PITTSBURGH GEOLOGICAL SOCIETY

This joint meeting is hosted by the Greater Pittsburgh Chapter of the Association of Environmental and Engineering Geologists in conjunction with PGS and the Pittsburgh Chapter of the ASCE Geo-Institute.

January 20, 2021

Virtual Meeting Time 7:30 PM
Joint Society Announcements followed by Featured Presentation

Virtual Meeting Format
This free meeting will be held using GoToMeeting. Pre-register for it here:

https://attendee.gotowebinar.com/register/5871197890584146957

PDH Certificates are Available
Attendees can receive an emailed PDH certificate at their request. These certificates are being handled by the January meeting host, the Greater Pittsburgh Chapter of the AEG.

Online Meeting Guidelines
All attendees are encouraged to join the meeting at 7:20 PM. Attendees are asked to mute their own audio and video during the presentation to avoid disruptions and to lower bandwidth usage.

Pennsylvania's Abandoned Mine Land (AML) Emergency Program

Richard L. Beam, PG

PA Bureau of Abandoned Mine Reclamation

Registration Deadline: Tuesday, January 19

Abstract

The Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation (BAMR) implements an Abandoned Mine Land Emergency Program to address suddenly occurring, high-priority, abandoned mine land (AML) problems that occur throughout Pennsylvania's coal fields. BAMR maintains two field offices: one in eastern Pennsylvania (Anthracite Region) in Wilkes-Barre and one in western Pennsylvania (Bituminous Region) in Ebensburg. Both field offices maintain in-house construction crews with significant equipment available to respond and address many small AML emergencies (hazards) such as pothole subsidences and mine drainage breakouts. For larger AML emergencies such as subsidence events causing structural damage to homes, businesses, and roads; mine fires; coal refuse fires; landslides; or other large-scale or complex AML problems, projects are completed by outside contractors. The contractors are hired through solicitation of bids or proposals with very short timeframes between bid issue and bid opening. Since October of 2010, BAMR has addressed over 750 AML emergencies which equates to approximately 80 AML emergency projects each calendar year. Due to the increased precipitation over the Commonwealth the last several years, that number has increased to an average of 86 AML emergency projects over the last five (5) years (2015–2019) with a record number of 127 addressed in calendar year 2018. The average cost to address those AML emergency projects over that five-year period was $4.66 million per year. This presentation will provide some background on Pennsylvania's AML Emergency Program; some summary statistics, including the annual number of projects completed and costs; and also highlight through both photos and video links some typical projects recently completed by the program.

Study Authors

Eric E. Cavazza, P.E., Director, Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation, Harrisburg, PA 17106, John J. Stefanko, Deputy Secretary, Pennsylvania Department of Environmental Protection, Office of Active and Abandoned Mining Operations, Harrisburg, PA 17106, Richard L. Beam, P.G., Professional Geologist Manager, Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation, Harrisburg, PA 17106

Speaker Biography

Mr. Richard Beam is a Professional Geologist Manager at the Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation. Rich is responsible for the collection and analysis of surface and subsurface geologic and hydrologic information needed for the development and design of reclamation projects. Rich also provides technical assistance with respect to both passive and active mine drainage treatment projects and for the past 18 years has been an instructor for OSM's National Technical Training Program (NTTP). Rich graduated from the University of Pittsburgh at Johnstown with a B.S. Degree in Geology. He was previously employed, for approximately 3 years, by a Geotechnical Engineering Firm in Pittsburgh, Pennsylvania, and for the past 34 years has worked for the Pennsylvania Department of Environmental Protection in both the surface coal mining regulatory program and the abandoned mine land program.

PRESIDENT'S STATEMENT

Happy New Year! I hope that the holidays were filled with laughter and much happiness, even though we remain isolated and tucked away from the dreaded COVID-19 monster. As I reflect on 2020, there are many lessons I learned from the challenges presented to me during the pandemic. I learned how to communicate better in the digital world, even though the technology did not cooperate at times. I learned that some students (but definitely not all) excelled in the virtual classroom as they had more time to immerse themselves into the coursework and listen to lectures free from the distractions in a face-to-face classroom setting. I discovered that I thoroughly miss teaching and learning in the field and laboratory setting and I look forward to returning to those pedagogies and experiences.

Despite missing the physical interactions and hands-on experiences, I found ways to adapt and to make geology accessible. This experience taught me that it is possible to make geology more inclusive and that experiencing the richness that the Earth offers is not limited to a select few. One way is through virtual field experiences. Many organizations and individuals have worked to bring the field to us. The Virginia Geological Field Conference and Field Conference of Pennsylvania Geologists (FCOPG) each brought their meetings into our homes. The Virginia Geological Field Conference used a Google Earth platform to develop a spectacular experience depicting the geologic features and outcrops along a stretch of the Appalachian Development Highway System known as the H Corridor. The highway cuts Ordovician - Pennsylvanian sedimentary rocks of the Valley and Ridge and Appalachian Plateau provinces and highlights the depositional and deformational history of this region of NA. This virtual field experience is the next best thing to experiencing it in person. If interested, check it out here: the Virginia Geological Field Conference (Callan Bentley's Corridor H site).

The Field Conference of Pennsylvania Geologists developed another creative way to experience the field virtually. The FCOPG's virtual conference consists of a series of YouTube videos highlighting the geology and geomorphology of Ohiopyle State Park and the Greater Youghiogheny River Gorge, complete with at trip into Laurel Caverns and drone footage of the river gorge. In the end, despite the restrictions of physical distancing requirements and concerns for the health and safety of field trip participants and field trip leaders, the conferences adopted new approaches to provide field experiences. The PGS had to cancel all of the several planned 75th Anniversary celebration field trips but are looking to offer at least one in the future virtually. Please continue to watch for announcements in the Newsletter for updates on our field trip and workshop offerings.

Thank you to all the PGS members for their continued support throughout the previous year. I especially want to express my sincere gratitude to our Corporate sponsors. Without your support many of our activities and presentation of awards would not be possible. I appreciate the members adapting to and embracing the new meeting format and being patient with us while we prepare virtual opportunities. I also thank the board members who spend many hours keeping the society running and providing all our members with valuable communications throughout the year.

I wish you a prosperous and healthy new year filled with peace, love, and happiness. Let us put 2020 behind us and toast to all the wonderful times ahead in this coming new year.

Tamra

PGS WALT SKINNER AWARD GIVEN TO ALBERT KOLLAR

The PGS is pleased to announce that Albert D. Kollar has been selected as the most recent recipient of the Walt Skinner Award. Albert, the Head of Section and Collections Manager for the Section of Invertebrate Paleontology at the Carnegie Museum of Natural History, has contributed much to PGS and the geologic community at large during his career. With the PGS, Albert served as President three consecutive terms (2011-2014), the first member ever to do so. As a Director At Large (2004–2011 & 2015-2020) Albert served the PGS Board in many capacities that included organizing field trips and being the current Chair of the Awards Committee. His greatest contribution, however, has been his leadership in community outreach, a quality that comes naturally. Through the Carnegie, Albert established PA/S (Patrons and *lauradanae* Supporters) in 2004, to enhance interested laypersons' knowledge of paleontology, fossil collecting, and regional geology. This annual program provides local and regional geology guides, seminars, and field trips for all to enjoy, as well as fossil activities for kids. Thanks to Albert, all of the PA/S brochures are now available on the PGS website.

Albert has encouraged many PGS members to participate in public outreach through the years, most notably through organizing classes and field trips through the Osher Institute in conjunction with the University of Pittsburgh, and by providing a collaborative educational experience with the Shady Side Academy Middle School Earth Science Class that brings science professionals in contact with young students. Albert has also recently received recognition as the recipient of the Eastern Section AAPG George V. Cohee Public Service Award (2017) and the GSA GSIS Award for Best Guidebook (co-authored with fellow PGS member John Harper) for "Geology of the Early Iron Industry in Fayette County, Pennsylvania" (2018). Albert's interest in art and architecture is well known. He has been particularly interested in the paintings of one of Pittsburgh's most celebrated artists, John Kane (1860-1934), who immortalized many Pittsburgh neighborhoods; Kane's work became the focus of some of Albert's field trips. Albert has also studied many of the landscape paintings of the 19th and 20th centuries at the Carnegie Museum of Art to provide a historical perspective to the progressive changes in climate recorded in them. In addition, his passion for architecture and the history of building stones, particularly those of the Gilded Age in the Pittsburgh region, has provided museum docents and visitors alike with a deeper understanding and appreciation of the geology that went into building the Carnegie Museum of Natural History, the Carnegie Library, and many other local, regional, and national buildings.

UPCOMING PGS MONTHLY MEETINGS

Meeting Date	*Scheduled Speaker*	*Presentation Topic*
February 17, 2021	TBA	TBA
March 17, 2021	Kendra Murray, Idaho State University	Cenozoic Magmatism on the Colorado Plateau
April 21, 2021	Student Research Night Joint Meeting with ASCE and AEG	Student Posters & Presentations
May 19, 2021	Thomas Bardol, Seneca Resources	Oil and Gas Industry Talk

OTHER GEOLOGICAL EVENTS

Pittsburgh Association of Petroleum Geologists

January 14, 2021 12:00 PM – 1:00 PM

"Modern Plate Tectonics and Petroleum Exploration –How do they fit together?" by Dr. Kevin Furlong, Penn State University

To register: https://www.papgrocks.org/meetings/upcoming-meeting

Pennsylvania Council of Professional Geologists

January 19, 2021 1:00 PM – 2:00 PM

Webinar: "Big Run Watershed Restoration - A Mine Drainage Remediation Success Story" (60 minutes) by Terry W. Schmidt, P.E., Vice-President of Engineering Earthres Group, Inc.

For more information: https://pcpg.wildapricot.org/event-4098639

February 1 to February 17, 2021 6:00 – 8:30 PM Monday and Wednesday evenings

6-Webinar Package: PG Review Course for the Practicing Geologist and ASBOG® Exam Candidate (900 minutes total). Individual webinars can also be taken separately. See following page for details.

For more information: https://pcpg.wildapricot.org/event-4047621

Geophysical Society of Pittsburgh

February 2, 2021 12:00 PM – 1:00 PM

"Interactive Well Path Planning Using Geoscience Data" by Joseph P. Dominguez, CGG Geosoftware

To register: http://www.thegsp.org/event-4091345

JOIN PCPG

COURSES & EVENTS

CORPORATE MEMBERS

RESOURCES

MEMBERS ONLY

6-Webinar Package: PG Review Course for the Practicing Geologist and ASBOG® Exam Candidate (900 mins.)

Start February 01, 2021
6:00 PM
End February 17, 2021
8:30 PM
Location Webinar

Registration

- Members – $399.00
- Non-Member – $599.00
  To save $200 over the cost of six sessions, return to home page and Join PCPG.

VISA MasterCard DISCOVER AMERICAN EXPRESS OFFLINE

PENNSYLVANIA COUNCIL of PROFESSIONAL GEOLOGISTS

You are registering for a **six-part webinar series** as noted below. If you intended to enroll for a single date, please return to the home page calendar and select the date for the topic(s) noted below.

Post-webinar recordings will not be available.

Our usual and customary cancellation policy applies to the six-part webinar series, and cancellation must be requested five business days prior to the first webinar scheduled for February 1. Partial refunds will not be made for missed webinars.

Reference materials will be sent ahead of each webinar, with some handouts available during the live webinar. If joining by mobile phone, please be familiar with the GoToWebinar app's control panel so you readily locate the attachment downloads under the Handouts tab.

Monday, February 1, 2021 • 6:00 - 8:30 pm

• Introduction and General & Field Geology

Martin Helmke, PhD, PG, West Chester University

• Seismology, Exploration Geophysics, and Well Logging

Thomas E. Jordan, PhD, PG, Key Environmental, Inc.

Wednesday, February 3, 2021 • 6:00 - 8:30 pm

• Mineralogy and Igneous/Metamorphic Petrology

Kurt Friehauf, PhD, PG, Kutztown University

• Sedimentology, Stratigraphy, and Paleontology

Tamra Schiappa, PhD, Slippery Rock University

Monday, February 8, 2021 • 6:00 - 8:30 PM

• Structural Geology and Tectonics

• Geomorphology

Daniel Harris, PhD, California University of Pennsylvania

Wednesday, February 10, 2021 • 6:00 - 8:30 PM

• Hydrogeology and Geochemistry

Chris Mulry, PG, Groundwater and Environmental Services, Inc.

Kyle Fredrick, PhD, California University of Pennsylvania

Monday, February 15, 2021 • 6:00 - 8:30 PM

• Engineering Geology

Matthew Morris, PG, Gannett Fleming, Inc.

Gary MB Kribbs, PG, AEON Geoscience, Inc.

Wednesday, February 17, 2021 • 6:00 - 8:30 PM

• Economic and Resources Geology: Mining

Kurt Friehauf, PhD, PG, Kutztown University

• Economic and Resources Geology: Petroleum and Coal

Kristin Carter, PG, DCNR Geologic Survey

Our instructors are wholly focused on your learning experience, and remain available via Email and telephone to answer questions after the webinar concludes.

Mock tests are a component of the seminar.

Visit *What others have said about this course.*

PCPG Review Course Participant / Future ASBOG® Exam Candidates:
The components of this seminar are aligned with the general subject areas contained in the ASBOG® Geologist Examinations. However, the course is not intended as a sole-source for your test preparation. It is instead a proven resource and guide for your further preparation efforts. As such, the course provides a concentrated review and a general refresher for the practicing, Professional Geologist.

During this seminar about one hour is devoted to review a full-semester, college course. *The webinars are not intended as a "How to take the Test" review.* Seminar registrants usually take this course 6 to 12 months from their intended exam date with the understanding that significant, additional preparation will be needed prior to sitting for their examination.

We are certain that you will find the provided information helpful to your preparation, enabling you to better succeed in the ASBOG® Examinations.

PGS STUDENT DELEGATE PAGE

Calling All Student Members

PGS would like to extend an invitation to all of our student members to attend our first ever student meeting night on **Wednesday January 6th at 8:30 PM**. PGS Student Delegate Michael Behe from Slippery Rock University will be hosting this virtual event. Topics will include upcoming events for students in the Spring of 2021 and a chat session to answer any questions or concerns during these ever-changing times. The PGS is dedicated to providing student members with an opportunity to broaden their horizons and prepare them to be successful productive members of the Earth Science community. Please join Michael and your fellow student PGS members on Zoom:

https://sru.zoom.us/j/96031580667

Meeting ID: 960 3158 0667 Passcode: 589184

Message to the Students

Happy New Year! A change in the calendar often brings welcome and timely relief from the past and an excitement and buzz for the future. This change feels particularly timely. A new year for fresh starts, resolutions, and a new year to become the best possible community we can be. As the student delegate to the PGS board, I have often wondered what the best way is to serve the PGS and the students of PGS.

I feel with my whole heart that the student body of PGS must become more active participants. We are the future of the PGS and of the world. We must take the bull by the horns perse and become more active and own our future. This new year the PGS is excited to announce many events directed at engaging the student body even more. I highly encourage students to become more engaged and reach out to the professionals in the room. We as students need to communicate our excitement and enthusiasm for entering the professional ranks to the “older” generation. We must not just expect a career or future but, we must go take that chance, have that conversation, and become comfortable with being uncomfortable.

I wish everyone a happy new year and cannot wait to see smiling faces at the upcoming meetings and events. Cheers!!

Michael P. Behe, Slippery Rock University

For more information: **mpb1017@sru.edu**

PGS - AEG - ASCE STUDENT NIGHT IS APRIL 21!

Students are invited to present college research projects at the **19th Annual PGS – AEG – ASCE Student Research Night on April 21, 2021**. If you have been conducting undergraduate or graduate research in any geological or geotechnical field, you can share your work in this virtual meeting with members of three regional professional scientific societies. All student presenters will receive official certificates of recognition. The three students chosen to give oral presentations will each receive awards of $100, while the three best poster presenters will each receive awards of $50.

The deadline for submitting abstracts for student research night will be March 15, 2021. Abstract submission forms and guidelines will be posted on the PGS website at: **https://www.pittsburghgeologicalsociety.org/student-night.html.**

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Originally called Chartier's Old Town, the Borough of Tarentum on the Allegheny River in northeastern Allegheny County was founded by Judge Henry Marie Brackenridge in 1829 when the Pennsylvania Canal was completed between Philadelphia and Pittsburgh. Brackenridge owned much of the land in the area and named it after an ancient Greek city-state in Italy.

One of Tarentum's parks.

In March 1842, the population of roughly 300 effectively petitioned the courts to incorporate the town. Industrialization developed in the valley when the Pennsylvania Railroad replaced the old canal in 1866. Transportation was very important in the town's development as the canal, then the railroad, the Tarentum Bridge in 1952, and the Allegheny Valley Expressway in 1986 brought settlers, visitors, and commerce to Tarentum. Following the opening of the railroad, the town became a leading mercantile center in the Valley. Tarentum had a population of about 4000 in the 1880s, and the population grew steadily until the early 1950s when it began to decline. Tarentum's leading role in the area declined as well. But, while the population continued to decrease, there was a rise in younger demographics within the Borough, citizens who take advantage of the modern amenities offered in the community, including riverfront parks, playgrounds and docks.

DID YOU KNOW . . . ?

University of Oregon geologist Greg Retallack recently discovered the fossil traces of a 460 ma old moss that he named *Dollyphyton boucotil*. The generic name *Dollyphyton* is in honor of country music singer and philanthropist Dolly Parton because the fossils were found in rock slabs just a few miles from the Dollywood theme park in Sevier County, TN.

It turns out the slabs, which are dotted with the imprints of both fossil plants and animals, have their own history. In 1942, the WWII war effort required factories that needed a lot of electricity, and part of the solution for that need resulted in construction of the Douglas Hydroelectric Dam, part of the TVA, built on the French Broad River in Sevier County. The dam was completed in just 12 months and 17 days, which was a world record for projects of similar size. During construction, workers unearthed large slabs of rock that formed 460 ma ago, during the Middle Ordovician. At that time, the area was mostly covered by shallow seas populated by ostracoderm fish, trilobites, brachiopods, graptolites, echinoderms, and the first reef corals.

Although the oceans dominated the area, some land also occurred where a few small plants such as mosses and liverworts and plant-like lifeforms such as lichens, had begun to colonize. The sudden appearance of land plants and plant-like organisms in the Lower Paleozoic left a mark on the world that nothing else could explain. They spelled doom for most of the life in the seas they'd left behind because the CO_2 they absorbed triggered drastic global cooling, the first post-Precambrian ice age. This event also triggered the first mass extinction for which we have evidence, killing ~85% of life on Earth.

But some of those early land plants survived and their descendants are all around us today.

Dolly Parton was recently honored scientifically when a paleontologist named the earliest known plant fossil *Dollyphyton.*

Although some are still tiny, simple nonvascular plants like mosses and liverworts, the vast kingdom of complex plants we know today wouldn't have evolved without them. No one had found actual fossils of those simple Ordovician plants themselves until Retallack and his colleagues took a closer look at the few sections of the rocks from the dam construction that had ended up at the University of Cincinnati and the Smithsonian Institution in the 1940s. Although the slabs had been examined previously, only invertebrate animals had been seen. Retallack and his associates examined those "dusty old museum collections" and found the plants.

It is comforting to think that *Dollyphyton* and other recently-described early plants and plant-like organisms gave rise to a host of great magnolias, dogwoods, willows, and oaks that Dolly Parton has sung about through the years.

https://www.forbes.com/sites/kionasmith/2020/11/28/dolly-parton-lends-her-name-to-a-460-million-year-old-fossil-plant/?sh=569597446fc0

The Perseverance Mars Rover launched from Cape Canaveral on July 30, 2020. It is

scheduled to reach Mars on Feb. 18, 2021. Based on previous and current rovers, early Mars was a habitable planet, but . . . was it, in fact, inhabited? That's one of the questions planetary geologists are hoping Perseverance will help answer. What got the scientists interested was the recognition that floods of unimaginable magnitude washed through the Gale Crater on Mars' equator around 4 ga ago – a finding that hints at the possibility that life might have existed there.

Composite, false-color NASA image of Gale Crater on Mars indicates a changing planetary environment. On Mars, the sky is not blue, but the image was made to resemble Earth so that scientists could distinguish stratification layers.

The raging megaflood created gigantic ripples similar to geologic structures on Earth. The scientists identified megafloods for the first time using detailed sedimentological data observed by the rover Curiosity, including the occurrence of megaripples or giant antidunes about 30-feet high and spaced about 450 feet apart in sedimentary layers in Gale Crater. Such sedimentary deposits had not been identified previously using orbiter data. The antidunes, a type of geological feature frozen in time at the bottom of Gale Crater for about 4 ga, are indicative of the features formed by melting ice on Earth about 2 ga ago. They convey processes that shaped the surface of both Mars and Earth in the geological past.

The most likely cause of the Mars flooding was the melting of ice from heat generated by a large bolide impact, which released CO_2 and CH_4 from the planet's frozen reservoirs. Both the water vapor and gases released by the heat would have combined to produce a short period of warm and wet conditions on Mars. Water vapor clouds formed by condensation created torrential rains, possibly across the planet. The water then entered Gale Crater where it combined with water coming down from higher elevations within the crater to produce gigantic flash floods that deposited gravel ridges in the Hummocky Plains Unit and ridge-and-trough band formations in the Striated Unit.

The Curiosity Rover science team established that Gale Crater once had persistent lakes and streams in the ancient past. These long-lived bodies of water are good indicators that the crater was capable of supporting microbial life. Early Mars was a very active planet geologically speaking. It apparently had the conditions needed to support the presence of liquid water on the surface and, as we are well aware, where there's water on Earth, there's life. Perhaps the same could be said of Mars.

https://phys.org/news/2020-11-field-geology-mars-equator-ancient.html

Russian researchers recently reported the discovery of an unusual mineral never before documented by scientists. It has been described as an alluring, vibrantly blue-and-green crystal the team called petrovite. It is interesting because it was created in a volcano. The new mineral was found atop the Tolbachik volcano in the Kamchatka Peninsula in far eastern Russia.

Although the Tolbachik volcano's eruptive history goes back thousands of years, two

recent, notable events are important – the "Great Tolbachik Fissure Eruption" in 1975–1976 and a smaller eruption in 2012–2013. The first eruptions formed numerous cinder cones and opened rocky terrain discovered to be a rich vein of fumarole deposits and unknown minerals. In fact, the research team claims the volcano created 130 type locality minerals (first identified there), the latest of which is petrovite.

Blue cryptocrystalline crusts of petrovite, a newly discovered mineral formed by a Russian volcano.

Petrovite is a sulfate mineral that forms blue globular aggregates of tabular crystals, many of which have gaseous inclusions. The type specimen was collected in 2000 near the second 1975-eruption cinder cone and stored for later analysis. Petrovite is thought to have crystallized by direct precipitation from volcanic gases. It occurs as blue cryptocrystalline crusts enveloping a fine pyroclastic material. Chemical analysis reveals that the vibrantly blue mineral exhibits peculiar, rarely seen molecular hallmarks. The copper atom in the crystal structure has an unusual coordination of seven oxygen atoms seen in only a few compounds such as saranchinaite, another Tolbachik volcano mineral identified only a couple of years ago. Like petrovite, saranchinaite is also extraordinarily colored.

Chemically, petrovite represents a new type of crystal structure consisting of oxygen atoms, sodium, sulfur, and copper. It is effectively porous, and its interconnected pathways could enable sodium ions to migrate through the structure. Because of this, the researchers believe that, if they can replicate the structure in the laboratory, it could lead to important applications in material science, potentially enabling new ways of developing cathodes for use in batteries and electrical devices. The biggest problem for this use right now is the small amount of copper in the crystal structure of the mineral, which the team believes might be solved by synthesizing a compound with the same structure as petrovite.

https://www.sciencealert.com/scientists-discover-exotic-new-mineral-forged-in-the-furnace-of-a-russian-volcano

A recent analysis of non-avian dinosaur diversity indicates that they were not in decline at the end of the Cretaceous Period, and were, in fact, still capable of generating new species at the time of their extinction. Dinosaurs were widespread globally at that time, occupying every continent on Earth. They were the dominant animal in most terrestrial ecosystems, but many paleontologists still argue as to whether dinosaurs were declining in diversity at the time of their extinction.

In order to address this question, a team of researchers from England collected different sets of dinosaur family trees and used statistical modeling to assess if each of the main dinosaur groups was still able to produce new species at the end of the Cretaceous. The statistical methods they used should have overcome sampling biases by looking at the rates of speciation of dinosaur families, rather

than by simply counting the number of species belonging to the family.

As a result, they found that dinosaur diversity was not declining in the Late Cretaceous. This contradicted previous studies that used various methods to draw the conclusion that dinosaurs would have become extinct naturally because they were already in decline towards the end at that time. The new study showed that by expanding the dataset to include more recent dinosaur family trees and a broader set of dinosaur types, the results point to only about half of them agreeing with that conclusion.

New research suggests that non-avian dinosaurs such as *Triceratops* were not in decline at the end of the Cretaceous.

The main point of the recent research is that it isn't as simple as looking at a few trees and making a decision. The researchers suggest that large, unavoidable biases in the fossil record, as well as lack of data, often imply a decline in species, an implication that may not reflect reality. Their data didn't show that the dinosaurs were in decline; in fact, according to their data, some hadrosaurs and ceratopsians were thriving. There was no evidence to suggest these and other groups would have died out 66 million years ago had the extinction event not happened. The researchers suggest that, had there not been an end-Cretaceous bolide impact, dinosaurs might have continued to be the dominant terrestrial animals on the planet.

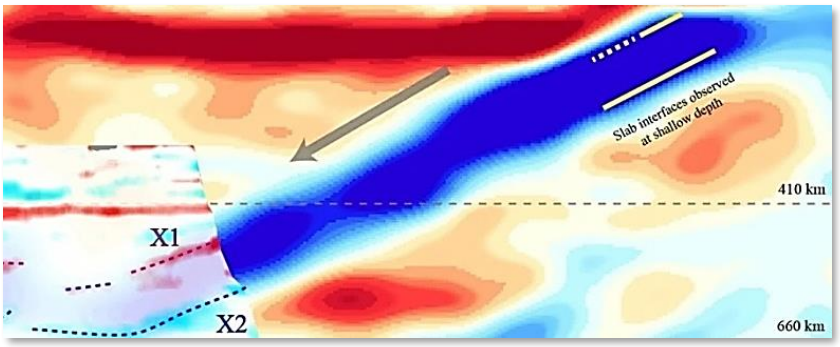
http://www.sci-news.com/paleontology/non-avian-dinosaurs-not-decline-prior-extinction-09065.html

Scientists from China and the US recently identified an ancient piece of the Pacific Ocean seabed extending hundreds of miles beneath China. The slab is a relic of the oceanic lithosphere, composed of the crust and the solid outermost parts of the upper mantle. The upper surface layer is composed of several fragmented tectonic plates that moved and shifted around at the surface and occasionally collided. During such collisions, subduction can occur where one plate is forced under the other. When that happens, one of the plates is driven deeper into the mantle.

In the recent study, scientists witnessed this phenomenon taking place at greater depths than ever before observed. Prior observations of subducting slabs seemed to show the boundaries at depths of about 125 mi. As a result of a newly-expanded network of over 300 seismic stations spread around northeastern China, the researchers were able to record the event at a much lower point, imaging parts of the tectonic plate formerly lying beneath the Pacific Ocean being pushed into the mantle's mid-level transition zone at

depths ranging from 254 to 410 mi below Earth's surface.

The team identified two seismic velocity discontinuities – regions far beneath the surface where seismic waves encounter anomalies – which the team says related to both the top and bottom sides of the subducting plate. Based upon their detailed seismological analyses, the researchers interpreted the upper discontinuity as the Moho of the slab. They think the lower discontinuity is probably caused by partial melting of the asthenosphere under hydrous conditions in the seaward portion of the slab.



Part of a seismic profile showing a portion of the Pacific plate subducting 410 mi beneath China.

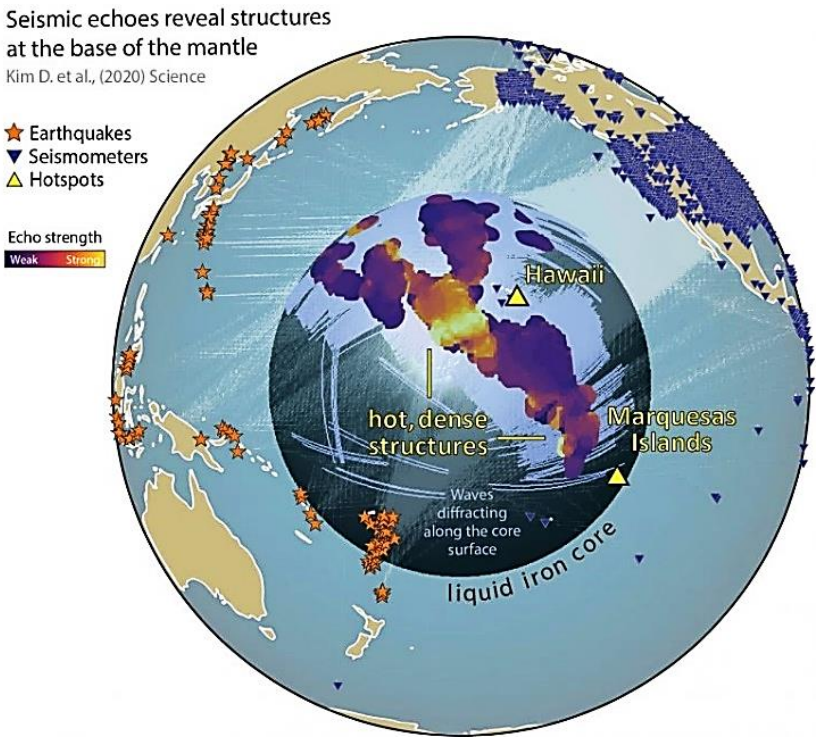
Although the slab being subducted can be seen occurring below China, the actual subduction zone occurs far to the east where the slab lies at a relatively shallow 25º angle. For reference, Japan sits just about where the Pacific plate lies about 62 mi down. As a result of the new imaging, scientists now have a better idea of what happens to a subducted slab when it reaches this part of the mantle transition zone, including how deformed it gets, and how much water content it loses from its oceanic crust. Many studies suggest that slabs actually undergo intense deformation in that zone, becoming soft so they become easily deformed. The research team is still trying to decide whether the water is totally released from the plate at that depth. The study indicates that there is increasing evidence that a portion of the water remains inside the plate as it goes much deeper.

https://www.sciencealert.com/ancient-fragment-of-the-pacific-ocean-found-buried-400-miles-below-china

Geophysicists from the University of Maryland have analyzed thousands of seismic wave recordings to identify echoes from the boundary between Earth's molten core and the mantle layer above it, revealing a lot more widespread, heterogeneous structures of unusually dense, hot rock, called ultralow-velocity zones or ULVZs, at the core-mantle boundary than was previously known. We aren't sure of the composition of these structures, but a better understanding of their shapes and extents can help uncover the geologic processes deep inside the Earth that may provide clues to the workings of plate tectonics and the evolution of our planet.

The researchers focused on seismic waves beneath the Pacific Ocean basin to reveal a previously unknown ULVZ beneath the volcanic Marquesas Islands in the South Pacific. They also found that the ULVZ beneath the Hawaiian Islands is much larger than previously known. The researchers looked at thousands of core-mantle boundary echoes at once rather than focusing on a few at a time to gain a completely new perspective. This resulted in finding that the core-mantle boundary region has lots of ULVZ structures.

For this study, the geophysicists looked for echoes generated by shear waves as they travel along the core-mantle boundary. Echoes from diffracted shear waves can be hard to distinguish from random noise but looking at many seismograms from many



Cartoon of the interior of the Earth showing dense rock structures at the core-mantle boundary detected by seismic wave, showing them to be much more widespread than previously known.

earthquakes at once can reveal similarities and patterns that identify the echoes hidden in the data. The researchers used a machine learning algorithm called Sequencer to analyze 7,000 seismograms from hundreds of earthquakes of 6.5 magnitude and greater occurring around the Pacific Ocean basin from 1990 to 2018. They found echoes on about 40% of all seismic wave paths, indicating that the anomalous structures at the core-mantle boundary are much more widespread than previously thought.

For example, they found that the large patch of very dense, hot material at the core-mantle boundary beneath Hawaii produced uniquely loud echoes, indicating that it is even larger than previous estimates. This ULVZ is currently the largest one known to exist.

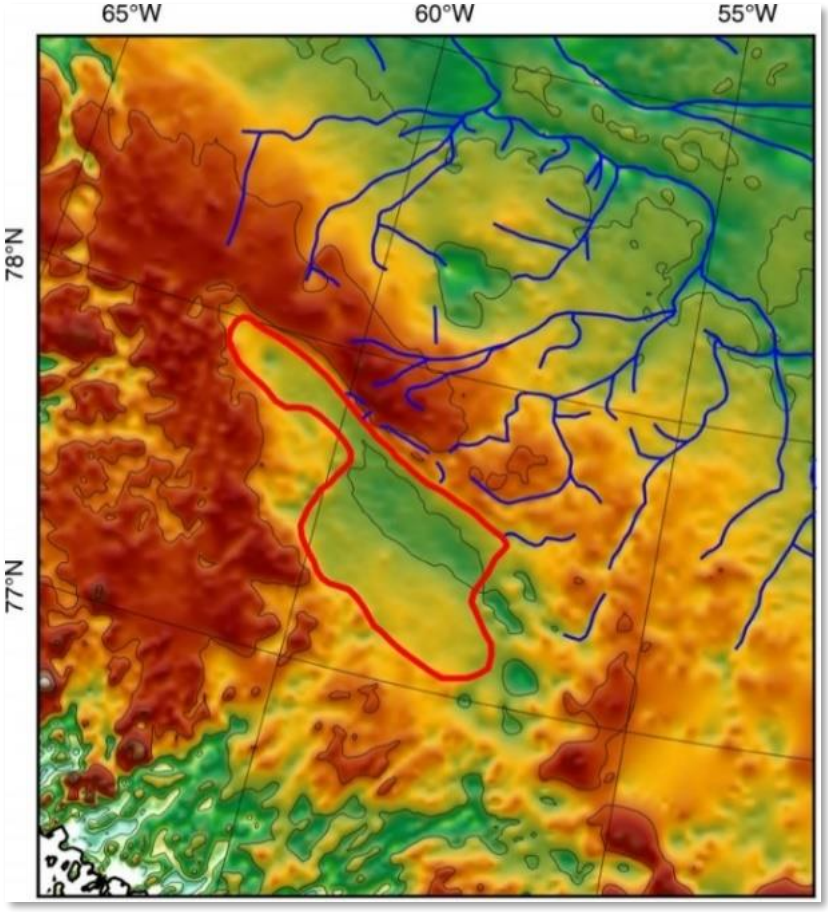
https://scitechdaily.com/unexpected-widespread-structures-detected-near-earths-core-a-totally-new-perspective/

Scientists recently discovered the remains of a giant “fossil lake bed” buried deep beneath the ice sheet in northwestern Greenland thatthey estimate to be hundreds of thousands if not millions of years old. No one has seen such a phenomenon in this part of the world previously, even though the colossal Greenland Ice Sheet, which is the world’s second largest after Antarctica's, has lots of things to be discovered now that it is shedding mass at an alarming rate.

Although more than 50 subglacial lakes are known beneath the ice sheet, this new find is very different. It is an ancient lake basin, long dried out and full of sedimentary fill as much as 0.75 mi thick under a cover of more than 1 mi of ice. The area would have been free of ice when the lake formed, and the basin would have been filled with a gigantic lake about 2,741 mi^2 in size, about the same square mi area as Delaware and Rhode Island combined. It was fed by a network of at least 18 streams and would have held about 139 mi^3 of water. Although no one knows how old this lake is, nor whether it filled and drained numerous times like western Pennsylvania’s periglacial Lake Monongahela, analysis of the basin fill probably would answer those questions, as well as provide clues about the

environment of Greenland at the time. The basin fill could be an important repository of all kinds of information if the sediments could be reached.

The lake bed has been dubbed “Camp Century Basin” in reference to a nearby historic military research base. It was identified using NASA's Operation IceBridge mission, an airborne survey of the world's polar regions. During flights over the Greenland Ice Sheet, the researchers mapped the subglacial geomorphology using instruments to measure radar, gravity, and magnetic data. The readings all showed the outline of the giant mass of loose sedimentary fill composed of less dense and less magnetic material than the surrounding bedrock.



Geologic map of a portion of Greenland showing the extent of a large ancient lake basin (outlined in red) and the streams that fed it (shown in blue).

While it’s possible that the lake formed as a result of bedrock displacement along a now dormant fault line, it’s also possible that the basin was carved by one or more glacial erosion events. If researchers could somehow drill deep enough to extract and analyse the basin fill, they might be able to determine when the region was ice-free versus ice-covered, thereby revealing constraints to the extent of the Greenland Ice Sheet and offering insights into past climate and environmental conditions in the region.

The deeply buried basin fill could tell us about polar climate change thousands or millions of years ago that could be vital to interpreting what's happening globally now.

https://www.sciencealert.com/ancient-lake-discovered-under-greenland-may-be-millions-of-years-old-scientists-say

PGS WEBSITE OF THE MONTH

https://www.digitalatlasofancientlife.org/learn/

PGS 2020-2021 Officers and Board of Directors

President	Vice President	Treasurer	Secretary
Tamra Schiappa	Dan Harris	Kyle Fredrick	Diane Miller

Directors-at-Large (2nd year)	Directors-at-Large (1st year)	Counselors
Wendell Barner	Brian Dunst	John Harper
Michael Bikerman	Ray Follador	Charles Shultz
Mike Keeliher	Mary Ann Gross	

Newsletter Editor	Continuing Education	AAPG Delegates
Karen Rose Cercone	Brian Dunst	Dan Billman / Ray Follador

Webmaster	Archivist	Student Delegate
Dan Harris	Judy Neelan	Michael Behe

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 Diane Miller, Secretary, at dianemiller123@msn.com.

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 US government banned sliced bread during World War II because weaponry and other wartime necessities were considered more important than manufacturing bread-slicing machines. The ban only lasted for a couple of months in 1943.

2020 CORPORATE SPONSORS

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

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

Barner Consulting, LLC

The Baron Group Inc.

Battelle
www.battelle.org/

Billman Geologic Consultants, Inc.
www.billmangeologic.com

Civil & Environmental Consultants, Inc
www.cecinc.com

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

DORSO LP

Enviro-Equipment
www.enviroequipment.com/

Falcede Energy Consulting, LLC

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

Geo-Mechanics, Inc.

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

HDR Engineering, Inc.
www.hdrinc.com

Huntley & Huntley, Inc.
www.huntleyinc.com

Michael Baker International
www.mbakerintl.com

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

Pennsylvania Drilling Co.
www.pennsylvaniadrillingco.com

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

Seneca Resources Company LLC
www.natfuel.com/seneca

THG Geophysics, Ltd.
www.THGGeophysics.com