PGS Newsletter

http://www.pittsburghgeologicalsociety.org/

Vol. LXIX, No. 5 | Karen Rose Cercone, Editor | January 2017

Wednesday, January 18, 2017

A Joint Meeting with the ASCE Geo-Institute of Pittsburgh

Slurry-Supported Excavations for Environmental and Geotechnical Applications

Daniel Ruffing
Geo-Solutions, Inc.

The concept of slurry-supported excavations is a natural extension of using slurry to stabilize boreholes. The slurry, an engineered fluid consisting of clay suspended in water, serves as fluid shoring to allow the excavation of deep and narrow trenches without the need for dewatering or conventional excavation support systems. Although slurry-supported excavation is used for the installation of foundation elements and structural walls, e.g. slurry walls or diaphragm walls, this talk is focused on the non-structural applications, i.e. slurry trenching for cutoff wall installations, permeable reactive barriers, deep drains installed using bio-polymer slurries, and mass excavation and replacement. The history and theory of slurry trenching is discussed, followed by case study projects highlighting industries and applications.

Social hour - 6:00 p.m. **Dinner - 7:00 p.m.** **Program - 8:00 p.m.**

Dinner costs $30.00/person, students $10.00; checks preferred. For reservations, please email your name and number of attendees in your party to pgsreservations@gmail.com. You can also reserve and pay for dinners via PayPal on our website http://pittsburghgeologicalsociety.org. Please include your name and number of attendees in your party. **The deadline for reservations is noon on Monday, January 16.**

Meeting will be held at Foster's Restaurant, Foster Plaza Building 10, Green Tree.

SPEAKER BIOGRAPHY

Dan Ruffing serves as the Engineering Manager of Geo-Solutions, Inc. (GSI) working out of the New Kensington, PA, regional office. As Engineering Manager, Dan is responsible for overseeing GSI's quality control efforts including management of the Project Engineers and Technicians, directing GSI's marketing efforts, and managing specialty geo-environmental and geotechnical construction projects. Dan earned his Bachelor's and Master's degrees from Bucknell University and is a Professional Engineer in PA with 7 years of construction and design experience. Dan lives in the South Hills of Pittsburgh with his wife and two sons.

PRESIDENT'S STATEMENT

During the middle of this past December, from the 14th through the 16th, a conference on the development and testing of techniques for turning "problem soils," into soils suitable for agriculture took place in Bangkok, Thailand. The event was sponsored by the United Nations Food and Agriculture Organization and the Association of Southeast Asian Nations, and coordinated by Thailand's Land Development Department (LDD), Soil Resources and Research Division. Back in 1977 to 1981, I had spent my Peace Corps years mapping landforms for the Soil Survey Division of LDD and along the way developed friendships with several Thai co-workers that have lasted up to the present time. One of those friends, Khun (Mr.) Taweesak Vearasilp, was involved with the conference preparation and asked me for a little help. Someone on the staff of LDD was charged with drafting two welcoming speeches for the event to be given by the Director General of LDD and the Minister of the Royal Thai Ministry of Agriculture and Cooperatives. The speeches had to be given in English. Although retired, Taweesak was willing to help with the write-up. He speaks English very well but he does not often write it, and so he asked me to review and edit his drafts. I received Taweesak's work via email on December 12 at 9:19 pm, i.e. 9:19 am on December 13 his time, and completed my adjustments by around midnight (well past my bedtime for which he needlessly apologized). All the while I felt gratitude for the opportunity to once again assist both my old friend and past employer after three and a half decades and from half-way around the world. I also was moved to reflect on an important reward we all can experience from our professional associations, whether it be on the job or through an organization like PGS: companionship. PGS provides many great services like keeping us abreast of recent developments in geology, providing networking opportunities, and performing services to the surrounding community. But what has equally impressed me over the many years I've been a part of the organization is the strong comradery among its members. This only accentuates the thankfulness I feel for the hard work of the PGS Board, the presentations of visiting speakers, and the financial generosity of our sponsors in support of the functions and consequent associations offered by this great society.

I wish to acknowledge the contributions of the following corporations received during the month of December: ACA Engineering, Inc.; American Geosciences, Inc.; Ammonite Resources; AWK Consulting Engineers, Inc.; Billman Geological Consultants, Inc.; DC Energy Consultants; Dorso LP; Enviro-Equipment, Inc.; Geo-Environmental Drilling Co., Inc.; HDR Engineering, Inc.; Howard Concrete Pumping Co., Inc.; Insite Group, Inc.; Michael Baker International; Moody and Associates, Inc.; Oil and Gas Management, Inc.; Pennsylvania Drilling Company; Pennsylvania Soil & Rock, Inc.; Range Resources Appalachia; THG Geophysics, Ltd.; and Vista Resources.

Hope to see you on the 18th.

Peter R. Michael

IN MEMORIAM

DEREK TATLOCK

October 15, 1931 - December 25, 2016

Honorary PGS Member Derek Bruce Tatlock, 85, of Williamsburg, VA, passed away from complications of Parkinson's Disease on December 25, 2016. Mr. Tatlock was born in Rochester, NY, and was a graduate of Brighton High School and Colby College in Waterville, ME, where he was an active member of the Outing Club and varsity ski team. In 1955 Mr. Tatlock received his Master's Degree in Geology from the University of Michigan.

Derek married Betty Niner in the summer of 1956 and after spending 2 years in the US Army, primarily at Yuma Test Station in Arizona, he moved to Bismark, ND, to become a geologist for Mobil Oil. In 1959 he and his family moved from Bismark to work for The Peoples Natural Gas Company in Pittsburgh, PA. He left Peoples Gas to open an office for Templeton Energy and finally started his own consulting firm, Tatlock Exploration, in the early 1980's which he ran until he retired to Sunapee, NH, in 1998.

Derek was an officer and board member of many local, state and national geological associations, including the Pittsburgh Geological Society. He was also a contributor to the landmark volume published by the society, *The Geology of Pennsylvania*. Along with John Harper and Bob Wolfe, he co-authored the chapter entitled “Petroleum – Shallow Oil and Natural Gas” and along with Pete Briggs, he co-authored another chapter entitled “Petroleum – Guide to Undiscovered Recoverable Natural Gas Resources.”

In Pittsburgh, Derek Tatlock was a member of the McCandless Township Planning Board for over 25 years and an active member of the North Area Environmental Council. While living in Sunapee, NH, he also was a member of the Planning Board where he helped to form the master plan for the community. He was Program Chairman for the Friends of the Abbott Library for over 5 years. Derek was an avid skier. He was a long time member of the National Ski Patrol and enjoyed skiing with his family and friends as often as possible. He also loved sailing and bicycling.

Mr. Tatlock is survived by his wife, Betty and daughters Beth, Susan, and Robbin as well as four grandchildren and a brother. In lieu of flowers, his family asks that you please contribute to the American Parkinson's Disease Association or to your favorite charity in his memory. A celebration of Derek's life will take place at a later date to be announced.

GEOLOGICAL EVENTS

GEOPHYSICAL SOCIETY OF PITTSBURGH

January 10, 2017
Erich Zorn, Department of Energy - "Comparison of Geo-mechanics of the Microseismic Response in Organic Shales of West Virginia and west Texas"
Cefalo's Event Center, Carnegie PA

HARRISBURG AREA GEOLOGICAL SOCIETY

January 12, 2017
Joe Lee (Lee Hydrologic) - The Potential for Induced Seismicity from Oil and Gas Wastewater Injection Wells and Unconventional Well Development in Pennsylvania

PITTSBURGH SOCIETY OF PETROLEUM ENGINEERS

January 17, 2017
Greg Wrightstone - "Optimizing Lateral Placement and Production While Minimizing Completion Costs: an Eagle Ford Case Study"
Cefalo's Event Center, Carnegie PA

PITTSBURGH AREA PETROLEUM GEOLOGISTS

January 19, 2017
Dr. Shuvajit Bhattacharya (Battelle) - "Data Driven Analysis in Reservoir Characterization, Well Integrity and Production Performance"
Cefalo's Event Center, Carnegie PA

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS

February 2, 2016
2-Day PG Review Course for the Practicing Geologist & ASBOG Exam Candidate.
Pittsburgh Marriot North, Cranberry Twp.

APRIL 19, 2017
AEG – ASCE – PGS
STUDENT NIGHT

Students will once again have the chance to present their research at the 15th Annual Student Night on April 19, 2017 at Foster's Restaurant, #10 Foster Plaza, Greentree. 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, and receive the benefits that go along with it. 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 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 top poster presenters will each receive $50.

Abstracts must be submitted to tamra.schiappa@sru.edu by March 1.

PGS SPRING 2017 FIELD TRIP

GEOLOGY OF THE PENNSYLVANIA MAIN LINE CANAL (WESTERN DIVISION) NEAR SALTSBURG, PA

SATURDAY, APRIL 8, 2017

In 19th century America, the most advanced way to ship goods and transport people across the country was by canal. The financial success of the Erie Canal in 1825 convinced the state of Pennsylvania to build a much longer and more technically difficult canal from Philadelphia to Pittsburgh. The Western Division (constructed between Johnstown and Pittsburgh between 1827 and 1831) was "the longest and most troublesome on the entire Pennsylvania Main Line route" according to canal historians.

Our spring field trip will examine the route of the Pennsylvania Main Line Canal near Saltsburg and Tunnelton, PA, focusing on the geology of this region and the engineering challenges it presented.

Stop One: Type Locality of the Saltsburg Sandstone. Upon our arrival in Saltsburg, we will follow the Pennsylvania Canal's former route north to examine the type locality of the Saltsburg Sandstone. Recent studies of this unit in West Virginia have suggested it may be an estuary deposit in an incised river valley.

Stop Two: Rebecca Haddon Stone House Museum. The Pennsylvania Canal was routed along the Conemaugh and Kiskiminetas Rivers in part because of the economic value of the salt-producing wells that gave Saltsburg its name. We will examine the history and geology of salt brine production at this historical gem of a museum, under the leadership of Gary Ball, museum affiliate and long-time PGS member.

Stop Three: Glenshaw Formation. By following the canal's path south from Saltsburg, we can observe some of the engineering feats required to place early rail and canal routes in the same narrow river valley. We will also see excellent exposures of fluvial deposits in the Glenshaw Formation.

Stop Four: Tunnelview Historic Site. We will eat our brown-bag lunches at an overlook near Bow Ridge, a topographic feature so extreme and narrow that four different tunnels were cut through it to allow the canal and subsequent railroad lines to shorten their paths.

Stop Five: Bow Ridge. A hunter's access road will allow us to climb up through the paleosols and fluvial channels that make up the upper Bakerstown interval of the Glenshaw Fm. At the top, we will view the incised meander bend around Bow Ridge from both sides.

Stop Six: Conemaugh River Lake Dam. The US Army Corps of Engineers will give us a tour of the dam that was built here in 1952 to protect Pittsburgh and other down-stream communities from floods. Note: field trip participants must submit their driver's license and birthdate to get security clearance for this tour.

FIELD TRIP LOGISTICS

Our rental van(s) will depart from the Shop and Save Parking Lot at the corner of Tarr Hollow Road and Route 22 in Murrysville at 8:30 AM and return by approximately 5 PM. You must bring your own bagged lunch; snacks and water will be provided by PGS. Cost of the field trip is $25. To reserve a spot, email your name, birthdate and driver's license number to Karen Rose Cercone at kcercone@iup.edu.

The deadline to sign up for the PGS spring field trip will be March 1, 2017.

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Cambria County was created on March 26, 1804 from parts of Bedford, Huntingdon, and Somerset Counties, but it wasn't organized until 1807. The name is a Latinized version of Cymry, the Welsh name for the nation of Wales[1]. This should not come as a surprise considering that the county seat, Ebensburg, was founded in 1796 by a party of Welsh settlers who thought the area at the top of Allegheny Mountain was an attractive spot to live and worship. Cambria County's largest town, the City of Johnstown, is known primarily for its history of coal mining, steel making, and, especially, its numerous devastating floods.

Ebensburg, the seat of Cambria County

Other towns within Cambria County include Loretto, home of St. Francis University and Mount Assisi Monastery (former summer residence of Charles M. Schwab); Gallitzin, where the railroad tops Allegheny Mountain through a summit tunnel; Portage, built along the route of the historic Allegheny Portage Railroad; and Cresson, the summer home of many great Pittsburgh entrepreneurs such as Andrew Carnegie and Henry Clay Frick.

Sunken Gardens of Mount Assisi Monastery

[1] *This is also the origin of the geologic time period, Cambrian, named by Adam Sedgwick in 1835.*

DID YOU KNOW . . . ?

Some of the largest footprints ever found were made by a type of dinosaur called a titanosaur that lived in central Asia 70 to 90 ma. Discovered by a Mongolian paleontologist in the Gobi Desert, the footprints show the dinosaur must have been titanic. One of the best preserved footprints is a convex mound 42 inches long and 30 inches wide, roughly the size of a popular kitchen table sold by Ikea, and contains impressions of the animal's toenails. Footprints more than a yard long have also been found in Morocco and France, but they aren't as well preserved as the Mongolian one. Although the size of the dinosaur that made the prints cannot be easily determined, the researchers estimate it was between 72 and 108 feet long.

Gigantic dinosaur footprint found in the Gobi Desert, Mongolia

Discovery of the footprints is not unusual in the Gobi Desert, which is something of a fossilized footprint mother lode. Between 1995 and 2008, scientists found more than 20,000 tracks belonging to a variety of dinosaur species. The titanosaur print is special because no one had ever found anything so large in the area before. And, even though paleontologists have found titanosaur fossils on every continent, titanosaurs as a whole remain shrouded in mystery. They are not considered to be a group of specific dinosaurs, but rather a kind of catchall term for a group of giant, four-legged, long-necked herbivores that lived in the Cretaceous. One of the largest dinosaurs ever found, *Dreadnoughtus*, may have weighed as much as 80 tons. Other very large titanosaurs include the 70-ton *Argentinosaurus*, and a yet unnamed dinosaur whose model skeleton is too big to fit in one room at New York's American Museum of Natural History.

Scientists have found the first evidence that oil from the Deepwater Horizon blowout in April, 2010 is affecting land animals. Carbon from the spilled oil is well known to have entered the offshore and nearshore food webs – plankton, fish and filter feeders. However, when the scientists analyzed the diet and feathers of Seaside Sparrows collected more than a year after the oil spill, they found that birds captured in habitats that had been exposed to the oil had a different chemical signature in their tissues than the birds from areas of the marsh that were not exposed to the oil.

A Seaside Sparrow

Many people tend to think terrestrial ecosystems are safe from contamination from offshore oil spills, but the boundary between marine and terrestrial ecosystems is much less defined than you might think. Species living on the boundary are vulnerable to the toxic effects of oil; they can also be responsible for the transport of oil to terrestrial food supplies. The scientists' results show that the oil from the oil spill was incorporated into the prey and feathers of the exposed birds. The Seaside Sparrow is a year-round resident of Louisiana marshes, so the research suggests that direct exposure to the oil may have a detrimental impact on the birds' reproductive success. Differences in the sparrows' gene expression and reproductive success between oil-contaminated and noncontaminated sites probably were caused by direct toxicological effects, not just habitat degradation or loss of prey species. The researchers urge that future risk and damage assessments should incorporate an evaluation of the potential threat to terrestrial wildlife from oiling operations and oil spills.

The Early Devonian Oriskany Sandstone was first described and named by Lardner Vanuxem of the New York Geological Survey in 1839 for a classic exposure at Oriskany Falls in Oneida County, NY. Almost 100 years later, R. B. Rowe, Charles Schuchert, and Charles K. Swartz described the Oriskany Group in Maryland as separated into an upper Ridgeley Sandstone (for Ridgeley, WV) and a lower Shriver Chert (for Shriver Ridge at Cumberland, MD). In keeping with stratigraphic practices of the time, they used both lithology and biostratigraphy in their description – the Oriskany became a group in Maryland because the Shriver Chert contained "Oriskany-age" fossils. While the Oriskany is only about 30 feet thick at its type section, the Ridgeley in some places in West Virginia exceeds 250 feet thick.

Oriskany crag in Huntingdon County, PA

For many years, the Oriskany Sandstone in Pennsylvania was called Ridgeley following the lead of Maryland's geologists. In western Pennsylvania, the name Ridgeley basically has been abandoned in favor of the original name, but in central Pennsylvania there are still those who continue to prefer the name Ridgeley. To confuse matters even more, because Pennsylvania geologists mapping on a 1:62,500 scale in the 1950s and 1960s had trouble mapping the Ridgeley where it is very thin, they combined the sandstone and the underlying carbonates, cherts, and shales of the Helderberg Group into a single mappable unit called the Old Port Formation.

The GRAPES-3 muon telescope, located in Ooty, India, is the largest and most sensitive cosmic ray monitor operating on the planet. On June 22, 2015, it recorded a burst of galactic cosmic rays of about 20 GeV that lasted for two hours. The burst resulted from a gigantic cloud of plasma ejected from the sun that moved at about 1.5 million miles per hour and struck the Earth, causing a severe compression of our magnetosphere from 11 to 4 times the radius of the planet. This triggered a severe geomagnetic storm that generated aurora borealis and radio signal blackouts in many high latitude countries.

The GRAPES-3 muon telescope

Solar storms can cause major disruption to human civilization by crippling large electrical power grids, GPS, satellite operations, and communications. Earth's magnetosphere, with a radius of more than 600 thousand miles, acts as the first line of defense by shielding us from the continuous flow of solar and galactic cosmic rays and protecting life on the planet from high intensity energetic radiations.

Unfortunately, numerical simulations performed by the GRAPES-3 collaboration team indicated that the Earth's magnetic shield temporarily cracked on the night of June 22, 2015,, allowing the lower energy galactic cosmic ray particles to enter our atmosphere. Earth's magnetic field bent these particles about 180o, from the day-side to the night-side of the Earth, where the GRAPES-3 muon telescope detected them around midnight.

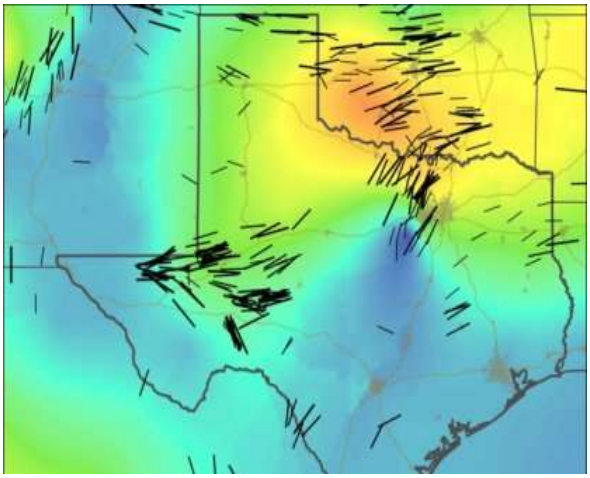
A team of paleontologists found the well-preserved remains of a Late Cretaceous bird in the Canadian Arctic that they named *Tingmiatornis arctica* (derived from Tingmiat, an Inuktitut phrase meaning “those that fly”). The bird would have been a cross between a large seagull and a diving bird like a cormorant, but probably had teeth. The team’s findings add to previous fossil records from the same geological time period and location in previous expeditions, which, taken together, paint a clearer picture of a Late Cretaceous ecosystem in the Canadian Arctic.

Previous studies have suggested that the Arctic during this period would have been warm, but would still have had seasonal ice. But this team suggests instead that this time period (the Turonian Epoch) was a hyper-warm interval because the bird’s food sources and the whole part of the ecosystem could not have survived in ice. The paleontological and sedimentary records indicate the environment would have been characterized by volcanic activity (*Tingmiatornis arctica* fossils were found above basalt lava fields), a calm freshwater bay, temperatures comparable to those in northern Florida today, and creatures such as turtles, large freshwater fish, and champsosaurs. Volcanoes most likely pumped carbon dioxide into the Earth’s atmosphere, causing a greenhouse effect and a period of extraordinary polar heat. This created an ecosystem allowing large birds, including *Tingmiatornis arctica*, to thrive.

Artist’s reconstruction of the very early bird *Tingmiatornis arctica*

Geophysicists from Stanford University have compiled detailed maps of the geologic forces controlling the locations, types, and magnitudes of earthquakes in Texas and Oklahoma. These "stress maps" provide insight into the nature of the faults associated with recent temblors, many of which seem to have been triggered by wastewater injection in deep formations. The maps help explain why injection-induced earthquakes have occurred in some areas, and provide a basis for making quantitative predictions about the potential for seismic activity resulting from fluid injection.

The researchers created the stress maps from data donated by oil and gas companies from different parts of Texas and Oklahoma. When combined with information about the faults present in a given area, the scientists were able to assess which faults are likely to be problematic and why. In the areas where induced earthquakes have occurred in Texas and Oklahoma, a relatively small increase of pore pressure would have been sufficient to trigger slip. Many of the recent earthquakes in Texas occurred on faults with orientations nearly ideal for producing earthquakes. Therefore, it behooves the wastewater injection companies to do this kind of study in advance of planned injection activities. Identifying which faults are potentially active in advance should help companies and regulators avoid problematic faults during fluid injection and prevent induced earthquakes from occurring.



Stress map of Texas and Oklahoma

(black lines = stress orientation; blue and green = crustal extension; yellow and orange = crustal compression)

Everyone knows that it takes incredible heat and pressure to form a diamond (for those of us old enough to remember the TV show, think of how Superman created a perfectly cut and polished diamond by crushing a lump of coal in his hand!). When diamonds are formed, microscopic minerals can be trapped inside as inclusion. The chemistry of these minerals provides a rare look at the processes that led to the formation of Earth's crust.

Inclusions found in diamonds at the Denver Museum of Natural History, which came from the Congo craton in central southern Africa, illustrate an incredible 3-billion-year journey through tectonic collisions and volcanic eruptions.

Diamonds come in many shapes, sizes, colors and qualities

An international team of scientists used an electron microprobe, an infrared spectrometer, and a secondary ion mass spectrometer to analyze the Museum's diamonds. They determined that the diamonds formed as thin continental fragments and began their journey beneath the thick, buoyant continental crust of central Africa. Over 2.8 billion years, this part of the African continent repeatedly rammed into smaller and thinner fragments that slid downward toward Earth's core. Along their journey, they were dehydrated by extreme heat and pressure, triggering the formation of diamonds. The diamonds were then brought to the surface in volatile eruptions. The grueling conditions that led to the formation of the diamonds and their inclusions included temperatures 5 times hotter than an oven, and pressures 10 times that found below Mount Everest. Knowing how and where diamonds like these are formed helps inform the ability to predict where to find future diamond deposits. Although many diamonds - the really beautiful ones - end up on a ring, the "ugly" ones often have better stories to tell.

The Alps are still growing!!!

Northern North America, Scandinavia, and the Alps are steadily "growing" by as much as 1 to 2 mm per year. At the end of the Last Glacial Maximum (LGM) about 18,000 years ago, the continental glaciers melted, and the heavy pressure of miles of ice on Earth's surface diminished. Although the ice melted within a few thousand years, Earth's crust is still responding to this relatively sudden melting today.

For years, it was assumed that the retreat of the ice cap played no significant part in the steady uplifting of the Alps during the Holocene. However, an international team of scientists has now been able to show that the loss of the LGM ice cap accounts for 90% of today's uplifting of the Alps. In old, tectonically-stable continental areas like North America and Scandinavia, vertical motion is almost exclusively caused by postglacial rebound (isostatic adjustment), the upward motion of the crust due to the thawing of the glaciers.

But in young mountain belts like the Alps, complex tectonic and sedimentary mechanisms occur that mutually effect each other. Many scientists assumed that the uplift of the Alps was caused primarily by erosion and sediment transport to the foreland. The new study used models, supported with drill core data, to show that most of the postglacially eroded material instead was deposited within the orogen, so erosion and transport have been excluded as a main cause for the alpine uplift. The models show that the uplift-signal is a compensatory movement following the decline of the LGM-glaciers.

Alpine glaciation decreased by about 80% within only 3,000 years, so only about 10% of today's uplift can now be attributed to sediment unloading (local tectonic effects also add to the uplift). The models suggest that the glacial load on the Alps amounted to about 62,000 gigatonnes, but the postglacial sedimentary unloading can account for only about 4,000 gigatonnes.

PGS Website of the Month

http://www.space.com/

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Officer Contacts: If you wish to contact a current PGS Officer, you can email Peter Michael, President, at shabell9@comcast.net; Tamra Schiappa, Vice President and Speaker Coordinator, at tamra.schiappa@sru.edu; Kyle Fredrick, Treasurer, at fredrick@calu.edu; and Karen Rose Cercone, Secretary and Newsletter Editor, at kcercone@iup.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 Tamra Schiappa, Program Chair at tamra.schiappa@sru.edu.

PGS Website: Access many online PGS resources at http://www.pittsburghgeologicalsociety.org/

Facebook: Follow the PGS at https://www.facebook.com/PittsburghGeologicalSociety for breaking news, announcements and interesting geological facts.

Twitter: PGS now has a Twitter Feed! You find it at https://twitter.com/ on the web or look for **@PghGeoSociety** on your mobile Twitter app.

LinkedIn: PGS has added a dedicated LinkedIn page to our social media portfolio. We'll use it to post job opportunities and other professional announcements for our members.

Fun Fact Having Nothing to Do with Geology

The human heart creates enough energy every day to drive a truck twenty miles. In the course of a lifetime, that's the equivalent of driving to the moon and back.

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