



# PITTSBURGH GEOLOGICAL SOCIETY

**MARCH 21, 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](mailto:pgsreservations@gmail.com)

You can also reserve and pay via PayPal on:

<https://www.pittsburghgeologicalsociety.org/>

### Location

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

## Recruiting for Diversity in the Geosciences



## Dr. Phil Stokes

**Executive Director**

**Penn Dixie Fossil Park  
& Nature Reserve**

**Deadline for reservations is noon on Monday, March 19.**

## SPEAKER ABSTRACT

Geoscience faces dual recruiting challenges: a pending workforce shortage due to retirements and attrition and a lack of diversity. Already suffering from low visibility compared to other STEM fields, geoscience does not resemble the makeup of the general population in terms of either race/ethnicity or gender and is among the least diverse of all STEM fields in the U.S. Many studies discuss recruiting and diversity issues in science and math, but only a small number consider - and address quantitatively - barriers in geoscience.

To examine potential barriers to recruitment, I interviewed 39 geoscience majors from two large public universities in the U.S. I gathered 1,169 'critical incidents,' or life experiences that affected choice of a geoscience major. The critical incidents were classified by time period (when they occurred), grouped by outcome, sorted into categories, and compared by the students' race/ethnicity and gender.

Among some important differences, my study found that white, Hispanic/Latino, and African American students reported different types of experiences affecting major choice while growing up. For instance, 81% of white students reported outdoor experiences (e.g., camping, hiking) as children that affected major choice, whereas Hispanics (33%) and African Americans (22%) reported significantly fewer outdoor experiences from the same time period. And, we found that women reported more negative experiences than men in required non-geoscience courses.

These findings suggest that sociocultural factors behind under-representation in other fields may similarly impede diversity in geoscience. Although geoscience majors share many common experiences, knowledge of subtle barriers that may exist for under-represented students and women in geoscience can inform recruiting, teaching, and advisement strategies.

## SPEAKER BIOGRAPHY



Dr. Phil Stokes is currently the Executive Director of the Penn Dixie Fossil Park & Nature Reserve in Buffalo, NY.

Prior to working for big fossil, Dr. Stokes served as instructor, research associate, academic advisor, and community outreach coordinator in the Department of Geosciences at the University of Arizona while pursuing his PhD. His 2016 dissertation, *Diversity in Geoscience: Critical Incidents and Factors Affecting Choice of Major*, used social and behavioral science to look at the factors behind under-representation in STEM fields, and in particular geology.

Dr. Stokes has coordinated four multi-year National Science Foundation projects: three at the University of Arizona (including SAGUARO) and one at SUNY Buffalo, where he earned his B.S. (2004) and M.S. (2007) degrees in Geological Science. His thesis work used ground penetrating radar to search for mastodon bones and to map glacially deposited units at the Ice Age Hiscock Site near Rochester, NY. In his spare time he plays guitar and ukulele, travels, and brings a telescope to music festivals for late night stargazing.



## About Our Cover Photo



The topic of diversity in Geoscience has become a focus of attention for many researchers over the past few years. In 2016, the PBS NOVA program spoke to an expert in science education outreach, **Dr. Lisa White** of the University of California Museum of Paleontology (UCMP). In this interview, Dr. White noted that geology is often described as a “discovery science” — a science that many individuals have little or no exposure to before college. This means that university geology programs must offer interesting general education courses to reach a diverse group of potential majors. You can read Dr. Lisa White’s NOVA

interview here: <http://www.pbs.org/wgbh/nova/blogs/education/2016/01/diversity-in-the-geosciences/>.

Recent efforts aimed at broadening participation are being pursued locally by Dr. Jon Lewis of Indiana University of Pennsylvania. The NSF-funded STEMSEAS program takes STEM-interested undergraduates aboard research ships between expeditions with mentors for immersive exposure to professional practice, research, career exploration and reflection. There is a Facebook and YouTube site, or check out <http://mlp.ldeo.columbia.edu/stemseas/> or <https://stemseas.wordpress.com/>.

Because the mentor pool available to STEMSEAS lacks diversity, Drs. Lewis and Steve Hovan (also at IUP) hosted a diversity-themed International Ocean Discovery Program (IODP) School of Rock (SOR) on the drilling vessel JOIDES/Resolution last summer with Dr. Lisa White as one of its chief scientists! To learn more about how this School of Rock connected influential STEM educators with early career IODP scientists, check out: <http://joidesresolution.org/expedition/sor2017/>



## Preview of our Next Meeting

**Wednesday, April 18, 2018**



**The 16<sup>th</sup> Annual Student Night**

## PRESIDENT'S STATEMENT

### *Closing the Diversity Gap*

Historically, the geosciences have been dominated by men. Prior to the late 1800's only a handful of women participated, usually in secondary roles as assistants to their spouses or as illustrators. Women were also barred from enrolling in universities or participating in professional societies until the late 1800's. Having the chance to attend a university and allowed to join scientific organizations was a liberating experience that allowed women to explore their interests and challenge their intellect. However, the geological sciences remained almost exclusively for men.



<https://trowelblazers.com>

Despite this, a few women broke through this barrier to advance and become the first women geologists. Women like Mary Holmes, Katherine Van Winkle Palmer, and Florence Bascom (seen leading a field trip to the Grand Canyon in this 1906 photo) paved the

way and brought the study of the Earth within reach for many aspiring women scientists. These women broke through barriers, overcame prejudices and persevered as they pursued their passions and interests.

Women are fortunate today to not be banned from programs such as chemistry, calculus or stratigraphy class, or from having to learn about the subject from behind a screen or in the hallway. I cannot image having to learn about the silica tetrahedron isolated from the rest of the class with no visual aids while taking notes in the hallway. Today, women are present in

academia, consulting, business, industry and other areas where the geosciences are used.

The barriers that existed in the past seem to have diminished for women but the number of minorities in the geosciences remains low to nonexistent. I think it is safe to say that the geosciences have suffered from the lack of diversity, both in the number of women and minorities, like most of the other STEM disciplines. Anyone that is involved in a science discipline understands the value of working with a diverse group. It allows for fruitful conversations and exchange of scientific ideas. Increasing the participation of women and minorities in the geosciences is a benefit that effectively aids in communicating the importance of science.

This month's talk will address the topic of diversity in the geosciences and will help to explain why the geosciences have the lowest diversity of all the STEM fields. To help with the efforts to increase diversity in the geosciences, the PGS board would like to invite alumni from all the universities who have attended meetings in the past to come back and reconnect with your students, faculty, and colleagues. Our current student members are interested in hearing from you as they prepare to graduate and seek meaningful employment. They need advice and assistance that only you can provide. Consider spending the third Wednesday of each month with us, get a few PDH's, and help a few students in the process.

I would like to thank all our sponsors for their financial support and all the active members that regularly attend the monthly meetings. It is your dedication and commitment to our science that keeps the society going. I enjoy the engaging dialogue and the intellectual discourse shared. Please feel free to provide us with feedback and suggestions to build a stronger and more diverse community.

Best wishes,

*Tamra*

Tamra Schiappa

# PGS Mentorship Program for Students

The PGS Student Liaison Committee would like to create a mentorship program for student members with young professional geologists who can offer advice about career paths and graduate schools, insights into what life as a working geologist is like, guidance for those who want to eventually become a licensed PG, and other helpful information. This can also be a way to help increase diversity in geoscience, which is the topic of our monthly meeting in March.

If you have entered the profession within the last ten years and would be interested in this program, please contact President Tamra Schiappa by email ([tamra.schiappa@sru.edu](mailto:tamra.schiappa@sru.edu)) or chat with PGS Board Student Liaison Philip Graves at a PGS meeting.



## NETL 2018 Subsurface Workshop in Pittsburgh

### Mastering The Subsurface August 13-17, 2018

The Department of Energy - National Energy Technology Laboratory (NETL) announces its 2018 Annual Meeting at the Sheraton Station Square, Pittsburgh, PA, August 13- 17, 2018. The NETL annual meetings focus on current technology research being conducted at NETL, other National Labs, universities and industry. The topics include Unconventional Oil & Gas Fields, CO<sub>2</sub> Storage, Geothermal Energy, and Advanced Diagnostic Tools for the Subsurface. This is an excellent opportunity to network with government researchers and other industry professionals, plus CEUs are available for maintaining licensure.

Although the online registration is not yet available, it will soon be available on the NETL website <http://www.netl.doe.gov>. The cost is expected to be \$300.

If you have questions please feel free to contact Dave Cercone at (412) 386-6571.

## GEOLOGICAL EVENTS

### OHIO OIL & GAS ASSOC. WINTER MEETING

March 7-9, 2018

Annual meeting, including a 1-day workshop sponsored by the Ohio Geological Society

Hilton Columbus at Easton, Columbus OH

### HARRISBURG AREA GEOLOGICAL SOCIETY

March 8, 2018

“U.S. Route 11/15 Rock Slope Safety Improvement Project - Marysville, PA” by Jonathan Relyea of American Engineers Group

AEG Office 441 Friendship Road, Harrisburg PA

### SOCIETY OF PETROLEUM ENGINEERS

March 13, 2018 (11:00 AM - 1:00 PM)

“Illuminating Insights Into Well and Reservoir Optimisation Using Fibre-Optic Distributed Acoustic Sensing” by SPE Distinguished Lecturer David Hill of OptaSense UK

Cefalo’s Banquet & Event Center, Carnegie PA

### PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS

March 20, 2018, 11:30 AM to 6:30 PM

Annual Meeting Luncheon & Program

Red Lion Hotel, Harrisburg PA

### ASCE GEO-INSTITUTE – PITTSBURGH CHAPTER

March 22, 2018

“Building Your Mentoring Network: A Relational Approach to Career Success” by Wendy Murphy (Joint Meeting of ASCE Diversity & Inclusion Committee, ASCE Geo-Institute, and DFI Women in Deep Foundations Committee)

Cefalo’s Banquet & Event Center. Carnegie PA



The Pittsburgh Geological Society is delighted to welcome the following new professional member to the society:

#### **Marisa M. Tobias**

Educator  
Carnegie Museum / LaRoche College

1982 BA in Geology, Alfred University

We are also happy to welcome the following new student members:

From California University of Pennsylvania:

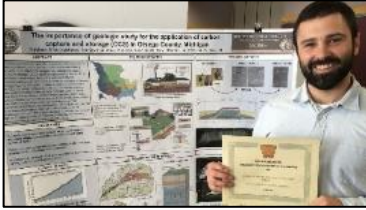
Timothy H. Severson

From Slippery Rock University of Pennsylvania:

J. Parker Roach  
Brent C. Patricelli

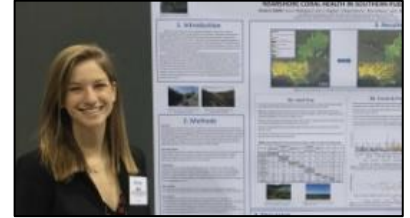
From Indiana University of Pennsylvania  
Heather L. Furlong

We look forward to seeing all of you at an upcoming society event!



# PGS – AEG – ASCE STUDENT NIGHT

April 18, 2018



University students, please consider presenting the results of your college research projects at the **16<sup>th</sup> Annual PGS – AEG – ASCE Student Night**. If you have been conducting undergraduate or graduate research in any geological or geotechnical field, here is an opportunity to show off your work to members of three professional scientific societies. Students who present their original research grow from the experience by improving their public speaking skills, networking with professionals and experts in their fields, listing a presentation on their resume and possibly even winning a cash award.

Each of the three sponsoring societies will select one student paper (graduate or undergraduate) for oral presentation. Additional abstracts will be accepted for poster presentations. All presenters will receive certificates of recognition and appreciation, as well as complimentary dinner. The three oral presenters will each receive awards of \$100, while the three best poster presenters will each receive \$50.

The process of submitting abstracts for student night has been revised this year. Please consult the **Student Night Guidelines** and download the **Student Abstract Submission Form** from our website:

<http://pittsburghgeologicalsociety.org/2018-student-events.html>.

The Student Night Guideline document contains the formatting rules to be used in the abstract submission and also the rules to be followed for the presentations themselves when the time comes. The Student Abstract Submission Form is a three-page fillable PDF document consisting of the following:

**Page 1: a cover sheet with digital signatures by the student and faculty mentor**

**Page 2: the abstract itself describing the research project**

**Page 3: a brief letter of support by a faculty mentor or sponsor**

A completed form with the student's name in the title should be submitted via email to the PGS Program Chair, Dr. Daniel Harris, at [Harris\\_D@calu.edu](mailto:Harris_D@calu.edu). If you are unable to complete the fillable PDF with the abstract and letter of support, send them as attachments along with a completed and signed cover sheet.

Some additional links that students may find helpful in putting together their abstracts and presentations are:

- The American Geophysical Union's oral presentation style guide with advice on best practices.  
<http://www.projectionnet.com/Styleguide/presentationstyleguide.aspx>
- Dennis Jerz's Tips on Oral Presentations. Dennis Jerz is an English professor at Seton Hill, and he's stellar at what he does. Do read and retain his coaching on oral presentations: it's top-notch.  
<https://jerz.setonhill.edu/writing/technical-writing/oral-presentations-tips/>
- The Professor's Guide to 15 Strategies for Giving Oral Presentations from US News & World Report.  
<https://www.usnews.com/education/blogs/professors-guide/2010/02/24/15-strategies-for-giving-oral-presentations>
- Rice University's site on oral presentations skills. There are sample clips to show you what to do (and not do) in your oral presentation.  
[http://www.owl.net.rice.edu/~cainproj/ih\\_presentation.html](http://www.owl.net.rice.edu/~cainproj/ih_presentation.html)
- The National Institutes of Health's 'Ten Simple Rules for a Good Poster Presentation' and 'Ten Simple Rules for Making Good Oral Presentations'  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1876493/>

**NOTE: The deadline for abstract submissions  
has been extended to Friday, March 23.**

**Pittsburgh Geological Society  
Spring 2018 Student Field Workshop**

**SPECIAL 2 DAY EVENT**

**APRIL 6 & 7, 2018**

**California University  
California, Pennsylvania**

**Friday (4/6) Evening Program:  
Networking and Preparing for a Career in the Geosciences**

**Saturday (4/7): Drilling and Environmental Sampling Field Workshop**

**Registration: \$35.00 (Two days) or \$20 (One day)**

**YOU MUST CONTACT US TO SAVE YOUR PLACE**

The Pittsburgh Geological Society again invites students of geology to attend the 14th installment of the “Student Field Workshop.”

- **Friday Evening (5pm-?): Classroom and Networking event. Dinner will be provided.**
- **Saturday (8am-3pm): Field Demonstrations. Light Breakfast and Lunch will be provided.**

**A block of rooms has been reserved at a local hotel, less than a mile from the morning drill site.**

**Have you wondered what you might be doing on that first job? Chances are you’ll be on a drill rig. In this workshop, you will have the opportunity to work alongside an experienced drilling contractor and field-wise professionals currently working in the industry. Not only is this an excellent learning opportunity, it is your chance to ask all those questions regarding life after college and brush up on your networking skills.**

**What will you experience?**

**Soil sampling using a drill rig**

**Basic sampling techniques**

**Basic monitoring equipment**

**Soil & Rock descriptions**

**Well installation basics**

**Designing a drilling program**

**As with all field work, this will be a *RAIN* or *SHINE* event. Please watch the weather forecast carefully and prepare yourself. The drilling process can be dusty, wet, and muddy – so leave the designer jeans and flip-flops behind. **We do ask that you be an active student – please no corporate trainees.****

- **Pre-payment can be made through PayPal to [pgsreservations@gmail.com](mailto:pgsreservations@gmail.com) or by check (payable to “Pittsburgh Geological Society”) mailed to P.O. Box, 58172 PITTSBURGH PA, 15209**
- **Cash, check, or charge payments may be made in advance at a PGS meeting**
- **Charge or PayPal payments may be made directly through the [PGS website](#).**
- **To register or for more information: Frank Benacquista PG at: [fbenacquista@kuresources.com](mailto:fbenacquista@kuresources.com)**



## **MARK YOUR CALENDARS FOR A POTENTIAL PGS SPRING FIELD TRIP!**

Are you curious about how geology and industrial history have combined to shape our region? Then mark your calendar for **Saturday, May 26, 2018** - the tentative date for our spring PGS field trip. The schedule is still a work in progress, but this tentative draft gives you an idea of what to expect. While field trip organizers Albert Kollar and John Harper hammer out the final details, keep an eye on the PGS newsletter and website for future announcements and registration information.

### **GEOLOGY OF THE EARLY IRON INDUSTRY IN FAYETTE COUNTY, PA**

*Please note that this is the current proposed trip itinerary. Locations, times and order of stops may change as our plans are firmed up. Right now, we are shooting for a date of Saturday May 26 but nothing is set in stone.*

Meet at Century III Mall, West Mifflin. Rent van(s) nearby. Drive south on PA 51 to Uniontown. Merge onto US 119/40 bypass and follow US 40 east toward and up Chestnut Ridge.

**Stop 1: Scenic Overlook:** This pull-off near the summit of Chestnut Ridge provides us with a chance to briefly discuss the geology of the area and the early iron industry in western Pennsylvania.

*Leave Stop 1 and continue east on US 40.*

**Stop 2 (tentative): Thompson Quarry:** Thompson Quarry is one of the best fossil collecting sites in western PA (Wymps Gap Limestone, Upper Mississippian). This stop will depend on the good graces of PennDOT, which uses part of the quarry for maintenance and storage. We will try to get permission.

*Leave Stop 2 and drive west on US 40 to Wharton Furnace Road (SR 2003). Drive south to Stop 3.*

**Stop 3: Wharton Furnace:** This is one of about 20 charcoal blast furnaces that operated in Fayette County in the early 1800s. We will discuss the process of smelting pig iron from local iron ore (siderite), and the geology of the material needed to erect the furnace and create a useful product.

*Drive west on Shephard Road to Skyline Drive. Drive north on Skyline Drive about 500 feet and pull to the side of the road.*

**Stop 4: North Summit Gas Storage Well:** We will discuss the geology of North Summit field, particularly the structure and stratigraphy of the reservoir (Middle Devonian Huntersville Chert).

*Drive north on Skyline Drive to US 40. Drive west on US 40 to US 119/40 bypass. Follow bypass to PA 51. Drive north on PA 51 to intersection with Laurel Hill Road (to the right) and Keisterville Upper Middletown Road (to the left).*

**Stop 5: First Puddling Furnace Historical Marker:** We will discuss the importance of puddling iron furnaces to iron and steel production in western Pennsylvania and the rest of the world.

*Drive east on Laurel Hill Road and West Crawford Avenue to US 119 in Connellsville. Drive north on US 119 to intersection with PA 819. Drive south on PA 819 to West Overton Village.*

**Stop 6 (tentative): West Overton Village and Museum:** This is the birthplace of Henry Clay Frick, the multi-millionaire coal and coke magnate. Coal and coke are essential to the steel-making process. As a young man, Frick worked at the West Overton distillery where Old Overholt rye whiskey was originally produced (now produced at the Jim Beam distillery in Kentucky). The museum features life-size dioramas that highlight the industries of West Overton Village between 1800 and 1919. Displays include coverlet weaving, coal and coke production, and whiskey distillation. For a fee, you can sample Old Overholt.

*Leave West Overton Village and return to US 119. Drive north on US 119 to I70. Drive west on I70 to PA 51. Drive north on PA 51 to Century III Mall. End field trip.*

# GEOLOGICAL EVENTS OF INTEREST TO MEMBERS



DFI WOMEN IN DEEP FOUNDATIONS COMMITTEE,  
ASCE GEO-INSTITUTE & ASCE DIVERSITY AND INCLUSION COMMITTEE  
PRESENT

## BUILDING YOUR MENTORING NETWORK | A Relational Approach to Career Success

with Wendy Murphy

In this interactive workshop, reconsider how you think about mentoring and learn to leverage your mentoring network to propel your career.

Thursday, March 22, 2018

6:00 p.m. Social Hour | 7:00 p.m. Dinner, followed by Lecture  
Engineers Society of Western Pennsylvania | Pittsburgh, Pa.

With job mobility increasing, globalization expanding, and technology advancing, you need more than a steady job and a solid network to keep your career on track. You need mentors--to learn and to grow--whether you're just starting out, are firmly established, or at the top of your profession. Everyone has something to learn, and everyone has something to teach.

*Wendy Murphy is an Associate Professor of Management at Babson College and author of Strategic Relationships at Work: Creating Your Circle of Mentors, Sponsors, and Peers for Success in Business and Life. Her research, teaching, and speaking engagements focus on the intersection of careers, mentoring and work-life issues. In 2014, she was recognized by Poets & Quants as one of the "40 Most Outstanding B-School Profs Under 40 in the World."*

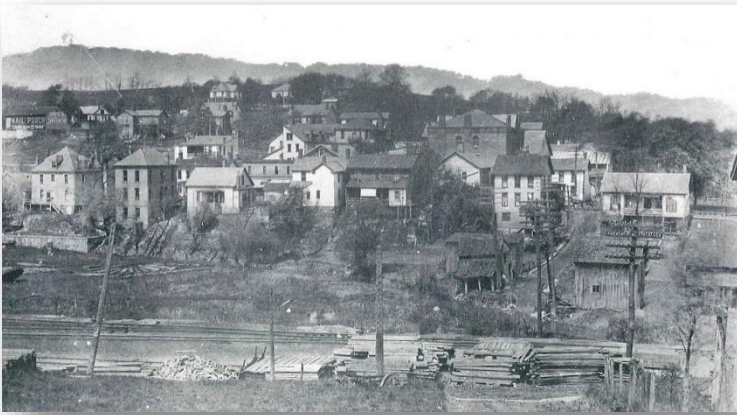
For more information or to register, contact G-I Program Chair Vishal Patel at [vpatel@agesinc.com](mailto:vpatel@agesinc.com) or visit [www.asce-pgh.org](http://www.asce-pgh.org).

[www.dfi.org/widf-gipitt2018](http://www.dfi.org/widf-gipitt2018)



# THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Sebastian Burgett, a native of Germany by way of Berks County, Pennsylvania, was the first settler on Raccoon Creek in that part of Washington County that became Smith Township. He built Burgett's fort and grist mill about 1773. On February 28, 1795, Peter Kidd surveyed the land for Sebastian's son George Burgett to lay out a town on the south fork of Raccoon Creek, a mile north of the center of the township. The original name proposed for the town was West Boston but the neighbors decided to honor Sebastian Burgett and called it Burgettstown instead.



**Photograph of Burgettstown, circa 1910.**

The village grew slowly despite the Panhandle Railway running through the area as early as 1865. The Rev. J. T. Fredericks laid out an addition to the town at that time that included the railroad station. Burgettstown eventually was incorporated as a borough in 1881, but still growth was slow – up until 1910, Burgettstown was merely the center of a farming community. “Old Town”, as the original section was known, was some distance from the railroad station. Gradually, the space between “Old Town” and the newer part of Burgettstown built up until all parts formed a single town.

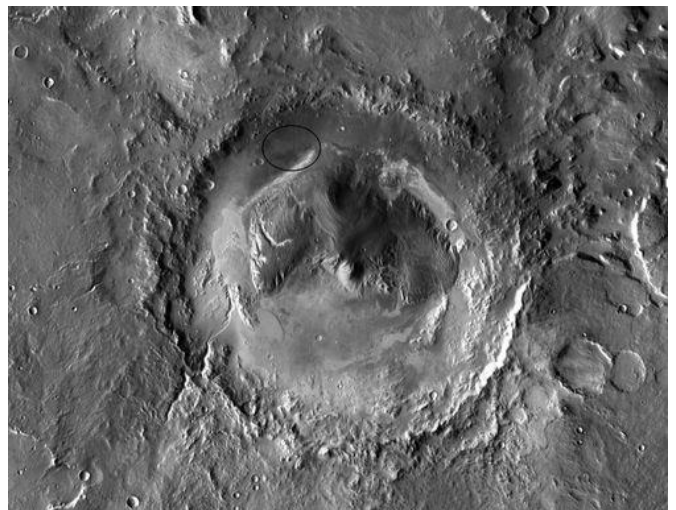
Burgettstown as a thriving community really began sometime around 1912 when the American Zinc & Chemical Company built mills on a local farm, and coal mines opened at nearby Atlasburg. Shortly after, property values increased and the town grew even more. Today, Burgettstown is best known as the home of the KeyBank Pavilion (formerly called the Star Lake Amphitheater), the Pittsburgh area's largest outdoor live music venue.

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## DID YOU KNOW . . . ?

A new panoramic image from the Mars Curiosity Rover shows a very wide view of the interior and rim of Gale Crater. The crater is a fascinating place to explore because of the 3-mile-high mountain of layered materials in the middle called Mount Sharp. The layers have different minerals depending on their height – clay minerals occur near the bottom, succeeded by layers with sulfur- and oxygen-bearing minerals. Flowing water seems to have carved channels in both the mound and the crater wall.

The new panoramic photo includes much of the rover's route during its first 5.5 years on Mars as well as features as much as 50 miles away. The view, taken from Vera Rubin Ridge on the north



**Overhead photo of Gale Crater on Mars.**



**Panoramic view of Mars' Gale Crater. For a better view, go to <http://www.sci-news.com/space/curiosity-mars-panorama-05687.html> and click on the photo.**

flank of Mount Sharp (officially, Aeolis Mons), encompasses much of the 11-mile route the rover has driven since its 2012 landing inside the crater. Although most of the horizon in the photo is the crater's northern rim about 1.2 miles above the rover, a hill can be seen on the northern horizon that is about 50 miles away, well outside of the crater.

Curiosity's Mast Camera (Mastcam) took the component images of the panorama on October 25, 2017, during the 1,856th Martian day, or sol, while the rover paused on the northern edge of Vera Rubin Ridge. From the rover's location on Vera Rubin Ridge, the plains of the crater floor stretch out to the spectacular mountain range that forms the northern rim of the crater. The rover shot the scene shortly before northern Mars' winter solstice while the skies were clear, thus enabling a sharp view of distant details.

Although Curiosity's exact landing spot in the crater is out of sight behind a slight rise, the photo does include Yellowknife Bay where the mission found evidence of an ancient freshwater-lake environment in 2013 that had all of the basic chemical ingredients for microbial life. Farther north are the channel and fan of Peace Vallis, relics of streams that brought water and sediment into the crater about 3 ga. The elevation of the site where the rover took the photos is about 1,073 feet above Curiosity's landing site.

Since taking the photos, the rover has climbed another 85 feet in elevation. In recent days, the Mastcam has recorded component images for a panorama looking uphill southward toward the mission's next major destination area. That is called the Clay Unit because observations from orbit detected clay minerals there.

<http://www.sci-news.com/space/curiosity-mars-panorama-05687.html>

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*Caihong juji*, or "Rainbow", as it has been dubbed in English, is a newly described genus and species belonging to a group of small, bird-like dinosaurs that lived in China during the Jurassic Period about 161 million years ago. It was about the size of a duck, had a bony crest on its head, and long, ribbon-like feathers. Based on analysis of the fossilized feathers, the feathers on its head, wings, and tail were iridescent, with colors that shimmered and shifted in the light and may have been used to attract mates.



**Artist's conception of *Caihong juji* with beautiful iridescent coloration.**

Iridescent coloration is a well-known trait linked to sexual selection and signaling, and this is the earliest evidence of iridescent coloration in dinosaurs. Normally, you only see hard parts in the fossil record, parts like bones and teeth, but every now and then soft parts like feathers are preserved. When that happens, paleontologists get a good glimpse into the past.

Serendipity plays a big part at such times. A farmer from Hebei Province in China discovered slab of rock in 2014 that contained a nearly complete skeleton surrounded by impressions of feathers that preserved the shape of melanosomes. Melanosomes are the cellular

sites of the synthesis, storage, and transport of melanin pigments that provide tissues with color. In their analysis, the paleontologists compared the melanosome impressions of *Caihong juji* to existing melanosomes in living birds. They found that the fossil melanosomes most closely resembled those found in the iridescent, rainbow feathers of hummingbirds.

*Caihong juji* is interesting because it has features that are both ancient and modern – the bony crest, for example, is a typical sexual selection feature of earlier dinosaurs. This is also the earliest known animal with asymmetrical feathers, which are used by modern birds to steer when flying. But the asymmetrical feathers of modern birds are on their wingtips, whereas those of *Caihong juji* were on its tail.

The fact that the tail feathers were asymmetrical but the wing feathers were not is a bizarre feature previously unknown among both dinosaurs and ancient and modern birds. This dinosaur couldn't fly; its feathers were probably used primarily to attract mates and keep warm. But it suggests that controlling flight might have been first evolved with tail feathers during some kind of aerial locomotion. Other features are interesting as well. Other dinosaurs have bird-like, triangular skulls and forearm bones longer than those found in birds today, *Caihong juji* had a long narrow skull like a *Velociraptor* and short forelimbs akin to those of modern birds. A very interesting dinosaur indeed.

<http://www.sci-news.com/paleontology/caihong-juji-jurassic-bird-like-dinosaur-iridescent-feathers-05637.html>

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Thanks to climate change, UK-based Bluejay Mining plans to begin commercial mining of the world's highest-grade deposit of ilmenite in Greenland next year. Once buried under ice and snow, the deposit, named Dundas by Bluejay Mining, is a high-grade asset.

Mining companies have become increasingly interested in Greenland as thawing sea ice opens up shipping routes

and exposes mineral riches. But the local population is divided – some worry about the loss of traditional lifestyles whereas others are embracing development.

The company is aiming for commercial production of 330,700 tons per year in 2019 after initial output of around 55,000 tons by the end of this year. When the project reaches its fifth or sixth year, it should be producing up to 1.1 million tons. This could be a windfall for Bluejay. There is increase in general demand but until now no new supply of the commodity. The company is predicting that global ilmenite supplies will hit a deficit by 2021, and that the global weighted average price will rise to \$196 this year from \$165 in 2017 (ilmenite is used to manufacture titanium dioxide, which is used in a number of personal care products, as well as a pigment in paint).

Although the ilmenite project is the prime aim, Bluejay also will try to develop of nickel, cobalt, and platinum deposits in Greenland. The country's geographic position, with new shipping access opening up easy export routes, and its high-quality resources raises the prospect of low business costs. Bluejay's project has been "cheap" so far; their total expenditures over the last three years of development in Greenland have totaled only £8.5 million (\$11.8 million).

<http://www.mining.com/web/bluejay-mining-seeks-pigment-riches-greenlands-ice-retreats/>



**The Dundas deposit in northern Greenland is thought to be the highest-grade ilmenite asset in the world.**

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The US Energy Information Agency (EIA) is projecting that the United States will probably become a net energy exporter in 2022, driven primarily by changes in petroleum and natural gas markets, according to a new study. The transition from net energy importer to net energy exporter could actually occur even earlier, based on some projections that modify assumptions about oil prices or resource extraction. Even the projections using models with less energy production show that the US will remain a net energy importer through 2050.

Projections of a transition to a net energy exporter is fastest in the case of high oil prices, where higher crude oil prices lead to more oil and natural gas production, leading to net exporter by 2020. This scenario also predicts that the higher crude oil prices will result in higher petroleum product prices, which leads to lower consumption of petroleum products, thus driving decreases in net petroleum imports. In the case where oil and gas resources and technologies are high, and assumptions for geology and technological

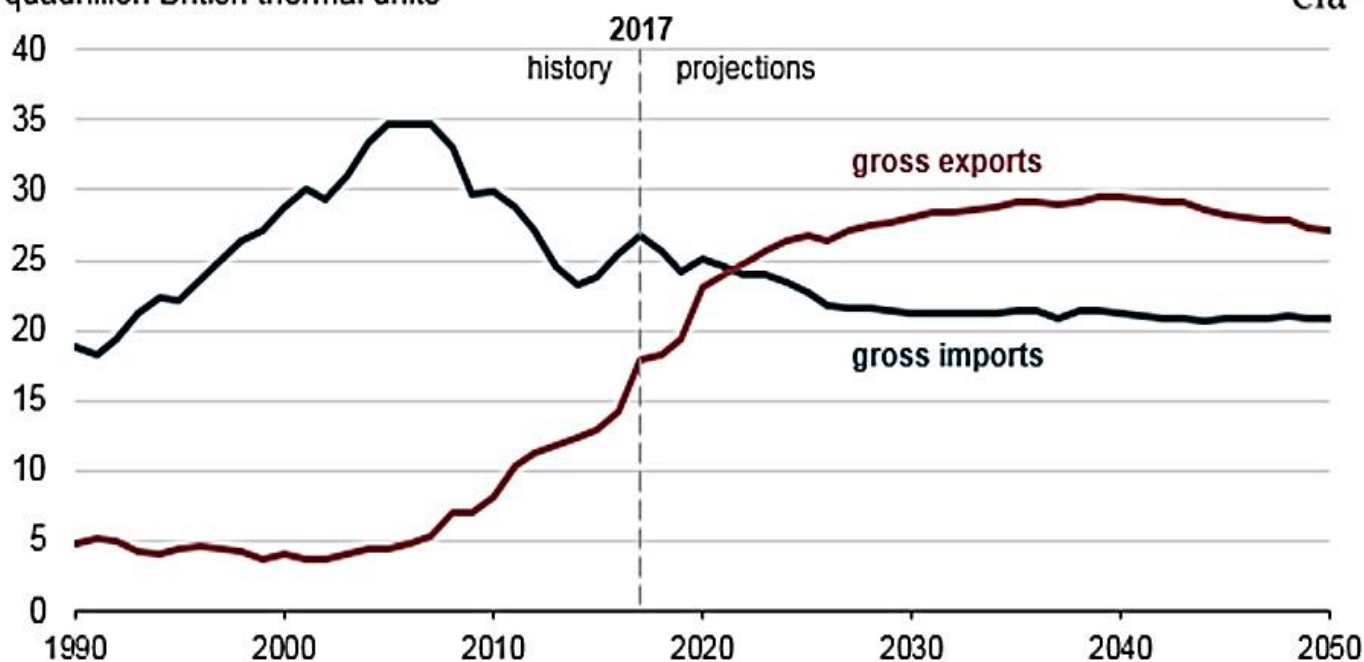
developments are more favorable, the US is predicted to become a net exporter in 2020, with net exports increasing through the end of the projection period.

However, in cases where oil prices are relatively low or there are less favorable assumptions for geology and technological developments, the US remained a net energy importer through 2050. For comparison, in energy equivalent terms, the US imported about 27 quadrillion BTU (quads) of energy in 2017 and exported 18 quads, resulting in 9 quads of net imports. That included 11 quads of petroleum and other liquids imported and 2 quads of coal and coal coke exported. Natural gas trade was nearly balanced between imports and exports, and net electricity trade with Canada and Mexico was relatively small. Petroleum and natural gas account for most of the changes.

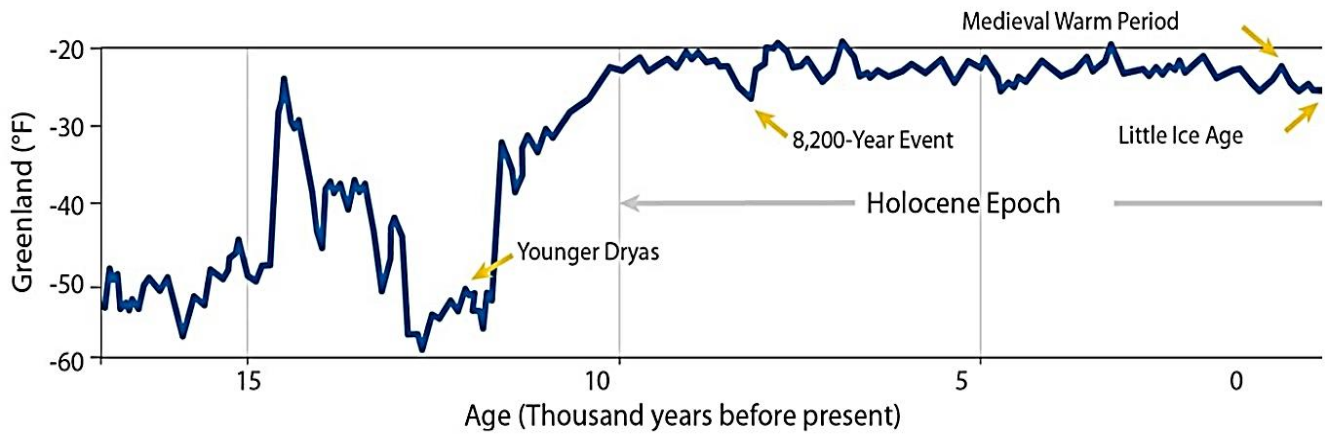
<https://www.eia.gov/todayinenergy/detail.php?id=34912>

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**U.S. gross energy trade, AEO2018 Reference case (1990-2050)**  
quadrillion British thermal units



The US trade in gross energy may change from net imports to net exports by 2020.



**Measured temperatures in Greenland over the last 16,000 years. Notice that the climate was warming prior to the Younger Dryas, which new data indicate could have been caused by collision of the Earth with cometary fragments.**

A new study used geochemical and isotopic markers to draw a very different picture of the end of the Ice Age than the one we're used to. It goes like this: one day about 12,800 years ago, near the end of the last Ice Age, the climate had warmed up, and the glaciers had retreated. Then, according to the study, BANG! Out of nowhere, the sky was lit up with fireballs, followed by shock waves. Fires ravished the landscape, dust filled the sky, cutting off the sunlight, and the climate rapidly cooled. Plants died, food sources became scarce, and glaciers began to advance again. Ocean currents shifted, the climate got colder, and the end of the Ice Age was postponed for another thousand years. When the climate finally began to warm again, there were fewer large animals roaming the landscape and the human culture in North America was using completely different spear points.

The study, recently published as two separate papers in the *Journal of Geology*, included the work of 24 researchers who looked at measurements taken at more than 170 sites around the world. The data suggest the global disaster resulted from the collision of the Earth with fragments of a disintegrating comet approximately 62 miles in diameter. The remnants of that comet are believed to still persist within solar system to this day. A number of different chemical signatures, such as CO<sub>2</sub>, nitrate, ammonia, and others, suggest that fully 10% of the Earth's land surface, about 4 million square miles, was consumed by fires. Analysis of pollen suggests pine forests probably burned off,

replaced by poplars, a tree known to colonize cleared areas.

The authors suggest the cosmic impact might have been responsible for the Younger Dryas cool episode, biomass burning, late Pleistocene extinctions of larger species, and human cultural shifts and population declines. The researchers' computations also suggest that the impact would have depleted the ozone layer, causing increases in skin cancer and other negative health effects. The impact hypothesis is still just a hypothesis. The study, however, provides a massive amount of evidence, which the authors argue can only be all explained by a major cosmic impact.

<https://www.sciencedaily.com/releases/2018/02/180201173251.htm>

The December 4, 2017 Thomas fire, which quickly became Southern California's largest wildfire on record, burned more than 280,000 acres of Ventura and Santa Barbara counties over nearly a month. Then on January 8, 2018, heavy rainfall eroded the burned areas, saturating the community of Montecito with 3 to 5 inches of rain. The result was a large and deadly debris flow which caused at least 21 confirmed deaths and left 150 people hospitalized with various injuries, including four in critical condition. The mudflows completely destroyed over 100 homes and damaged an additional 300 in the area.



**A team of USGS geologists assess the recent Montecito debris flow in southern California.**

Areas where steep topography has been subjected to intense rainfall following a large fire are especially susceptible to damaging debris-flow episodes, such as those that devastated Montecito. These flows, which are commonly called mudflows, are slurries of water, rock, soil, and vegetation with the consistency of wet concrete that can move rapidly downhill.

A team of geologists from the USGS joined county, state, and federal partners to survey and evaluate the aftermath of the Montecito debris flow. The USGS geologists, from the Landslide Hazards Program and Earthquake Science Center, were deployed to Santa Barbara County to support a California Geological Survey-led geohazard assessment of the Montecito area. By mapping the area that was inundated by debris flows, they will be able to produce a forensic reconstruction of what happened throughout the event. They will be able to estimate the velocity and other dynamics of the flow to better understand and forecast how similar events might behave in the future.

Hazard mapping that had been done following the fire indicated that such areas are highly susceptible to debris flows even during normal storm events. As it turned out, the cloudburst that triggered the Montecito debris flows was over three times greater than the storm model used to create the maps! The team moved through the area and recorded the locations and descriptions of flow features such as deposit thickness, boulder size, and inundation depth on GPS-connected electronic tablets. By working on the ground,

rather than just using satellite data, the team can evaluate the features that influenced how the debris flow spread across the land and model the flow. The models in turn can inform federal, state, and local partners how future events can unfold.

<https://www.usgs.gov/news/usgs-geologists-join-efforts-montecito-assess-debris-flow-aftermath>

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The fossil record of cockroaches suggests that most extant families evolved during the breakup of Pangaea (beginning ~200 Ma) but before the beginning of continental separation within Gondwana (~135 Ma). Now, using a large amount of genomic data, a team of researchers has performed the first molecular dating to gain the clearest picture yet of the biogeographical history of cockroaches.



**A cockroach from the Lower Cretaceous Santana Formation of Ceara, Brazil.**

They have traced the key evolutionary time points of the cockroach back almost 300 ma when the Earth's mass was organized into the Pangaea supercontinent. Their results indicate that extant cockroach families evolved over periods of up to ~180 ma. Reconstructions of the ancestral distribution of cockroaches using the known distributions of extant genera sampled in their study, the researchers found evidence that continental breakup had important impacts on cockroach biogeography. That makes sense because cockroaches can't fly very far, so they are mostly terrestrially bound.



In order to accomplish this, the scientists estimated divergence times of all living cockroach families, based on complete mitochondrial genomes of 119 cockroach species. For comparison, they also used 13 termites, seven mantids, and numerous other insects as part of the outgroup. Their estimates suggest that the last common ancestor for cockroaches appeared much earlier than fossil evidence indicates, about 235 ma, before Pangaea broke up. That was about 95 ma before the appearance of the first fossils considered to be modern cockroaches during the Cretaceous Period (~140 ma).



**A reconstruction of Pangaea**

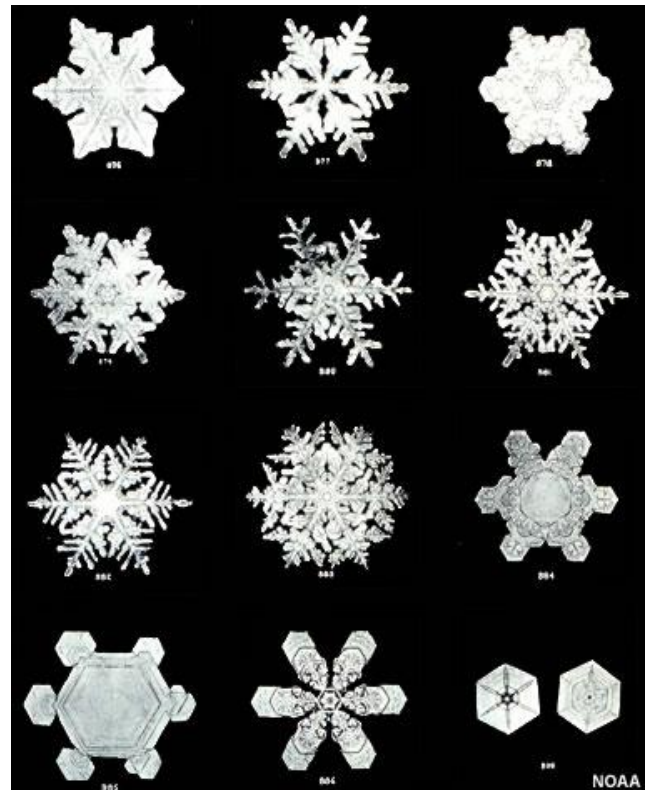
One of the more appealing aspects of the study was to compare the cockroach divergence time with the geological history of the Earth. The researchers speculated that cockroaches spread to every part of the globe as a result of plate tectonics following the breakup of Pangaea. As an illustration, the researchers cited the many sister cockroach lineages that diverged before the breakup of Gondwana and diversified on their respective continental plates. In addition, however, within younger cockroach lineages, they found evidence of transoceanic dispersal in regions near Australia and Indo-Malaysia. The study underscores the importance of plate tectonics in shaping modern insect distributions, as well as provides a new framework for future cockroach biogeographical research.

<https://www.sciencedaily.com/releases/2018/02/180208180359.htm>

Snowflakes occur when a speck of dust or a particle of pollen comes into contact with water vapor high in the atmosphere. As the water vapor coats the tiny particle it freezes into a tiny crystal of ice that becomes the "seed" from which a snowflake will grow. The molecules of water arrange themselves naturally into a hexagonal crystal structure, resulting in a snowflake with six sides or six arms.

Because they are naturally occurring solids with a definite chemical composition and an ordered internal structure, ice crystals are by definition minerals, and so are snowflakes. Snowflakes are heavier than the surrounding air, so they fall. As they fall through humid air, more water vapor freezes onto the surfaces of the tiny crystals, repeating the hexagonal crystal structures. So the snowflake grows larger and larger as it falls, enlarging the hexagonal pattern.

<https://geology.com/articles/snowflakes/>



Every snowflake has a hexagonal crystalline structure but a unique geometry. Snowflake shape is determined by atmospheric conditions experienced as it falls through the sky. Various atmospheric conditions such as temperature and humidity can change as the flake falls, thereby causing variations in crystal growth.



# PGS WEBSITE OF THE MONTH

<https://geology.com/articles/homeowners-insurance.shtml>

An essay for homeowners that is well worth reading.

**WHAT WE DO NOT COVER—EXCLUSIONS**

We do not pay for loss resulting directly or indirectly from any of the following, even if other events or happenings contributed concurrently, or in sequence, to the loss:

(1) by earth movement, due to natural or man-made events, meaning earthquake including land shock waves, or tremors before, during or after a volcanic eruption; mine subsidence; landslide; mudslide; mud flow; earth sinking; rising or shifting. Direct loss by Fire, Explosion, Sonic Boom, Theft, or Breakage of Glass resulting from earth movement, mine subsidence, landslide, mud-slide, mud flow, earth sinking, rising or shifting is covered.

(2) by water damage, meaning:

(a) flood, surface water, waves, tides, tidal waves or overflow of a body of water. We do not cover spray from any of these, whether or not driven by wind;

(b) water or sewage which backs up through sewers or drains; or

(c) water below the surface of the ground. This includes water which exerts pressure on, or flows, seeps or leaks through any part of a building or other structure, sidewalk, driveway, foundation, or swimming pool.

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**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](mailto:Harris_D@calu.edu).

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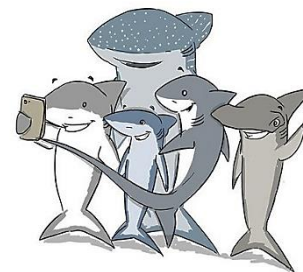
**Twitter:** PGS can be followed on Twitter by using the handle [@PghGeoSociety](https://twitter.com/PghGeoSociety)

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## Fun Fact Having Nothing to Do with Geology

In 2015, more people were killed from injuries caused by taking selfies than by shark attacks.

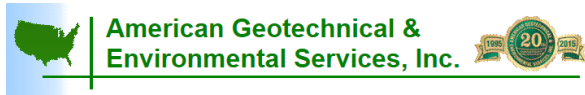


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