton W. Byers
James E. Cochran
Ariel D. DaSilva
Caylee E. Jayne
Emily K. V. King
Destiny S. Yount

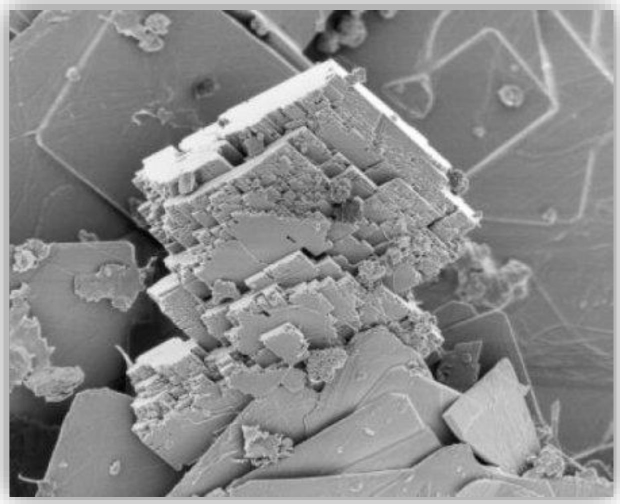
THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Hidden Valley ski resort near Donegal, PA as it will soon look.

The Borough of Donegal, nestled in the Ligonier Valley of Westmoreland County between Chestnut Ridge and Laurel Hill, is well known to skiers as the Pennsylvania Turnpike exit for Seven Springs and Hidden Valley resorts, and to hikers as a stepping-stone to the Laurel Highlands.

In the 1800s, however, it was little more than a stagecoach stop along the turnpike from Somerset to West Newton (now PA Route 31). Founded in 1818 and named for Donegal, Ireland, the village was incorporated as part of Donegal Township on August 20, 1867. At the time, the turnpike was a major route for travelers between the Monongahela River and south-central Pennsylvania where they could easily get to the National Pike at Cumberland, Maryland. Donegal also allowed turnpike travelers easy access to Ligonier to the north. Although considered the smallest municipality in the county, the borough at one time had five general stores, three millinery shops, a hotel, blacksmith shop, brass foundry, barbershop, and funeral home.

DID YOU KNOW . . . ?



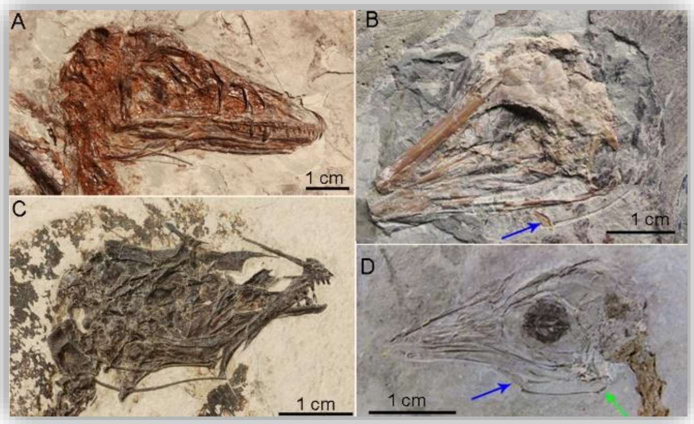
A natural magnesite crystal.

Scientists have been trying for years to slow global warming by removing CO_2 from the atmosphere, but there are immense limits, both practical and economic, to developing a technology that will work. Many researchers have looked at using the mineral magnesite ($MgCO_3$), which is known to be able to sequester CO_2 by incorporating the gas molecules into the mineral. Until recently, however, there was no way to produce the mineral rapidly enough to combat the current increase in the gas (a metric ton of naturally-occurring $MgCO_3$ can sequester about ½ metric ton of CO_2, but the rate of mineral formation is very slow).

Now scientists from Canada have found a way of producing magnesite rapidly in the lab. The process of forming magnesite naturally takes hundreds to thousands of years at Earth's surface. The researchers found that, by using polystyrene microspheres as a catalyst, magnesite would form within a mere 72 days. The microspheres themselves are unchanged by the production process, so ideally they can be reused. If the process can be developed at an industrial scale, it will allow the removal of large volumes of CO_2 from the atmosphere for long-term storage, supposedly countering the global warming effect of atmospheric CO_2. Use of the microspheres helped speed up magnesite formation by orders of magnitude. Since the process takes place at room temperature, magnesite production also is extremely energy efficient. Yes, the process is still in the experimental phase, and will need to be scaled up before we can be sure that magnesite can be used in carbon sequestration. The scientists pointed out that it will depend on the price of carbon and the refinement of the sequestration technology among other things, but at least they now know that the science makes it feasible.

https://www.sciencedaily.com/releases/2018/08/180814162608.htm

It turns out dinosaurs probably couldn't stick out their tongues the way snakes and lizards do.



Fossils with hyoid bones intact: (A) *Microraptor zhaoianus*, (B) *Confuciusornis* sp., (C) *Enantiornithine* sp., (D) *Hongshanornis longicresta*. The blue and green arrows point to the hyoid apparatus.

According to paleontologists at the Chinese Academy of Sciences tongues are usually overlooked in vertebrate studies, but they can offer key insights into the lifestyles of extinct animals. The discovery resulted from a comparison of the bones that support and ground the tongue (hyoid bones) of extinct dinosaurs, pterosaurs, and alligators to the hyoid bones and muscles of modern birds and alligators. Although hyoid bones serve as anchors for the tongue in most animals, in birds they can extend to the tip. Because dinosaurs were related to crocodiles, pterosaurs, and modern birds, by comparing anatomies scientists can understand the similarities and differences in tongue anatomy and how traits evolved through time and across different lineages.

The researchers took high-resolution images of hyoid muscles and bones from 15 modern species – three alligators and 13 birds as diverse as ostriches and ducks. The fossil specimens studied included pterosaurs, small bird-like dinosaurs, and even a *T. rex*. The results indicate that the hyoid bones of most dinosaurs were like those of alligators and crocodiles, i.e., short, simple and connected to a tongue that was not very mobile. In contrast to the short hyoid bones of crocodiles and dinosaurs, the scientists found that pterosaurs, bird-like dinosaurs, and living birds have a great diversity in hyoid bone shapes.

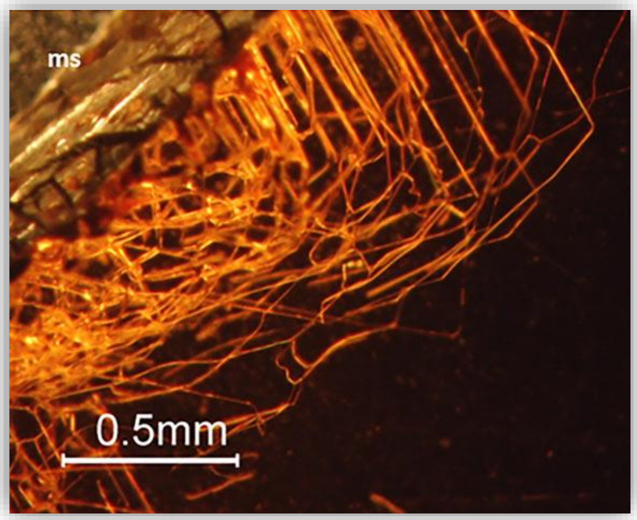
The scientists speculated that the range of shapes could in these groups be related to flight ability, or in the case of flightless birds such as ostriches and emus, evolved from an ancestor that could fly. Birds in general have elaborate tongue structures that might be related to the loss of dexterity that accompanied the transformation of hands into wings - perhaps once they couldn't use their hands to manipulate prey, their tongues may have become much more important to manipulate food.

The researchers noticed one exception linking tongue diversity to flight – the ornithician dinosaurs, the plant eaters like *Triceratops* that chewed their food had hyoid bones that were highly complex and more mobile, although they were structurally different from those of flying dinosaurs and pterosaurs.

http://www.sci-news.com/paleontology/dinosaurs-tongues-06126.html

According to new research led by the scientists from Denmark, tubular structures found inside garnets (pyrope and almandine) from Thailand are most likely the result of microorganisms called endoliths living inside these crystals. Endoliths typically live in rocks and minerals, but also shells, corals, and wood. They include forms of bacteria, fungi, algae, and several animal groups. The typical advantage of an endolithic lifestyle is obtaining residence space on a substrate that provides a stable and protected environment, as compared to being outside. Some endoliths move into existing cavities, whereas others burrow their way in through either physical force or chemical dissolution.

The Danish researchers examined the structures and contents of intricately branching tunnels inside garnet crystals from river sediments and soils in Thailand in order to determine whether abiotic or biological processes formed the tunnels. Chemical analysis of the tunnels found lingering organic compounds and filament-like structures reminiscent of bacteria and fungi, strongly suggesting that microbes once lived inside. Whether or not these organisms excavated the tunnels is less clear. The tunnels originate at the grain surface and extend into the mineral. They typically were funnel-shaped, with hexagonal or rectangular cross sections in the coarser portions, more rounded towards the tip. The diameters of the openings vary considerably, from about 5 μm to about 100 μm. The tunnels typically were straight near the openings to the mineral surface but tended to change direction or branch toward the tips. Tunnel direction sometimes changed sharply with a kink, but they typically followed a smooth and sinuous curvature, suggesting that the direction was not governed primarily



Microphotograph of network of tubular structures originating at the mineral surface and stretching into the garnet relatively localized to the margin of the garnet. (ms = mineral surface).

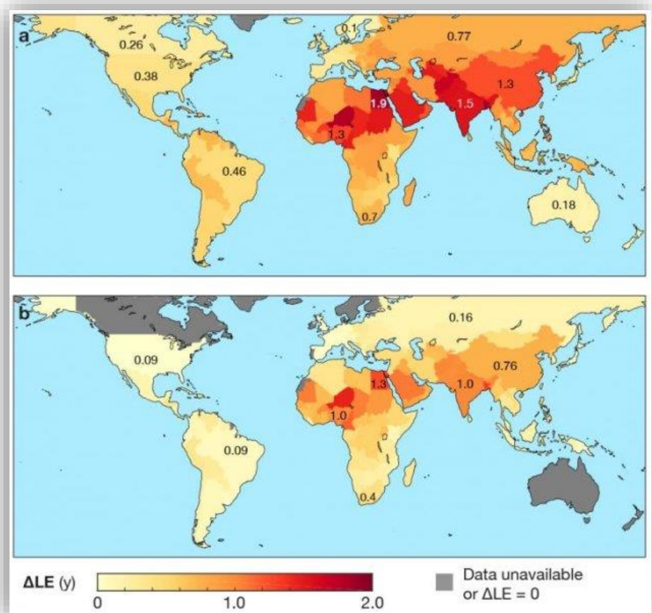
by crystallography.

As commonly occurs in much larger trace fossils left by megafauna ("worms" and such), some endolith tunnels were arch-shaped with both ends at the same surface close to each other, whereas others reached from one side of a grain to the other, right through the mineral grain. Some of the tunnels contained filamentous structures with a diameter of 5–15 μm and lengths of at least a few hundred μm.
Using a microscope, the researchers noted the shapes of the tunnels didn't completely rule out an abiotic origin, but certain features characteristic of endolithic lairs, such as anastomoses (connecting passages between adjacent tunnels) suggest the tunnels were at least partially formed by endolithic microbes. As fascinating as these tunnels are, they unfortunately decrease the quality and value of the garnets as gems significantly. So, if you're looking for good gem-quality garnets, you don't want to see endolithic tunnels. But if you are a microbiologist, you will be fascinated to know that some iron-oxidizing microbes are taking advantage of a good source of iron in the environment.

http://www.sci-news.com/biology/tunnel-like-networks-garnets-endolithic-microorganisms-06290.html

A new study from a team of environmental engineers and public health researchers finds that air pollution shortens human lives by more than a year. Better air quality could lead to a significant extension of lifespans around the world. This is the first time that data on air pollution and lifespan has been studied together in order to examine the global variations in how they affect overall life expectancy. The researchers looked at outdoor air pollution from particulate matter smaller than 2.5 μm (referred to as PM2.5). Such fine particles can enter deep into the lungs; breathing PM2.5 has been linked to increased risk of heart attacks, strokes, respiratory diseases and cancer. Power plants, vehicles, fires, and agriculture and industrial emissions are primary sources of PM2.5 pollution.

The team, led by researchers from the Cockrell School of Engineering at The University of Texas at Austin, used data from the Global Burden of Disease Study to measure PM2.5 air pollution exposure and its consequences in 185 countries. They then quantified the national impact on life expectancy for each individual country as well as on a global scale. Fine-particle air pollution is a well-known major global killer. The researchers found that air pollution has a very large effect on survival -- on average about a year globally.



Top: How air pollution shortens human life expectancy around the world. Bottom: Gains in life expectancy that could be reached by meeting World Health Organization guidelines for air quality around the world.

By comparison with other significant phenomena negatively affecting human survival rates, this is a big number. The benefit to survival of improving air quality is considerably larger than the benefit we might see if we found cures for both lung and breast cancer combined, according to the team. In countries like India and China, the benefit of improving air quality for elderly people would be especially large. For much of Asia, if air pollution weren't a risk for death, 60-year-olds would have a 15 to 20% higher chance of living to age 85 or older than they do now. To put it in context: saying that 90,000 Americans, or 1.1 million Indians dying each year from air pollution is impressive because large numbers are impressive. But it doesn't put a face on the problem. Saying that, on average, a population lives a year less than they would have otherwise, is much more relatable.

https://www.sciencedaily.com/releases/2018/08/180822112406.htm

A researcher from England thinks the French Emperor Napoleon Bonaparte was defeated at the Battle of Waterloo by geology. Historians have known for two centuries that rainy and muddy conditions helped the Allied army defeat Napoleon at Waterloo, an event that changed the course of European history. Now, it seems, electrically charged volcanic ash from Mount Tambora short-circuited Earth's atmosphere in 1815, causing poor weather globally – and therefore Napoleon's defeat.

Napoleon and the French army at the Battle of Waterloo, 1815

Mount Tambora erupted on the Indonesian island of Sumbawa two months before the battle, killing 100,000 people and plunging the Earth into a 'year without a summer' in 1816. The researcher discovered that electrified volcanic ash from eruptions can "short-circuit" the electrical current of the ionosphere, the upper level of the atmosphere that is responsible for cloud formation. Dr. Matthew Genge of the Imperial College of London, suggested that the Tambora eruption ultimately led to a pulse of cloud formation that brought heavy rain across Europe. His research showed that volcanic eruptions can hurl ash much higher than previously thought into the atmosphere -- up to 62 miles above ground.

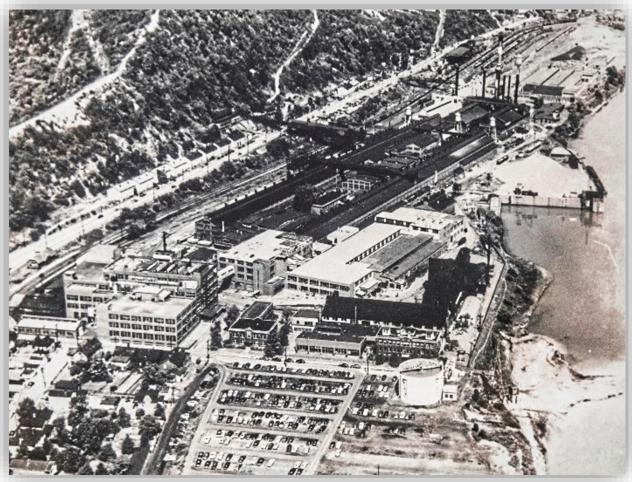
Geologists used to think that ash gets trapped in the lower atmosphere, because volcanic plumes rise buoyantly. His research showed instead that ash can be shot into the upper atmosphere by electrical forces. Using a series of experiments, he showed that electrostatic forces could lift ash far higher than by buoyancy alone, and then created a model to calculate how far charged volcanic ash could levitate. What he found was that particles smaller than 0.2 µm in diameter could reach the ionosphere during large eruptions. Volcanic plumes and ash both can have negative electrical charges, so the plume tends to repel the ash similar to the way two magnets push away from each other if their poles match, sending the ash high in the atmosphere.

Since weather records are sparse for 1815, Dr. Genge tested his hypothesis by examining weather records following the 1883 eruption of the more infamous Indonesian volcano, Krakatau. Those data showed lower average temperatures and reduced rainfall almost immediately after the eruption began, with global rainfall reduced during the eruption. He also found reports of ionospheric disturbance following the 1991 eruption of Mount Pinatubo in the Philippines, which he speculated could have been caused by charged ash in the ionosphere from the volcano plume. In addition, Dr. Genge noticed a special cloud type called noctilucent clouds appeared more frequently than usual following the Krakatau eruption. Noctilucent clouds are rare and luminous, and their presence in the ionosphere results from electrostatic levitation of ash from large eruptions.

Noctilucent clouds shine brightly in the night sky.

In his novel, *Les Miserables*, the great French author, Victor Hugo, wrote "an unseasonably clouded sky sufficed to bring about the collapse of a World", meaning the Battle of Waterloo. Thanks to Dr. Genge's work, we are a step closer to understanding Tambora's part in the battle from half a world away.

https://www.sciencedaily.com/releases/2018/08/180822101037.htm



A 1952 aerial photo of PPG's first glass-making plant in Creighton, Pennsylvania.

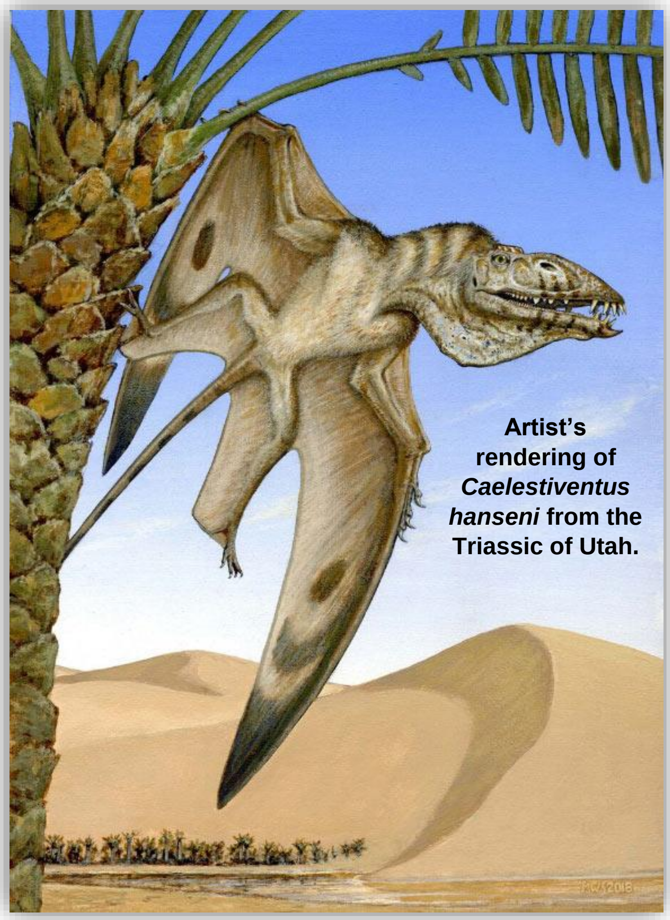
The Pittsburgh Glass Works plant in Creighton closed recently because the company operates more technically-advanced facilities elsewhere in the U.S., Mexico, and Poland. Erected in 1883 by Pittsburgh Plate Glass (now PPG Industries), and originally using glacially derived sand dredged from the Allegheny River, it was the first successful commercial and plate glass business in the U.S., but recent changes in demand and company strategies have left it obsolete.

Over the years, the plant, which has a production area of 140,000 square feet spanning two floors, churned out glass used in the first sedans sold with windshields, in airplanes piloted by American soldiers in World War II, and in buildings across the U.S. Before closing, it was capable of producing approximately 2 million windshields annually. Although employment reached its peak in the 1950s, by the 1960s PPG had stopped making glass at the plant and converted it to a fabrication shop. In the 1980s the company phased out their aircraft glass fabrication and modernized the plant with computer controlled robotic technology and temperature-controlled kilns. Then by 2008, PPG had shifted from glass and chemicals manufacturing to increasing sales in paints and coatings.

The company sold its controlling interest in its automotive glass segment, including the Creighton plant, to a private investment firm that renamed the business Pittsburgh Glass Works. PPG finally divested the rest of its stake in 2016. In 2017, Mexico's Vitro S.A.B. de C.V., the western hemisphere's largest glass manufacturer, acquired Pittsburgh Glass Works, then announced it would shutter the historic plant because the facility needed significant upgrades to produce the windshields for technologically-advanced and self-driving vehicles. With 46 acres between the river and railroad tracks, the site has generated some interest from potential buyers in the site, including the Pittsburgh Regional Alliance. But there is a major drawback to its re-use – an underground "fire" attributed to the combustion of coal waste contained in fill material under an addition built years ago has caused part of the interior floor of the plant to buckle, and flames can sometimes be seen coming from cracks in the ground. Although OSHA investigated and did not issue any citations against the plant or its parent company, there is concern in the community, particularly concerning air quality and any effect the fire could have on adjacent properties.

https://www.post-gazette.com/business/career-workplace/2018/08/16/Pittsburgh-Glass-Works-Creighton-plant-closing-PPG-East-Deer-car-windshields-production/stories/201808150038

Paleontologists recently reported the discovery of a dimorphodontid pterosaur that apparently lived in the desert of Utah during the Late Triassic, about 210 ma. The discovery sheds new light on early pterosaur anatomy and development. Triassic pterosaur fossils are very rare and known only from marine deposits in the Alps of Italy, Austria and Switzerland, and from fluvial deposits in Greenland.



Artist's rendering of *Caelestiventus hanseni* from the Triassic of Utah.

This new pterosaur is from a quarry near Dinosaur National Monument. Named *Caelestiventus hanseni*, it lived in harsh desert environments and was relatively large, having a wing span over 5 feet. It predates all known desert-dwelling pterosaurs by more than 65 ma. Because the fossils were found in sandstone, the thin bones were not crushed, but paleontologists CT scanned the specimen and created 3D models of the bones for study just to be safe. The images showed the sides of the face and the complete roof of the skull, including the brain case, lower jaws and part of the wing, providing the researchers with insights into muscle attachment and the nature of the approximately 112 teeth the pterosaur possessed. The skull roof preserved an impression of the brain, revealing that early pterosaurs had a poor sense of smell but well-developed vision.

http://www.sci-news.com/paleontology/caelestiventus-hanseni-triassic-pterosaur-06304.html

A tiny chunk of stone found in southwestern Egypt in 1996 and called the Hypatia stone has scientists confused because it looks like nothing else seen before in the solar system. Although only pebble size (1.3 in wide and barely more than an ounce in weight), the stone fit into no known category of meteorite. In fact, even though it came from space, the rock has not yet been officially categorized as a meteorite because most of it is residing in pieces at research facilities around the word, and the Meteoritical Society requires 20% of a meteorite's original mass to be present to officially declare it to be a meteorite.

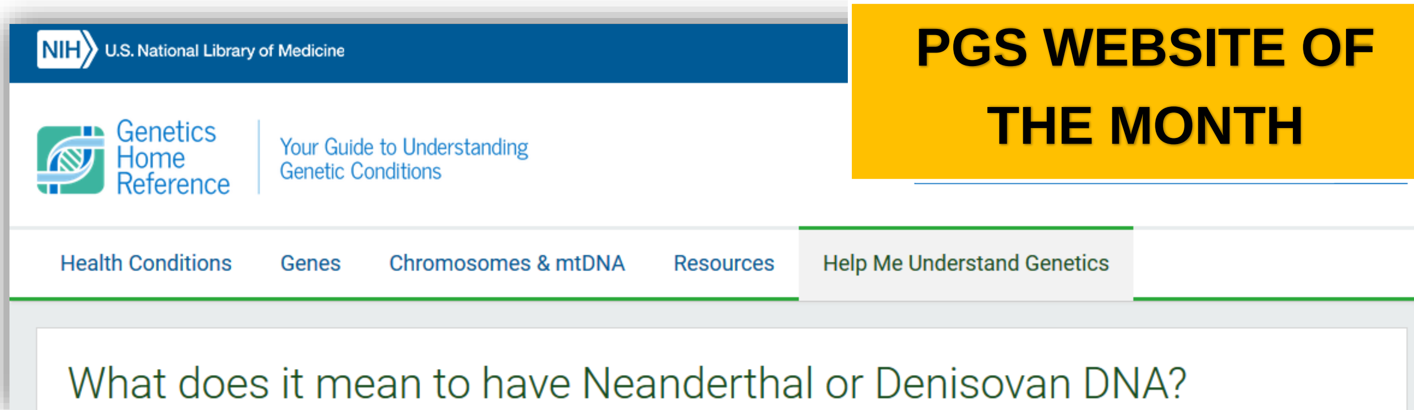
The ratios of noble gases in the stone show that it is most certainly from out of this world. It is studded with microdiamonds 50 nm to 2 µm in size, leading some to suggest that it is a strange example of a type of diamond known as a carbonado diamond – studies done in 2013 and 2015 definitively ruled that out. The diamonds probably formed by the shock experienced when the space rock entered Earth's atmosphere. New research suggests at least some parts of the stone might have formed even before formation of the solar system. If that's the case, it might indicate that the dust cloud that eventually congealed into our solar system was not as uniform as previously believed.
In the new study, researchers discovered that the stone itself is not uniform, but consists of a carbon-rich matrix shot through with a variety of mineral inclusions that are as weird as the rest of the rock. They include extremely rare pure metallic aluminum nuggets; moissanite and silver iodine phosphide grains; and strange ratios of elements that fail to match the typical ratios of solar system objects, such as a nickel-phosphide compound with very high ratios of nickel to iron. The researchers think this portion of the Hypatia stone formed from the pre-solar nebula, making it older than the sun itself.

Fragments of the Hypatia stone. This strange space rock may have formed before the solar system.

The remaining carbon-rich matrix of the stone may have coagulated later in the coldest outer reaches of the solar nebula, because forming large bodies requires a dense dust cloud like the solar nebula to provide the material. Because the matrix of the stone contains no silicate minerals, but Earth and the other rocky planets are full of them, if the Hypatia stone formed from the solar nebula, the researchers feel that nebula couldn't have been totally uniform as currently accepted. It will take isotope analysis or analysis of the variations of atoms based on the number of neutrons in their nuclei to finally determine if the Hypatia stone is pre-solar in origin. Pre-solar material has a very strange isotopic composition compared to the average values of the solar system.

https://www.livescience.com/61409-extraterrestrial-hypatia-stone.html

PGS WEBSITE OF THE MONTH



https://ghr.nlm.nih.gov/primer/dtcgenetictesting/neanderthaldna

PGS Board-of-Directors

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Other PGS Positions: **Newsletter Editor / Webmaster**: Karen Rose Cercone; **AAPG Delegates:** Dan Billman and Andrea Reynolds; **Historian**: Judy Neelan; **Continuing Ed**: Frank Benacquista

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 Ken LaSota, Secretary, at lasota@rmu.edu.

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.

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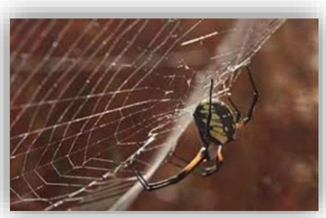

Fun Fact Having Nothing to Do with Geology

A strand from the web of a golden garden spider is as strong as a steel wire of the same size (a fact Peter Parker knows only too well!).

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