PITTSBURGH GEOLOGICAL SOCIETY

March 20, 2019

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

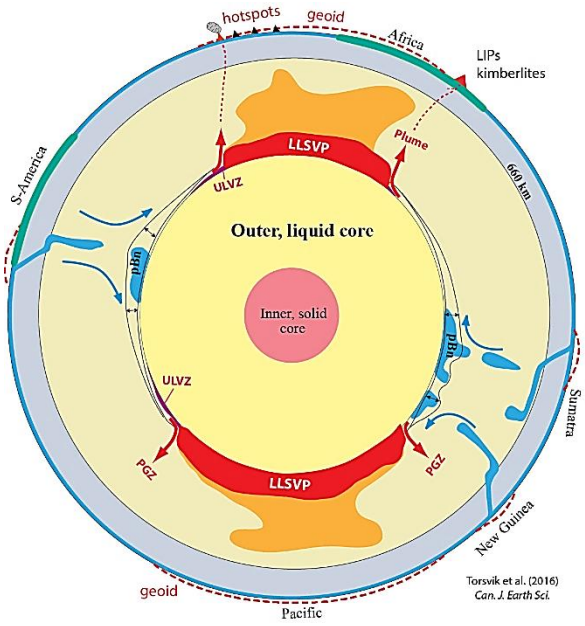
Dinner costs
$30.00 per person
$10.00 student member

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

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

NEW LOCATION
Cefalo's Banquet & Event Center, Carnegie PA

Could Earth's Long-Wavelength (Degree-2) Mantle Structure Be Stable Through Time?



Dr. Mathew Domeier

Researcher, Centre for Earth Evolution and Dynamics (CEED), University of Oslo, Norway

Deadline for Reservations: Wednesday, March 13.

Speaker Abstract

At the base of Earth's mantle, just above the boundary with the core, lie two large and nearly antipodal provinces characterized by anomalously slow seismic wave speeds, termed the Large Low Shear-wave Velocity Provinces (LLSVPs). One of these structures lies beneath Africa, and the other beneath the Pacific Ocean. Accumulating evidence has increasingly revealed that the LLSVPs play an important role in mantle dynamics, most notably in that they are spatially associated with most deep-seated mantle plumes, and they coincide with the broad, antipodal upwellings in Earth's degree-2 mantle flow. In affecting large-scale convection in the mantle, and the nucleation of plumes that can fragment the lithosphere, these lowermost mantle structures may furthermore influence long-term plate motions. A key question is therefore: how stable have these features been through time?

Here I discuss multiple independent lines of evidence that indicate that the LLSVPs have been in approximately the same position for the last 300 Ma, and possibly considerably longer. However, such long-term stability of the LLSVPs remains a contentious interpretation, and I will also consider some important criticism that has been raised in response to it. Given the broad implications that this discussion carries for an understanding of the nature and history of mantle convection and plate tectonics, the further interrogation of LLSVP stability beyond 300 Ma represents one of the foremost imperatives in modern geophysics. But the way forward is not yet clear: innovative observational methods and novel experiments together with further numerical simulations are needed to resolve the question of Earth's degree-2 stability.

Speaker Biography

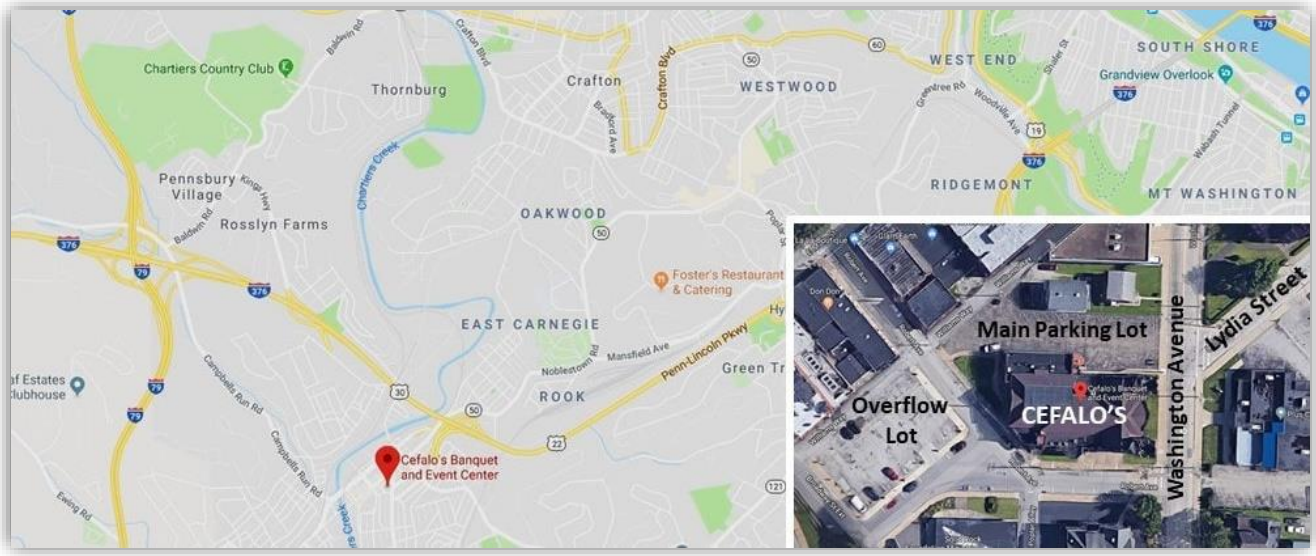
Mathew Domeier is a researcher at the Centre for Earth Evolution and Dynamics (CEED) at the University of Oslo, Norway. He received a BSc in Geology from Slippery Rock University, and a PhD in Geophysics from the University of Michigan. He started his career as a postdoc at the Physics of Geological Processes (PGP) at the University of Oslo, before joining CEED at its commencement in 2013.

Mat's current research focuses on the construction and application of global plate tectonic models in times ranging from the Cenozoic to the late Precambrian, with active projects focused on the opening of the Iapetus Ocean in the Neoproterozoic, Pacific intraoceanic subduction in the Cenozoic, and the assembly of a temporally seamless global plate model for all times in between. In support of this paleogeographic research, he also actively participates in field and lab-based paleomagnetic research, with ongoing projects operating on 5 continents, on rocks spanning 600 million years of Earth's history. On the model application side (the really fun stuff!), Mat's present work explores the history of subduction and its effects on the deep mantle, crust and atmosphere.

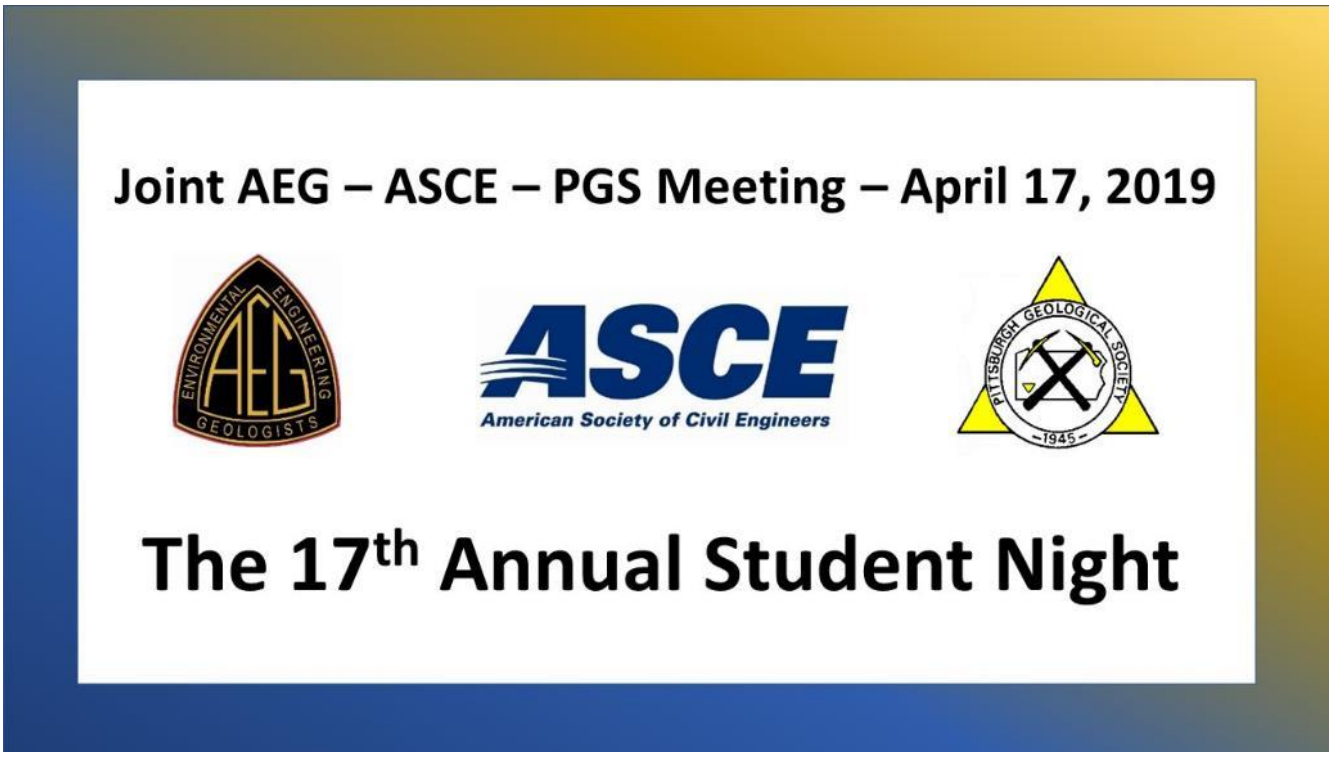
PGS MEETING LOCATION

A reminder that the Pittsburgh Geological Society has moved its monthly meetings for spring to **Cefalo's Banquet and Event Center** in Carnegie PA. Please note that for this facility, your dinner reservations must be made by **Wednesday of the week prior to the meeting**.

Directions: Take Parkway West to Exit 65 for Carnegie. If exiting from westbound lanes, use the left exit ramp (marked Heidelburg) to Lydia Street. Follow Lydia Street for four blocks until it ends at Washington Avenue. Cefalo's Banquet Center (a former church) will be directly across from you. Overflow parking is along side streets and across the street from the site.



Preview of the Next PGS Meeting



PRESIDENT'S STATEMENT

Greetings and welcome to the end of winter!

As we enter March, we think of the gradual greening of the landscape, the color of early blossoms, and the arrival of spring. March is known as the "rough month". It is a month of change, a time of blustery winds, unsettled weather, and longer daylight hours.

The daytime temperatures begin to warm and as the days get longer, the sun crosses the celestial equator (the imaginary line in the sky above the Earth's equator). This is called the vernal or spring equinox and this year it will occur on March 20th. At that moment, the Sun will be directly above the equator and day and night will be approximately equal length.

The term "equinox" is derived from Latin, meaning "equal night". For the Northern Hemisphere, the spring equinox is the moment when the winter season ends and spring begins. Fun fact: It is also the point in time that is used to determine the date of Easter. Easter falls on the first Sunday after the first full moon occurring on or after the vernal equinox.

March is the time of year that we begin planning the upcoming field season and thinking about summer and beyond. Students are applying and interviewing for internships, and preparing for graduation and field camp.

For students, if you are working on a cool research project, now is the time to submit an abstract for Student Night (page 8). It is also the time to sign up for the Drilling Workshop (page 9). Both of these opportunities are organized to help you sharpen both your communication and field skills, and prepare you for a life-long career in the geosciences. Review the announcements in this newsletter and on the website for details and deadlines.

In closing, I would like to thank Pete Hutchinson for stepping in, at the last minute, to speak at last month's meeting. We received good feedback from the members in attendance and several have graciously volunteered to present at the last minute, if a situation like this happens again. This has spurred an effort to put together a list of speakers, with potential titles and already prepared talks, that are willing to jump in at the last minute. Many of us on the board are doing the same. If you are interested in joining the list, please send me a potential title and/or topic that you want to present and we will add you to the list.

Finally, I would like to thank the corporate sponsors that continue to contribute to the PGS and to all of the members whose support and dedication to the Society makes us a strong, caring, compassionate, community of professionals.

Looking forward to seeing you at the meeting!

Tamra

LOCAL GEOLOGICAL EVENTS

GEOPHYSICAL SOCIETY OF PITTSBURGH

March 5, 2019

"Fracture analysis in the MSEEL MIP3H well, new processing of the DAS and the long term DTS monitoring an update about the new MSEEL2 project" by Dr. Tim Carr and Dr. Payam Kavousi, WVU

Cefalo's Banquet Center, Carnegie PA

SOCIETY OF PETROLEUM ENGINEERS

March 12, 2019 (lunch meeting)

"The "Fracts" of Life (Common Failure Mechanisms Associated with Fracturing)" by 2019 SPE Distinguished Lecturer Martin Rylance, BP Exploration

Cefalo's Banquet Center, Carnegie PA

AMERICAN SOCIETY OF CIVIL ENGINEERS – GEO-INSTITUTE

March 13, 2019
(See details on page 12)

April 5, 2019

2019 Short Course "Practical Aspects of Tunnel Design and Construction" by Dr. Michael A. Mooney, Colorado School of Mines and Dr. Conrad W. Felice, C.W. Felice, LLC.

Engineers' Society of Western Pennsylvania Pittsburgh, PA

SOCIETY OF WOMEN ENVIRONMENTAL PROFESSIONALS

April 4, 2019

Creating an Environment to Advance Women Leaders with County Executive Rich Fitzgerald

Pittsburgh Plaza Hotel, Greentree PA

The Pittsburgh Geological Society welcomes the following new society member:

Richard P. Aschenbrenner, PG
East Liverpool, Ohio

We also welcome the following new student members from Slippery Rock University of Pennsylvania:

Brett J. McClinton
Michael P. Behe
Celia C. LaPorta
Autumn L. Mohler
Tiffany D. Wolf

THE PITTSBURGH GEOLOGICAL SOCIETY ENDOWMENT FUND

Established May 8th, 2014 through the

COMMUNITY FOUNDATION
Serving the Heart of Western Pennsylvania

A CALL FOR EMERGENCY BACKUP SPEAKERS ....

Do you have a talk prepared and ready to present in the event of a PGS emergency? On rare occasions, PGS speakers can't make the meeting for their planned talk due to inclement weather, health concerns, or sudden family emergencies. In the event of a speaker cancellation, PGS is requesting volunteers to act as backup speakers for future meetings.

If you have talk ready to present, please consider volunteering as a backup. Contact the program coordinator, **Daniel Harris** (mailto:harris_d@calu.edu) to add your name to the list of volunteers. Please provide the title of your talk, an abstract if available, and contact information where you can be reached easily in the event of a required backup speaker. In the event that we would request your talk, your meeting registration would be covered by the society. Volunteering for this opportunity does not offer a guarantee that your talk would be necessary or requested as the chosen backup talk would be selected from a collected database to most closely match the original topic. If you would like to provide a talk at a future meeting as the invited speaker and not as a backup, please indicate that intention.

.... AND A CALL FOR NOMINATIONS!

It is March and a good time to consider becoming more involved in the Pittsburgh Geological Society by serving as an officer or board member. Over the next several weeks, Nominations and Elections Chair Ray Follador will be asking non-student members who regularly, or semi-regularly, join us at our Wednesday meetings to consider a position on our Board or as an officer. He will be looking to fill a ballot with qualified and energetic members by the April 17 meeting prior to our May 15 election.

If you have no previous experience in governing a professional society, you may want to consider vying for one of the three Director-at-Large positions that are filled every year by the Society. In this position you will assist the officers and committee chairs in the monthly functions of the Society. It is a great way to contribute to your Society while getting acclimated to its functions. Membership on the Board also helps train our future officers. The Director-at-Large position is a 2-year commitment and requires regular attendance at the Board meetings held one hour prior to the social hour of each monthly meeting.

If you are a past officer/board member, you are always welcomed back. Previous experience is very useful at our Board meetings whether you want to come back as an officer or take the gradual approach as a board member. If you are an active professional member of the Society and have an interest in being a candidate or know of a member that you think would be a good candidate, please contact **Ray Follador**, Nominations and Elections Committee Chair, at geodawg@comcast.net or (724) 744-0399. A list of all candidates will be announced at the April 17 PGS meeting with the election to be held at the May 15 meeting.

PGS Member Spotlight: Morgan Jones, Student Member

Geological Education
California University of Pennsylvania, Geology major, Expected Graduation: May 2021

How long have you been a member of PGS?
One year.

What is your favorite subject/area of study?
Hydrology

What are your plans if money was not an issue?
Own a volcano!

What is the most exciting place you have been geologically or one place you wish you could visit?
Cave of the Crystals in Mexico

What is your favorite PA geology site/fun fact/phenomenon, etc.?
The Ringing Rocks

What is the most exciting place you have been geologically?
Devil's Tower

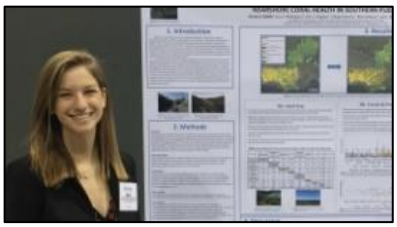
What is your favorite or least favorite "Bad" geology movie or book and why?
Volcano. It's completely accurate and has amazing acting. Highly recommended.

What is your favorite rock, mineral, or fossil?
Azurite

If you could meet any geologist, living or dead, who would you meet?
Marie Tharp

PGS – AEG – ASCE STUDENT NIGHT

April 17, 2019



University students, please consider presenting the results of your college research projects at the **17th 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.

Guidelines and Submission Forms can be downloaded from the PGS website:

https://www.pittsburghgeologicalsociety.org/student-night.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 Night Abstract Submission Form is a two-page fillable PDF document consisting of a cover sheet with digital signatures by the student and faculty mentor and an abstract describing the research project. A letter of support for the project must be submitted separately to PGS by the faculty advisor of the project.

Abstract submission forms and letters of support should be emailed to the PGS Program Chair, Dr. Daniel Harris, at Harris_D@calu.edu.

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.owlnet.rice.edu/~cainproj/ih_presentation.html
- The National Institute 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/

The deadline for abstract submissions will be March 22, 2019 by 5:30 PM. Acceptance decisions will be announced in early April.

Pittsburgh Geological Society
Spring 2019 Student Field Workshop

SPECIAL 2 DAY EVENT

APRIL 5 & 6, 2019
California University of Pennsylvania

Friday (4/5): Evening Program with Dinner:
Networking and Preparing for a Geoscience Career
(A block of rooms has been reserved at a local hotel, less than a mile from the morning drill site)

Saturday (4/6): Drilling and Sampling Field Workshop.
Light Breakfast and Lunch will be provided

Registration: $40.00 (Friday evening with hotel and Saturday) or $25 (One day, no hotel)

YOU MUST REGISTER TO SAVE YOUR PLACE

Have you wondered what you might be doing on that first job? Chances are you'll be assigned to a project that involves taking samples with a drill rig. In this field 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.

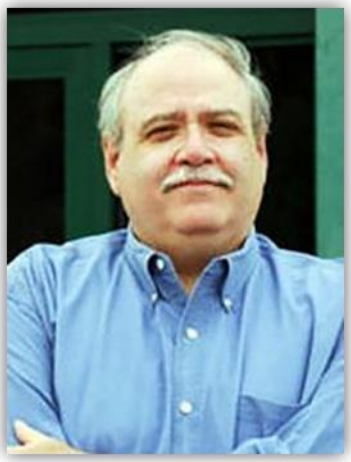
What will you experience?

Soil sampling using a drill rig	Soil & Rock descriptions
Basic sampling techniques	Well installation basics
Basic monitoring equipment	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. **You must be an active student, not a corporate trainee.**

- Pre-payment can be made through PayPal to pgsreservations@gmail.com or using a credit card through our website: https://www.pittsburghgeologicalsociety.org/field-workshop.html
- Checks made payable to "Pittsburgh Geological Society" can either be mailed to P.O. Box, 58172 PITTSBURGH PA, 15209 or submitted in advance at a PGS monthly meeting.
- To register or for more information, contact Kyle Frederick at **fredrick@calu.edu**

The Pittsburgh Geological Society is proud to announce



The Frank Benacquista Undergraduate Scholarship

The PGS Frank Benacquista Undergraduate Scholarship is an award of $500 to an undergraduate-level earth science student. This scholarship, created in honor of a long-time PGS member and student advocate, is intended to assist a student with college education costs and to promote student participation in the Pittsburgh Geological Society.

Eligibility Requirements

Any student who is majoring in the earth sciences, is at least a sophomore, and attending a four-year accredited college or university in the Pittsburgh region is eligible to apply.

The applicant must be a student member of PGS or must have applied for student membership at the time the application for the scholarship is submitted.

Required Materials

The full application must include the following:

- One-page resume
- Cover letter introducing yourself and elaborating on key points of your resume with a focus on activities outside of the classroom such as research projects, academic club service, or community involvement
- One-page essay describing your background, decision to pursue earth science, career goals, and academic objectives beyond the bachelor's degree (if any)
- Copy of your transcript (unofficial) and documentation that you are a current student. The requisite standard to apply is a minimum of 12 semester credits of earth science courses. Successful applicants should have a strong academic record that can be achieved through course work, research or service
- Letter of recommendation from a professor or another professional in the earth science field that provides information on your performance and activities in the classroom, in the department, or at an affiliated or non-affiliated institution. The letter should address your work ethic and your character in how you work and assist others in the classroom or field.

Scholarship Application Process

Your application packet may be printed out and submitted by mail to:

Pittsburgh Geological Society
Attn: Scholarship Committee
P.O. Box 58172 Pittsburgh, PA 15209

The application may also be sent in digital form (email with attachments) to the current PGS President at tamra.schiappa@sru.edu. Follow these instructions if sending as an email:

- In subject line of email message, please type “PGS Scholarship, Your Last Name”
- Include a professional message to the President stating that you are submitting your application for the PGS Frank Benacquista Undergraduate Scholarship
- Attach all documents required as Word or PDF documents. Please make sure that each document is titled with your last name.

  For example: Jones Resume.pdf, Jones Essay.pdf

Application Deadline and Award Date

All applications must be received by May 1, 2019. The scholarship will be awarded at the first meeting of the Pittsburgh Geological Society in September.

Acceptable Fund Uses

Students may use the scholarship toward tuition fees, for field camp, to purchase equipment required for hands-on exploration as required by academic course work (e.g., rock hammers, hand lens), to attend geologic conferences or field trips, or to attend the PGS field trip, or to attend the Field Conference of PA Geologists.

Basis of Awards

Awards will be based on the cover letter, recommendation letter, transcript, and the content and creativity of the essay as judged by the Scholarship Committee. The decision of the scholarship committee is final.

UPCOMING EVENTS OF INTEREST TO MEMBERS OF PGS

PTTC Workshop

March 13-14, 2019
WVU National Research Center
for Coal and Energy

"Volumes and Risks Assessment for Conventional and Unconventional Plays and Prospects"

WHO SHOULD ATTEND

Geoscientists, engineers and managers who work on exploration projects and require competency in the assessment of risks and volumes.

COURSE DESCRIPTION

The course enables participants to transform qualitative geological descriptions of plays and prospects into technically robust quantitative success-case and risked volumetric models. Obtained learnings will help participants to evaluate probabilities of success (PoS) for exploration plays, segments, prospects, wells and portfolios and to assess the range of petroleum volumes in exploration projects. Examples and case studies come from both conventional and unconventional plays, prospects and wells around the world. The learning objectives are achieved through well-illustrated lectures, numerous hands-on exercises and active class discussions. We will cover the following topics: Play Based Exploration, Assessment of success-case volumes for plays (conventional and unconventional), segments, prospects, wells and portfolios, Assessment of exploration risks and probabilities of success, and Post-mortem analysis.

ABOUT THE SPEAKER

Dr. Alexei V. Milkov is a Full Professor and Director of the Potential Gas Agency at the Colorado School of Mines, and a consultant to oil and gas industry. After receiving his PhD from Texas A&M University, Dr. Milkov worked for BP, Sasol and Murphy Oil as a geoscientist and senior manager. He explored for conventional and unconventional oil and gas in >30 basins on six continents and participated in the discovery of four billion BOE of petroleum resources. Dr. Milkov has expertise in exploration strategy, exploration risk analysis, resource assessments, portfolio management oil and petroleum systems modeling. He has published 50 peer-reviewed articles. Dr. Milkov received several industry awards, including the J.C. "Cam" Sproule Memorial Award from the American Association of Petroleum Geologists (AAPG) for the best contribution to petroleum geology and Pieter Schenck Award from the European Association of Organic Petrochemists (EAOG) for a major contribution to organic geochemistry.

REGISTRATION: ONLINE AND MAIL OPTIONS

The registration cost of $295 covers lunch, coffee breaks and all workshop expenses. **Pre-registration online is required by March 6 at: https://www.eventbrite.com/e/volumes-and-risks-assessment-tickets-**56134894982 **For further information contact: Doug Patchen, at 304-293-6216 (doug.patchen@mail.wvu.edu)** or **Rose Vergara at 304-293-6905 (rvergara@mail.wvu.edu).**

UPCOMING EVENTS OF INTEREST TO MEMBERS OF PGS

THE ASCE PITTSBURGH SECTION GEO-INSTITUTE CHAPTER PRESENTS

March 14, 2019 – Dinner Meeting

Evaluation of axial pile response for load-displacement-capacity and load transfer using seismic piezocone tests

Presented By: The Cross-USA Lecturer, Paul W. Mayne, PhD, P.E.,
Professor of Civil and Environmental Engineering at the Georgia Institute of Technology

For deep foundations, cone penetrometer (CPT) and piezocone (CPTu) data can be used in either traditional bearing capacity solutions via interpreted geoparameters, or alternatively with direct-CPT methods that scale the measured cone tip resistance and sleeve friction to unit end and unit side resistances of the full-scale pile foundation. A Modified Unicone Method is presented based on 330 pile load tests, compared with 105 load tests for the original Unicone Method. With seismic piezocone tests (SCPTu), the small-strain stiffness (G0) is obtained from the shear wave velocity measurement. A modulus reduction curve can be expressed in terms of the mobilized load (Q/Qult) which is in essence, the factor of safety. Introducing closed-form elastic solutions for axial pile displacement and load-transfer with depth, the use of SCPTu permits a construction of the load-displacement-capacity curves and axial load distribution for driven, jacked, and drilled pile foundations. Case studies from South Carolina, Georgia, British Columbia, Texas, Alabama, and Alberta are presented

With 42 years in geotechnical engineering, Paul is an expert in geotechnical site characterization, particularly the cone penetrometer, piezocone, dilatometer, and seismic tests with applications to foundation systems and ground modification. He has published 320 technical papers and participated in 120 short courses. Of recent, Paul authored the Synthesis 368 on Cone Penetration Testing (www.trb.org), co-authored the SOA-1: Geomaterial Behavior & Testing at the 17th ICSMGE in Egypt in 2009, gave the ASCE SOA lecture on In-Situ Testing (GeoOakland 2012), 16th Sowers Lecture (2013), 12th Jennings Lecture in South Africa (2014), James Hoover Distinguished Lecture at Iowa State Univ. (2014), invited keynote KN2 at CPT'14, 2014 Hal Hunt Lecture at the 39th Annual DFI Conference, invited keynote at ISC-5 Brisbane (2016), Nonveiller Lecture in Zagreb (2016), 34th Manuel Rocha Lecture in Lisbon (2017), and was selected as a GeoLegend by GeoStrata (2016).

Dr. Mayne is an active member of ASCE, TRB, DFI, ADSC, CGS, USUCGER, and ISSMGE, and served as chair of the international committee on in-situ testing (TC 102) from 2000-2013 and ISSMGE Vice President for North America from 2013-2017. Of additional note, Paul has worked as a consultant on recent projects in Australia, Virginia, Washington, South Carolina, Ontario, Puerto Rico, Alabama, Georgia, Belgium, North Carolina, and Alaska. He is married with one daughter and plays bass guitar.

DATE: Thursday March 14, 2019

Place: Cefalos Banquet and Event Center
428 Washington Ave.
Carnegie, PA 15106

RSVP by 3/8/19:
$25 ASCE Pittsburgh Section Members / Government Employee
$35 Non-members
Free to Students

Time:
6:00 PM – 7:00PM Socializing and Cash Bar
7:00 PM – 8:00PM Dinner
8:00 PM – 9:00PM Presentation

PLEASE RSVP by contacting Dr. Maria Jaime at mjaime@agesinc.com OR by registering online at http://www.asce-pgh.org/ Online registration is highly encouraged and payments can be made with credit card. Only cash or checks will be accepted at the door.

UPCOMING EVENTS OF INTEREST TO MEMBERS OF PGS

URTEC is coming to Pittsburgh for a one-day workshop in the heart of the Appalachian Basin. While operators are still pushing the boundaries of the Utica play, the Marcellus is firmly established and optimization is the name of the game. This multi-disciplinary event will cover a broad range of topics from geologic characterization, inter-lateral spacing, proppant and perforation designs, and production best practices. Come hear from industry and academic professionals, make new connections and learn current best practices to maximize your production.

Horizontal Targeting Strategies and Challenges: Examples from the Marcellus Shale, Appalachian Basin, USA

Randy Blood - DRB Geological Consulting

Far-Field Tectonic Controls on Deposition of the Ordovician Utica/Point Pleasant Play, Ohio Using Core Logging, Well Logging, and Multi-Variate Analysis

Julie Bloxson - Stephen F. Austin State University

Marcellus Shale Energy and Environment Laboratory Results: Improved Subsurface Reservoir Characterization And Engineered Completions

Tim Carr - West Virginia University

Laser Induced Breakdown Spectroscopy An Emerging Spectroscopic Technique For Shale Rock Characterization

Jinesh Jain - USDOE National Energy Technology Laboratory

Facies, Depositional Environments, Chemostratigraphy, and Reservoir Quality of the Middle Devonian Marcellus Formation, Appalachian Basin, Northeastern Pennsylvania

Lucy Ko - Bureau of Economic Geology

Topical Luncheon*

Shawn Bennett – Office of Fossil Energy

Topical luncheon ticket is included with registration to the workshop.*

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

James Semple, a native of Cumberland County, PA, came to Allegheny County in 1789, and settled on a large tract of land bordering the Allegheny River nine miles north of Pittsburgh. Semple was the second sheriff of Allegheny County, as well as twice a member of the assembly. Soon after arriving, he left his land and moved to what is now East Liberty and the land became part of Indiana Township in 1805. Settlement in the area increased in 1826 after construction of the Pennsylvania Canal, and again in the 1860s with the extension of the Pennsylvania Railroad through that area.

Old factories such as this once were the hallmark of Blawnox, PA (called Hoboken until 1925).

In July 1868, the first lots were laid out in that section of Indiana Township, and the community was named Hoboken. It became part of O'Hara Township in 1875 after O'Hara separated from Indiana Township. In 1912, the Blaw Steel Construction Co. relocated from New Jersey to Hoboken and transformed the small rural community to an industrial town. The company merged in 1917 with the Knox Pressed and Welded Steel Co. to become the Blaw-Knox Steel Construction Co., which built 150 homes in Hoboken. Sometime around 1925, the Post Office required Hoboken to change its name because Hoboken, NJ, had a prior claim to the name. As the town was getting ready to incorporate and become a certified borough, the management of the Blaw-Knox Steel Construction Co. suggested the name of the town be changed to Blawnox. And the rest is history.

DID YOU KNOW . . . ?

According to new research, the bolide impact purported to have killed off the dinosaurs blasted a nearly mile-high tsunami through the Gulf of Mexico that caused chaos throughout the world's oceans. The Chicxulub asteroid has been estimated at 9 miles across. Its collision with Earth resulted in a huge global tsunami, the likes of which have not been seen in modern history, according to a research team from the University of Michigan. This team believes they are the first to model the tsunami globally from impact to the end of wave propagation. The impetus for the research that led to the new concept was the lack of a global simulation of the tsunami the asteroid created. Until they started doing the research, none had realized the scale of the tsunami. They knew that the asteroid had hit in shallow water in the Gulf of Mexico. To model its huge impact correctly, however, they needed a model that could compute the large-scale deformation of the Earth's crust that formed the crater, as well as the chaotic waves from the initial blast of water away from the impact site, and waves from ejecta falling back into the water.

Artist's wildly imaginative illustration of the "dinosaur-killing asteroid." In reality, it was many times smaller than this illustration would suggest.

They contacted a researcher from Brown University who ran a model detailing what happened in the 10 minutes following the impact, when the crater was nearly a mile deep but there was no water in the crater yet. As water began moving into the crater, it would in and then back out, forming the "collapse wave." In a second model, the team studied how the tsunami propagated through oceans around the world by taking the results from the first model and the impact's waves with respect to resting sea level and water speeds. They then used data sets on the ancient terrain of the ocean, and used that to determine how the tsunami would have played out.

Their results indicate the effects of the tsunami were felt all around the world as the tsunami moved throughout the entire ocean, in every ocean basin. In the Gulf of Mexico, water must have moved as fast as 89 mph. Within the first 24 hours, the effects of the tsunami spread out of the Gulf of Mexico into the Atlantic Ocean and through the Central American seaway connected the Gulf with the Pacific Ocean at the end of the Cretaceous. Based on the modeling, the initial wave was nearly one mile high. Later waves reached a maximum height of 46 feet in the South Pacific and North Atlantic, whereas in the North Pacific, they reached 13 feet high. The Gulf of Mexico waves would have been as high as 65 feet in some spots and 328 feet in others. By comparison, the largest modern wave ever recorded, which struck near New Zealand in May 2018, was "only" 78 feet tall.

Of course, this is all based on computer modeling. There is evidence to supports the models, however. Supposedly the fast-moving water from the impact would have caused erosion and sediment disruption in South Pacific, North Atlantic, and Mediterranean basins. In examining sediment records across the ocean, the researchers found they agree with the tsunami model. So, can you image a catastrophe of that magnitude? A tsunami that hit the Indian Ocean in 2004 killed an estimated 225,000 people, an enormous loss of human life. Yet, over the first 7 hours of both tsunamis, the Chicxulub impact tsunami was 2,500 to 29,000 times greater in energy than the 2004 Indian Ocean tsunami!

https://amp.livescience.com/64426-dinosaur-killing-asteroid-caused-giant-tsunami.html

In a new analysis published recently, scientists say the world's oceans are warming far more quickly than previously thought, a finding with dire implications for climate change because almost all the excess heat absorbed by the planet ends up stored in their waters. The new analysis found that the oceans are heating up 40% faster on average than a United Nations panel estimated in 2013. The researchers also concluded that ocean temperatures have broken records for several straight years with 2018 estimated to be the warmest year on record for the Earth's oceans. 2017 was the warmest year, as was 2016, indicating the oceans are increasingly getting warmer.

A dead coral reef in waters off Indonesia.

This is a problem on many fronts. For example, while the planet has been warming, the oceans have provided a buffer, slowing the effects of climate change by absorbing 93% of the heat trapped in the atmosphere. Thus, if the oceans weren't absorbing as much heat, the land surface would heat up much faster than it has been. In fact, the oceans are saving us from massive warming right now. Unfortunately, the rising water temperatures are killing off marine ecosystems, raising sea levels, and making hurricanes more destructive, and as they continue to heat up, those effects will become more catastrophic.

Researchers are predicting that storms more powerful than Hurricane Harvey in 2017 and Hurricane Florence in 2018 will become more common, and coastlines around the world will flood more frequently. Coral reefs, whose fish populations are sources of food for hundreds of millions of people, will come under increasing

stress. Already, 1/5 of all corals have died just in the last three years. Those living in the tropics who rely on fish for protein could be hit especially hard. Warmer oceans have a lower ability to produce food, so those who rely on the oceans for their food are going to be more quickly approaching nutritional insecurity.

While scientists acknowledge that oceans are the best thermometer for changes in the Earth, understanding ocean temperatures has been difficult. An Intergovernmental Panel on Climate Change (IPCC) report issued in 2014 presented five different scenarios of ocean heat. All of them showed less warming than the levels projected by computer climate models suggesting that the ocean heat measurements, the climate models, or both were inaccurate. In the new analysis, the researchers assessed three recent studies that better accounted for older instrument biases, resulting in an estimate of ocean warming higher than that of the 2014 IPCC report and more in line with recent climate models. Near-surface waters have heated up the most, and the warming is accelerating. As the oceans heat up, sea levels rise because warmer water takes up more space than colder water. In fact, most of the sea level rise observed to date is because of this warming effect, not melting ice caps. Warming alone should cause sea levels to rise by about a foot by 2100, with the ice caps contributing more, if nothing is done to reduce greenhouse gases. As the oceans warm, fish are migrating to new areas, causing international turmoil as fishermen chase traditional food stores into other countries' waters, leading to a breakdown in international relations in some cases.

https://www.nytimes.com/2019/01/10/climate/ocean-warming-climate-change.html

You may have heard that the Earth's magnetic poles are reversing. This has even caused some recent panic because, as "everyone knows," magnetic pole reversals spell impending doom!!! The Earth's magnetic field, we think, is generated by the motion of its core. A recent book and the press coverage surrounding it mentioned that the Earth's magnetic poles have flipped hundreds of times in Earth's 4-ga history, but haven't done so in almost 800 ka. The magnetic field has been weakening around 5% per century since 1840 and is especially weak in the South Atlantic. Some think this could signal an impending flip, which could herald mass extinctions and power outages. Would you believe that public worry about the poles flipping has been going on for some time, and that such worries almost always come with doomsday threats?

Actually, there is nothing to worry about. The current behavior of the magnetic field is not characteristic of the beginning of a reversal or quick position change to the field's poles, according to researchers from Germany, who found two times in the Earth's history where its magnetic field looked similar to the way it does today. It had big spots of weaker field, like the one over the South Atlantic. At neither time did the poles switch, nor did they experience an excursion where they quickly snapped to a different position. Still, if the South Atlantic magnetic field anomaly persists, and if the field continues to weaken, it could still be bad for electrical grids or satellites passing overhead. Human civilization relies on the magnetic field as protection from high-energy radiation from space.

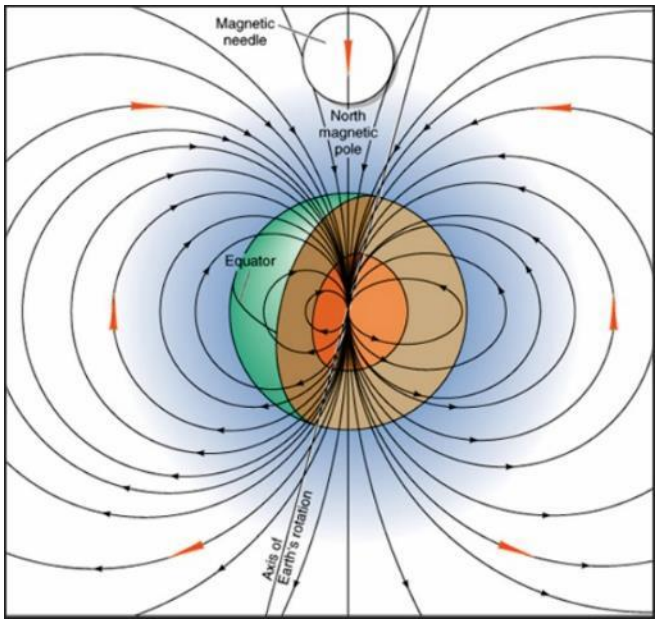


Diagram of the Earth's magnetic field.

Of course, as with any research based on modeling, there are limitations, such as missing data. This might be the first model using a reasonable data coverage, but there are still large gaps in global data coverage with palaeomagnetic sediment records that limit our knowledge about the global field behavior. And given that this is a

model, the Earth may not behave the way scientists expect. Still, you shouldn't worry about the magnetic field flipping. It is a process that occurs on incredibly slow timescales, thousands of years or so. There isn't even any proof that such reversals lead to mass extinctions. No, the end of life as we know it is not imminent. At least not from pole reversals.

https://gizmodo.com/the-earth-s-magnetic-poles-are-not-about-to-flip-and-h-1825657854

It has been known for many years that a particular quarry near the Dutch town of Winterswijk is a fossil lover's paradise. Even those with knowledge of the site might be surprised to find out just how outstanding the site actually is. A student at the University of Bonn in Germany recently analyzed pieces from museums and private collections for a master's thesis and found an amazing amount of almost completely preserved skeletons between 242 and 247 ma old.

Fossils from a quarry near the Dutch town of Winterswijk. The site preserves an amazing amount of almost completely preserved skeletons.

The good condition is presumably due to particularly favorable development conditions. The student examined 327 remains of marine reptiles collected partly from public museums, but primarily from about 20 private collections. Impressed by the high quality of the fossils, he found among them more than 20 contiguous skeletons. Very few complete skeletons are known from the other sites in region that stretches from England to Poland.

In his study, the student suggested the bones were preserved so well as a result of a combination of fortunate circumstances: 1) they were deposited in a shallow sea that ensured the cadavers quickly hit the ground where they were then covered by sediment. When dead animals float in the water for a long time and are tossed back and forth by waves and currents, the probability increases that body parts, such as tail, limbs or head, will be lost; and 2) the animals were colonized by microorganisms and algae that held the skeleton together like a skin, a process called "stick'n'peel." Some of the skeletons lack individual larger bones, whereas the small bones are complete, despite the fact that smaller bones typically are most likely to be carried away by the water. Such unusual patterns occur when a skeleton is unevenly colonized and only parts of it are protected.

Although Winterswijk stands out among fossil collecting sites in Europe, the large number of high-quality finds came as a surprise even to those familiar with the site and its treasure because most of the fossils are not accessible to the public. Since the student was a member of an association of private collectors in the Netherlands for many years, he was in the ideal position to contact the collectors who were all proud to be able to contribute to the research.

https://www.sciencedaily.com/releases/2019/01/190114103243.htm

The tiny Hypatia Stone is unique – it has been called the strangest rock on Earth. In December 1996, a researcher with the Geological Survey of Egypt was in the southwestern section of that country participating in an Egyptian-Italian expedition to the site of "Lybian desert glass." The glass is an unusual yellowish material thought to have formed from a meteorite or asteroid impact on desert sand. A pebble about one inch long, one inch wide, and less than an inch thick caught the researcher's eye because it didn't look like other rocks in the area. It was shiny gray-black and weighed just over an ounce. At first he thought it might be a tektite, but examination in the field showed it was not. It was something more peculiar. The pebble was studded with microscopic diamonds.

Diamonds typically form in the Earth's mantle about 90 miles underground in super-hot and super-pressurized conditions, where naturally present carbon deposits are squeezed and heated (despite what you might have seen on the TV show *Superman*, coal is not involved!). Volcanoes and plutons then shove the diamond-bearing formations to the surface. Diamonds also can form through the enormous pressures and heat of asteroid impacts. Nano-diamonds (VERY small ones) resulting from high-speed collisions of rocky debris in space have even been discovered in meteorites.

A fragment of the Hypatia Stone, the sstrangest rock on Earth, found in the Egyptian desert in 1996.

Small pieces of the Egyptian stone were examined independently in labs in Egypt, Italy, and South Africa, resulting in verification of the first record of tiny diamond grains in Egypt. The pebble has been dubbed the “Hypatia Stone” after Hypatia of Alexandria, an outstanding woman philosopher, astronomer, mathematician, and inventor (circa 350 or 370 AD to 415 AD).

Contributing researchers from the University of Johannesburg, South Africa reported that they found exotic micro-mineral compounds in the “Hypatia Stone” that are not known to occur on Earth, elsewhere in our solar system, or in known meteorites or comets. They originally thought it might be a remnant of a comet's nucleus. However, they have more recently found that it does not contain any silicates (except in fractures where terrestrial minerals such as clays have formed), whereas all known cometary material that has been studied to date have silicate minerals. They think the exotic minerals in the rock must be presolar, such as silicon carbide, a nickel phosphide compound with an extremely high Ni/Fe ratio (around 80) that cannot be formed in the solar nebula by any process, as well as grains of metallic zinc, aluminum, iron, and silver. The researchers now think the stone's parent body formed by dust agglomeration in the outermost solar nebula and remained cold until its encounter with Earth. They are pretty sure the object does not come from outside the solar system because its xenon isotopes are similar to those of carbonaceous chondrites, but it does contain extrasolar dust.

The Hypatia Stone appears to be a relic of a period around the time the solar system condensed from a vast interstellar cloud of hydrogen, nitrogen, carbon, dust, and other molecules. One important conclusion is that the solar nebula was primarily not quite homogeneous, containing regions without silicate grains. As elsewhere in space, this cloud was seeded with elements from previous generations of stars that went supernova. The new study indicates that the strangest rock rock on Earth comes from the nebula that was clumping up before the solar system finished condensing. As the result of a chance encounter in the Egyptian desert, we know that elements were not distributed evenly in the pre-solar nebula.

https://www.deseretnews.com/article/900011891/the-hypatia-stone-the-strangest-rock-on-earth.amp

Geologists have been puzzling over “The Great Unconformity” for more than a century. This unconformity is known from many places around the world where huge amounts of rock representing enormous spans of geologic time are missing from the geological record. Arguably the best example of “The Great Unconformity” in the US, if not all of North America, occurs in the Grand Canyon where the Cambrian Tapeats Sandstone (~525 ma) sits on the Early Proterozoic Vishnu Metamorphic Complex (~1,700 ma). This was first noticed in 1869, and subsequent research found it was replicated around the world in rocks of similar age.

Although “The Great Unconformity” isn't seen everywhere on Earth, and the span of missing time varies where it does, its scale is truly enormous. Before approximately 500 ma, approximately 0.05 miles^3 of preserved rock of sedimentary origin occurs for each year of the Earth’s existence. After 500 ma, the amount of preserved rock of sedimentary origin jumps to 0.2 miles^3. Without “The Great Unconformity,” we would expect a gradual increase.

An example of The Great Unconformity from the Grand Canyon. Rocks of the 525 ma Tapeats Sandstone sit directly on 1,700 ma basement rocks of the Vishnu Metamorphic Complex. Fully 1,200 million years of geologic time is missing!

The authors of a new study say “The Great Unconformity” was the product of glacial erosion during the period known as “Snowball Earth,” when almost the entire planet was covered in ice. As a result of this erosion, the researchers calculated a global average of 2 to 3 miles of the Earth’s surface were stripped away, an astonishing 200 million miles^3 of pre-Cambrian material. Either sedimentation increased dramatically at the start of the Phanerozoic era or there was much greater erosion beforehand. Evidence for the latter include crystals from the relevant era have isotopes of hafnium and oxygen consistent with being eroded from old rock and deposited at low temperatures. A phenomenal spike in erosion rates would also explain why we know of many asteroid impact craters less than 700 million years old, but only two older than that.

According to this hypothesis, between 717 and 580 ma, the Earth went through a series of dramatic glaciations that make the recent ice ages look like minor chills. Even at the equator, the planet was covered with ice that was often piled higher than the tallest skyscraper. The researchers proposed these glaciers scoured the existing rocks and washed them out to sea, producing “The Great Unconformity.” They suggested the rate of erosion required is consistent with that seen in modern Greenland. If the hypothesis is correct, it not only explains the mystery of “The Great Unconformity,” but also supports the developing theory that the appearance of the first animals so soon after Snowball Earth was the result of the nutrient pulse delivered by so much erosion creating the conditions for complex life forms to survive.

https://www.iflscience.com/environment/a-large-chunk-of-earths-crust-is-missing-and-we-may-have-just-discovered-why/

You probably know that modern birds evolved from dinosaurs, and that some dinosaurs had feathers. Did you know, however, that feathers evolved before the dinosaurs? A team of researchers recently examined two pterosaurs, the flying “reptiles” that shared a common ancestor with dinosaurs, found in China. The paleontologist member of the team just KNEW that pterosaurs had no feathers. To her astonishment, however, her research biologist partner from Ireland found evidence for feathers. This was the first time anyone had ever found feathers on something other than a bird or dinosaur.

Pterosaur fossils showing the presence of feathers.

So if pterosaurs had feathers, and dinosaurs had feathers, that means their common ancestor most likely also had feathers, meaning there was a feathered reptilian creature of some sort walking around before dinosaurs even existed. That means feathers may be 70 ma older than we thought, older even than dinosaurs. Not everyone's convinced, of course (there are always skeptics to anything new!), and paleontologists hope to find more specimens before deciding for certain what to think about dinosaurs and feathers. The feather apparently has far deeper origins than has been commonly thought.

https://www.treehugger.com/animals/amp/scientists-cracked-mystery-dinosaur-feathers.html

The end of the Milky Way as we know it may come a few billion years ahead of schedule! According to new research, our home galaxy appears to be on a collision course with one of its nearest cosmic satellites, the spiral nebula known as the Large Magellanic Cloud (LMC). Such a cosmic crash, modeled in detail by a team of astrophysicists from the UK, could begin as soon as 2 billion years from now, about 2-3 billion years sooner than the long-anticipated collision between the Milky Way and the Andromeda Galaxy, our nearest cosmic cousin (don't forget to adjust your doomsday clock accordingly!).

While the LMC boasts only about 1/20 the solar mass of the Milky Way, the collision would nevertheless leave permanent scars on both galaxies, igniting once-dormant black holes, flinging stars quadrillions of miles out of orbit, and staining the sky with crackling cosmic radiation wreaking havoc with our galaxy. Inasmuch as galactic collisions are quite common, scientists are getting pretty good at modeling how fresh mergers might play out. Using a supercomputer collision simulator called EAGLE, the UK researches modeled several possible scenarios for the "impending" Milky Way/LMC merger. The LMC would likely pour lots of fresh gas and stars into the black hole at the center of the Milky Way, breathing fresh life into the once-sleeping giant.

Such a collision could bulk up the black hole to about 8 times its current size, possibly even turning it into a quasar, which occurs when a supermassive black hole sucks in and spits out blazing celestial matter at near-light speed. The stars currently at our galactic center will then yield to a new population of cosmic emigrants from the LCM. Many stars will be sucked into the growing black hole at the galactic center; other stars, reacting to the extra mass pouring into the galaxy, could be flung into quadrillions of miles of interstellar space. If, by any chance (unlikely at best), you have any descendants still living on Earth 2 billion years from now, they will observe only a few stars inhabiting the general region of our sun being affected. The risk to life on Earth is "very unlikely." On the brighter side, the Milky Way's brand-new quasar probably would treat future Earthlings to a spectacular display of cosmic fireworks.

https://amp.livescience.com/64433-milky-way-large-magellanic-cloud-collision-imminent.html

Image from the Hubble Telescope showing the Whirlpool Galaxy (M51a) and a companion (M51b) merging. The two galaxies are similar in mass to the Milky Way and the Large Magellanic Cloud.

Seismometers of the EarthScope Transportable Array (ESTA) captured the magnitude 7.1 Iniskin earthquake that shook Anchorage, Alaska, in 2016. was captured by the. Data from the array are helping researchers fill crucial gaps in our understanding of intra-slab earthquakes, and may provide insight into the magnitude 7.0 earthquake that hit the Anchorage area on November 30, 2018. It could also help improve earthquake hazard assessments in the future. Intra-slab earthquakes

usually occur deep in the earth, within tectonic plates descending into the mantle at subduction zones. Because they are so deep, intra-slab earthquakes can be felt over a broad area. They don't usually exhibit strong seismic wave acceleration or ground motion, however, since the fault causing the earthquake is deep.

In this sense, the Iniskin quake was different. It originated within the Pacific Plate, which is being forced slowly under the North American Plate. It was 77.5 miles deep, but caused some very high ground motion that was felt and recorded in Anchorage. When it occurred in 2016 it was actually the strongest ground shaking in Anchorage since the great 1964 earthquake that destroyed half the town. The Iniskin earthquake was more than 168 miles from Anchorage. The magnitude 7.0 earthquake that occurred on November 30 was also an intra-slab earthquake within the subducting Pacific Plate, but it was only 27 miles deep and only a few miles from Anchorage. It produced extensive damage. Even though initial data are still being processed, it serves as a reminder of the hazard posed by this kind of earthquake.

ESTA station P19K, one of the stations closest to the Iniskin earthquake of 2016. Solar panels power the station, and the seismometer is buried in a borehole to insulate it from surface noise.

The Iniskin earthquake provided a prime opportunity to study the mechanics of an intra-slab earthquake, and how local geology can dramatically change the earthquake's effects. It rattled Anchorage shortly after seismometers from the ESTA were installed in southcentral Alaska. The array consists of hundreds of seismic stations deployed in a grid, leapfrogging its way every two years across the continent for more than a decade; it is currently in Alaska. The grid, with a spacing of about 50 miles, covers Alaska from the southeast panhandle to the North Slope. Big intra-slab earthquakes do occur occasional, and there's been a lot of concern that they are underrepresented globally in hazard estimates in the places in the world where they occur.

The researchers think there are two possible factors for what caused the quakes: 1) the temperature of the mantle the seismic waves travel through to reach the surface; and 2) the seismic waves can sometimes ricochet between the layers of a subducting tectonic plate. Anchorage sits near the edge of the North American Plate, where the continental plate pushes the Pacific Plate down into the mantle. The plate from the surface is cooler, and therefore more solid, than the surrounding mantle, so seismic waves travel faster. At very low temperatures the Earth rings like a bell and waves can propagate. The array allowed a comparison of seismic waves the same distance from the source of the earthquake, but in different directions. North of the Alaska Range, where the distance from the subduction zone means the crust lies above the mantle, the seismic waves have to travel through hot mantle to get to Anchorage. The heated rock is softer, so seismic waves don't travel as quickly as through cooler crust.

The other possible reason why the Iniskin earthquake shook the ground so much has to do with the local structure of the crust. The researchers found that, at some frequencies, seismic waves seemed to be amplified. If a weaker layer of rock in the subsurface is sandwiched between stronger layers in the sinking crust of the subduction zone, seismic waves may travel up the subducting plate and be caught in the sandwiched layer, bouncing back and forth and amplifying the wave's energy. Scientists have known about this problem for a while but, because they haven't worked out how to determine the parameters, it hasn't really been incorporated into how hazards are assessed. In places such as Anchorage, earthquake hazard assessment may need to include information about the deep earth, tens of miles down, and not just the near-surface geology. Puzzling out what happened during the Iniskin earthquake and possibly the November 30 one, and having good data coverage to compare the earthquakes from different locations, is a step forward for improving hazard assessment for intra-slab earthquakes in the future.

https://www.sciencedaily.com/releases/2018/12/181211122442.htm

PGS Board-of-Directors

President:	Tamra Schiappa	**Director-at-Large:**	Albert Kollar	**Director-at-Large:**	Wendell Barner
Vice President:	Dan Harris	**Director-at-Large:**	Ray Follador	**Director-at-Large:**	Erica Love
Treasurer:	Kyle Fredrick	**Director-at-Large:**	Brian Dunst	**Counselor:**	John Harper
Secretary:	Ken LaSota	**Director-at-Large:**	Mary Ann Gross	**Counselor:**	Charles Shultz
Past President:	Peter Michael	**PGS Student Board Member Delegate**:	Jacob Podrasky (CalU)		

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

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.

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

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

Twitter: PGS can be followed on Twitter by searching out the username @PghGeoSociety

LinkedIn: To join the PGS Group, click https://www.linkedin.com/groups/12018505

Fun Fact Having Nothing to Do with Geology

The world-famous Harlem Globetrotter basketball team actually was formed in Chicago in 1927; they never played a single game in Harlem until 1968. Wilt "the Stilt" Chamberlain began his professional career playing with the team.

ACA Engineering, Inc.
www.acaengineering.com

American Geosciences, Inc.
www.amergeo.com

American Geotechnical & Environmental Services, Inc.
www.AGESInc.com

Ammonite Resources
www.ammoniteresources.com

Applied Geology and Environmental Science, Inc.
www.appliedgeology.net

APTIM Environmental & Infrastructure, Inc.
www.aptim.com

AWK Consulting Engineers, Inc.
www.awkengineers.com/

Barner Consulting, LLC

The Baron Group Inc.

Battelle
https://www.battelle.org/

Billman Geologic Consultants, Inc.
www.billmangeologic.com

DiGioia, Gray & Associates, LLC
http://www.digioiagray.com

DORSO LP

Enviro-Equipment, Inc.
"When it *has* to work"
1-888-274-8929

Enviro-Equipment
https://www.enviroequipment.com/

Falcede Energy Consulting, LLC

Gannett-Fleming
http://www.gfnet.com/

Geo-Environmental Drilling Co., Inc.
www.geoenv.com

Groundwater & Environmental Services, Inc.
hwww.gesonline.com

HDR Engineering, Inc.
www.hdrinc.com

Howard Concrete Pumping Co., Inc.
www.howardconcretepumping.com

Huntley & Huntley, Inc.
www.huntleyinc.com

The Insite Group
http://insitegroup.org/

Key Environmental
http://www.keyenvir.com/

Laurel Mountain Energy
laurelmountainenergy.com

Montrose Air Quality Services
www.montrose-env.com

Moody and Associates Inc.
www.moody-s.com

PA Council of Professional Geologists
http://www.pcpg.org/

Pennsylvania Drilling Co.
www.pennsylvaniadrillingco.com

Pennsylvania Soil and Rock
http://www.pasoilrock.com/

Range Resources - Appalachia
www.rangeresources.com

Rosebud Mining Company
www.rosebudmining.com/

Seneca Resources Company LLC
www.natfuel.com/seneca

Stahl Sheaffer Engineering
http://www.sse-llc.com/

TD Geologic LLC
https://www.tdgeologic.com/

THG Geophysics, Ltd.
www.THGGeophysics.com

Your Company's Name Could be Here!

Support the educational mission of the Pittsburgh Geological Society by becoming a Corporate Sponsor.

https://pittsburghgeologicalsociety.org/corporate-sponsors.html

The Pittsburgh Geological Society is thankful for the generosity of its members and others who supported the society in recent months.