PITTSBURGH GEOLOGICAL SOCIETY

Pittsburgh Geological Society 1945 - 2020
Celebrating 75 Years

November 18, 2020

Virtual Meeting Times

Board Meeting	6:00 PM
Social Gathering	7:00 PM
Presentation	7:30 PM

Pre-Registration is Required

PGS members and guests must RSVP by November 17 to receive the meeting Zoom link. Register here: pittsburghgeologicalsociety.org

PDH Certificates are Available

Attendees can receive an emailed PDH certificate at their request. Non-PGS members are asked to kindly donate $10 to either the Pittsburgh Geological Society Endowment Fund or the PGS Galey Fund for Students when they request a certificate on the PGS website.

Online Meeting Guidelines

All attendees are encouraged to join the meeting no later than 7:20 PM when announcements will be made. PGS requests all attendees to mute their own audio and video during the presentation to avoid disruptions and to lower bandwidth.

GSA Hydrogeology Division
2020 Birdsall-Dreiss Distingushed Lecture

High Latitude Hydrology: Water in a Changing World

Dr. Jonathan B. Martin

Department Of Geological Sciences
University of Florida

Please RSVP by November 17 to receive the Zoom link.

Speaker Abstract

Retreat of continental ice sheets has exposed ~15% of Earth's surface since the Last Glacial Maximum (LGM) and deposited fine-grained sediments in "deglaciated" watersheds. These sediments are susceptible to enhanced chemical weathering, which may vary in intensity and reaction mechanisms depending on exposure times and precipitation. Thus, ice retreat should alter solute fluxes to the ocean and gas exchange with the atmosphere as reflected by the rise in seawater Pb isotopes following the LGM. Solute and gas fluxes will depend on both riverine concentrations and discharges. Although discharge may be orders of magnitude greater for individual proglacial than non-glacial streams, their specific discharge (normalized to drainage area) is similar in western and southern Greenland. However, chemical compositions are distinct between proglacial and deglaciated watersheds and among deglaciated watersheds depending on their exposure ages and precipitation. Newly deglaciated watersheds have dissolved $^{87}Sr/^{86}Sr$ ratios that are 0.003 greater than bedload values but this difference decreases to near zero in watersheds with longer exposure ages, reflecting greater chemical weathering. The dominant weathering reactions shift with exposure age from carbonic acid weathering of carbonate minerals to sulfuric acid weathering of silicate minerals, thereby altering CO_2 consumption and production. Compared to proglacial watersheds, deglaciated watersheds have enhanced dissolved organic carbon (DOC) specific yields but the DOC is more recalcitrant than proglacial DOC. Among proglacial watersheds CO_2 and CH_4 fluxes vary, depending on magnitudes of subglacial mineral weathering and organic matter contents. These results indicate ice retreat is an important control on mass fluxes from periglacial environments. Understanding causes of these differences could improve analyses of how past ice retreat altered ocean and atmospheric chemistry and provide predictive capability for changes in fluxes with continued ice retreat in a future warmer world.

Speaker Biography

Jonathan B. Martin is Professor of Geological Sciences at the University of Florida, where he has worked since 1994. He received a BA in Environmental Science at Wesleyan University in 1980, an MS in Geology from Duke University in 1987, and a PhD in Earth Sciences from UC San Diego, Scripps Institution of Oceanography in 1993. His research evaluates water chemistry in a range of environments to understand interactions between flow and biogeochemical and inorganic reactions. His dissertation research focused on discharge and chemical processes at cold methane-rich seeps on the seafloor at convergent margins. Following his move to Florida, his research expanded to include studies of chemical reactions in carbonate aquifers based on variations in spring water compositions. He also developed an interest in nearshore marine settings where he assesses impacts of sea level rise on freshwater-saltwater mixing in coastal aquifers and the chemistry of submarine groundwater discharge. His interests in flow through karstic systems and effects of sea level rise led to studies of glacial hydrology. This research examines how chemical and isotopic compositions of streams draining the Greenland Ice Sheet differ from those draining watersheds exposed during ice sheet retreat. Martin was selected as a GSA Fellow in 2006. He is an emeritus member of the Karst Waters Institute Board of Directors, has been associate editor of Groundwater since 2005, and was a visiting professor at the University of Montpellier, France (2007), and University of Bristol, UK (2017).

PRESIDENT'S STATEMENT

Belated congratulations to Albert Kollar, PGS's most recently awarded Honorary Member. Although designated in October 2019, we neglected to annouce this honor until now. Albert is an active member of PGS, who has served in a variety of positions: President, Director-at-Large and as the current chair of the Awards committee as well as organizing and conducting PGS field trips.   We appreciate all he has done for PGS and the professional community.

Hard to believe that it is November, the 2020 elections are behind us, and we are still under the dark Covid-19 cloud. I never realized the scope of a pandemic and the effect it has on the entire global society and the difficulties it brings to everyday life. I serve as a voting member on the International Sub-commission on Permian Stratigraphy and at our Zoom meeting last week, we were discussing the difficulties we were facing during the pandemic. It occurred to me at that moment that everyone around the world is dealing with the same restrictions from Covid-19. My colleagues are faced with the same frustrations that come with working remotely, teaching virtually and not being able to conduct field trips.

When this is over a new normal will begin. What this will look like, I have no idea, but this will have reshaped our societies and cultures in ways we may not realize for years to come. One benefit that I realize now is that virtual meetings have allowed a paleontological committee that consists of members from almost every country to meet more often instead of only meeting at international conferences that were becoming unaffordable for some. One not so positive aspect is the lack of field excursions and the interchanges that occur on the outcrop. I am afraid it will be sometime before we are all comfortable or allowed by our governments to conduct international field excursions. But for now, our ability to communicate virtually (not just through email) has brought a group of international colleagues together to advance our science.

This time of year is when the Society invites current corporate sponsors to continue their support, and asks former sponsors and new companies in the region to join in support of the PGS. It is mainly from the support of our sponsors that we have remained true to our mission, which is to disseminate geologic knowledge and to provide a forum for discussions on geologic problems by offering a monthly speaker series. We offer Continuing Education Credits (CEUs) to licensed professional geologists that attend our monthly meetings; networking and training opportunities for students; and field trips for all.

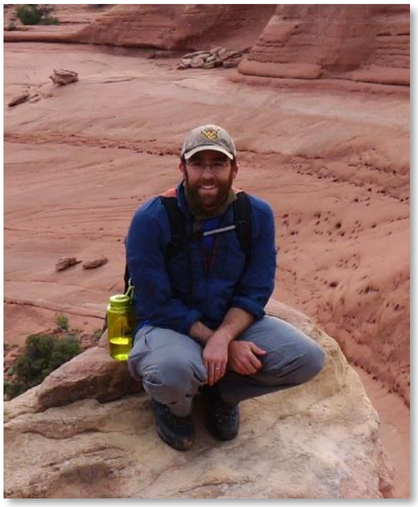
It is because of the generous support from the Corporate sponsors that we have remained financially strong and able to do all of this. Corporate membership plays a vital role in making the Society a place where professionals and students can interact and stimulate geologic thought. We understand that times are tough right now due to Covid-19 restrictions, but I remain hopeful that this will end, and our economy will bounce back. We appreciate all the support from our corporate sponsors.

Similar to last month, I would like to introduce a few more of our PGS Board members. Please remember that you can contact them for networking or if you would like to assist with any PGS activities. In closing, I would like to thank the membership for understanding and adapting to the new meeting format while the Covid-19 cloud looms overhead.

If you have not already done so, please renew your membership either on the PGS website or through the mail. Stay safe and see you at the next meeting.

Tamra

Officers



Daniel Harris, Vice President, is an Associate Professor of Geology at California University of PA. He received his M.S. in Geochemistry from WVU in 2008 and his Ph.D. in Structural Geology from WVU in 2011. Before coming to California University of PA, Daniel worked as an adjunct lecturer at Bethany College and WVU for several years. Daniel teaches a number of courses with a heavy emphasis on field work, including Mineralogy, Petrology, Structural Geology, Tectonics, Field Methods in Geology, Field Camp, Computer Applications in Geology, Geophysics, Geochemistry, and Petroleum Geology. His research focuses on Mesozoic tectonic reconstructions of Arctic Basins using field mapping and geochronologic sample analysis. Other research involves new methods in apatite geochronology and 24-hour fluctuations of heavy metal concentrations in acid mine-impacted streams.

Kyle Fredrick, Treasurer, is a Professor of Geology at California University of Pennsylvania. He holds a BS in Geology from University of Wisconsin – River Falls (2000) and a PhD in Geology from University at Buffalo (2008). His graduate work focused on groundwater modeling using novel approaches to large datasets and integration with geographic information systems. Dr. Fredrick's teaching career began in 2005 at Buffalo State College as an adjunct instructor. He moved on to Hobart and William Smith Colleges in Geneva, NY in 2006 prior to beginning in his current position at CalU in Fall 2007. Dr. Fredrick teaches a range of classes across the geology curriculum, specializing in environmental geology and hydrology. His research interests focus on stream-groundwater interactions, water quality, and fluvial and hillslope geomorphology.

Directors-at-Large

Raymond Follador is currently President and Owner of Falcede Energy Consulting, LLC and Co-owner of ARK Resources, Inc. providing oil and gas consulting services to a diverse client base consisting of industry, private and institutional investors, law firms, and private mineral owners. These services include geologic, engineering, land and contract, and reserve and financial analysis. With over 40 years of multi-basin industry experience, he has worked in exploration, development, operations, and management for several companies, both publicly and privately held. Ray is a registered Professional Geologist (PG) in the state of Pennsylvania and a Certified Professional Geologist (CPG) with both the American Association of Petroleum Geologists and the American Institute of Professional Geologists. He received his BS degree in Earth Science from Pennsylvania State University and his MS degree in Geology from West Virginia University. Ray has served on the PGS Board as a Director at Large or Officer for almost 30 years.

<u>Editor's Note</u>

There is a correction to the bio for Director-at-Large Mary Ann Gross that was published in last month's issue. Mary Ann has helped to organize a field trip only recently, but she has enjoyed attending many PGS trips over the years. This statement replaces "led many field trips", a phrase which was incorrectly modified from her original submission during final assembly of the October newsletter.

UPCOMING PGS MONTHLY MEETINGS

Meeting Date	*Scheduled Speaker*	*Presentation Topic*
December 16, 2020	Amy Henrici, Carnegie Museum	Vertebrate Paleontology
January 20, 2021	TBA, Joint Meeting with ASCE and AEG	Engineering Geology
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

Pennsylvania Council of Professional Geologists

November 17, 2020 1:00 PM-2:00 PM

"Webinar: Determining Seasonal High Water Tables Using Soil Morphology" by Russell Losco, Lanchester Soil Consultants Inc.

To register: http://www.pcpg.org/event-3989357

Pittsburgh Association of Petroleum Geologists

November 19, 2020 12:00 PM – 1:00 PM

"What Every Geologist Should Know About Climate" by Dr. Fred Zelt, ExxonMobil (ret.)

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

American Society of Civil Engineers Geo-Institute

November 19, 2020 12:00 PM – 1:00 PM

56th Terzaghi Lecture: "Observing and Controlling Ground Behavior During Tunneling" by Dr. Edward Cording, Professor Emeritus, University of Illinois at Urbana-Champaign.

To attend: https://us02web.zoom.us/webinar/register/WN__FwCRC0LRJ-SMBYGP_08Wg

The Geo-Institute
Pittsburgh Chapter
is hosting:

The 56th Terzaghi Lecture (Webinar) – November 19th, 2020

OBSERVING AND CONTROLLING GROUND BEHAVIOR DURING TUNNELING

By:
Edward J. Cording

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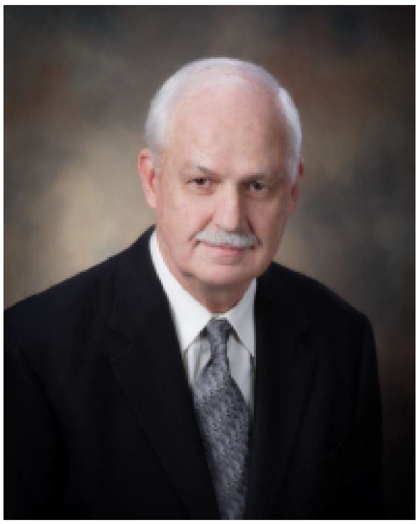


The lecture focuses both on observing ground behavior – displacements and porewater pressures at their source around an advancing tunnel heading, and on observing and correlating the construction process with the ground behavior.

The lecture proceeds (1) from the pioneering observations of Karl Terzaghi and Ralph Peck on the Chicago Subway in 1940 where they linked tunnel construction and ground loss in the soft Chicago clay to surface settlement, (2) to our observations of open face tunnel shields in the 1970's – 2000's where it was often a struggle to minimize ground loss, and (3) to the current fully pressurized tunnel boring machines (TBMs) that have revolutionized our ability to control the ground and to tunnel at shallow depth under urban areas without ground loss or damaging settlement.

In 2016 – 2017, on the Alaskan Way Viaduct Replacement (SR 99) Project, the 57.5-foot-diameter TBM was advanced beneath downtown Seattle using control procedures for pressurizing the TBM face and shield perimeter that prevented ground loss, with a comprehensive monitoring program that demonstrated how the ground behaved and how control was achieved in both granular and cohesive soils at tunnel depths ranging from one-half to three diameters. Lessons learned from that project and current developments in observing and evaluating ground behavior around tunnels are described.

Edward Cording is Professor Emeritus in Department of Civil and Environmental Engineering at the University of Illinois at Urbana Champaign, where he taught rock mechanics and soil-structure interaction for underground structures, excavations, slopes, and tunnels. His laboratory has been in the field observing and analyzing the stability of deep and shallow caverns and tunnels in rock, and ground movements around urban tunnels and excavations in soil and their relation to building distortion and damage.

Some recent projects include the Long Island RR East Side Access to Grand Central, 2nd Avenue Subway, No. 7 Line Extension subway, and Hudson River tunnels for the Gateway Project in New York City. Recent projects with pressurized tunnel boring machines have been in Washington, D.C, Toronto, Cleveland, Vancouver, Seattle, and San Jose. He is a member of the Tunnel Advisory Panel for Los Angeles Metro on the planning, design and construction of subway tunnels and stations.

He is a member of the National Academy of Engineering and received the Moles Award for Outstanding Achievement in Construction, 2003, the Beaver's Engineering Award in 2013, and Geo Institute Harry Schnabel, Jr Award for Career Excellence in Earth Retaining Structures, 2007. The lecture "Observing and Controlling Ground Behavior around Tunnels" was presented as the 2020 Terzaghi Lecture.

WHERE	TIME
Zoom – Webinar Link to Registration: HERE	12:00 PM – 1:00 PM EST

Program Chair: Randall Booker (Email – rbooker@agesinc.com)


LANDSLIDE
Capacity Building Virtual Seminar
RESCHEDULED
Friday, November 6, 2020
Beginning at 11 a.m.
Please register again for this session even if you previously registered for the series. This will assist us in successfully presenting the event.
Building on its successful August 2019 Exploring Approaches to Managing Landslide Risks workshop, the Impactful Resilient Infrastructure Science and Engineering (IRISE) research consortium at the University of Pittsburgh is conducting a series of seminars focused on various aspects of the landslide problem in Southwestern Pennsylvania. These are being conducted in partnership with the Geo-Institute (American Society of Civil Engineers), the local section of the Association of Engineering Geologists, and the Pittsburgh Geological Society.
The final seminar in the Landslide series will be held on Friday, November 6 starting at 11 a.m. It will focus on applying technology to the problem, including a variety of techniques such as photogrammetry, LiDAR, interferometric synthetic radar (InSAR), laser scanning and neural networks.
The seminar will feature leading professional experts with years of experience in the community who will present and lead discussion on a variety of topics.
CEUs will be provided for all of the Landslide Capacity sessions after the November 6 session.
Register at:
tinyurl.com/LandslideNovember
PITT | IRISE
CENTER FOR IMPACTFUL RESILIENT INFRASTRUCTURE SCIENCE & ENGINEERING

The Pittsburgh Geological Society welcomes the following:

New Professional Member
Anna M. Ablak
Geologic Associate, Michael Baker International

David E. Rounce
Assistant Professor, Carnegie Mellon University

New Recent Graduate Member
Christopher E. Metz
Lab and Field Technician, Geotechnics

New Student Member:
Daniel Zoeller, Slippery Rock University

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

The village of Farmington in Wharton Township, Fayette County, is located on the National Road, US Route 40, between Uniontown and the Youghiogheny River Lake. A Mr. Connor built the first house, a log tavern, probably in the late 1700s, and after a few stores were built the community was called Sterling's Cross-Roads after one of the store owners.

When the National Road was opened in 1818, James Bryant established the Bryant post-office in the village. In 1838, Morgan Jones named the village Farmington, probably because of the good farming country surrounding it, and the post office name was changed to fit the name of the village.

Farmington is better known as the location of Fort Necessity National Battlefield, Braddock's Grave, Nemacolin Woodlands Resort, the old Stone House Restaurant in Chalk Hill, Laurel Caverns, and the Historic Summit Inn Resort at the top of Chestnut Ridge.

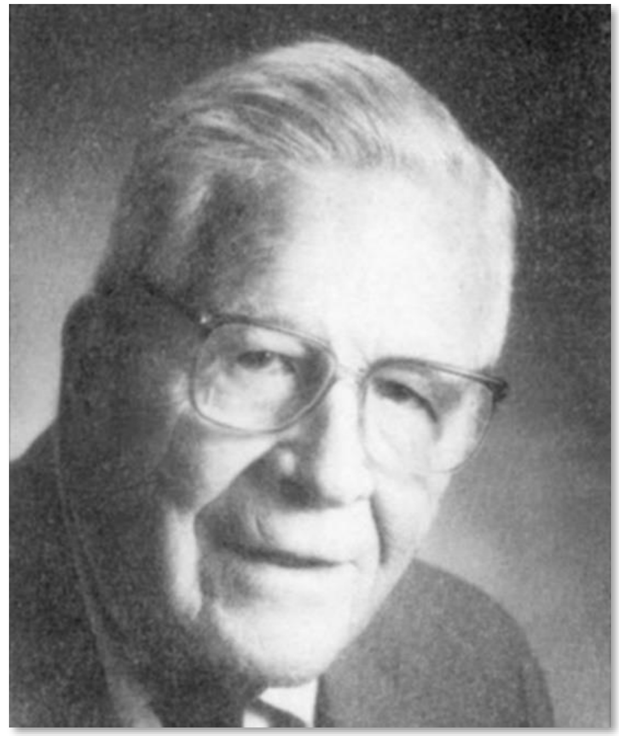
Iconic images of Farmington in Fayette County, PA.

Left – Fort Necessity National Battlefield

Right – Braddock's Grave

DID YOU KNOW . . . ?

John Taylor Galey (1907-1992), one of the founders of PGS, and the man for whom PGS's Galey Fund was named, was a famous fourth generation oil and gas explorer. Born in Beaver, Pennsylvania, John attended the Hun School, a private 6-12th grade boarding school in Princeton, New Jersey. Upon graduation, he enrolled in Princeton University where he received a BS degree in geology in 1932. He then spent a year at the University of Pittsburgh studying geology and petroleum engineering. For the remainder of his life, he was what his memorialist, Larry Woodfork, called a "quintessential independent petroleum geologist, consultant, and gentleman."



John T. Galey, one of the founders of PGS, and also one of Pennsylvania's most famous and successful oil and gas explorers.

John participated in many successful oil and gas ventures during his lifetime. This is not the least bit surprising given his family heritage, which extended back to the founding of the modern petroleum industry. On the day John's father was born, his paternal grandfather, Robert, drilled a 1000 barrel-per-day oil well. John's great-uncle, John H. Galey, is generally considered to have been the greatest wildcat oilman of the 1800s. He drilled many of the more famous wells in the US, including the J. J. Mathews well in the McDonald oilfield of Allegheny County, Pennsylvania, in 1891 which became the largest oil well in the Appalachian Basin in terms of open flow and production. John H. Galey also drilled the Lucas well at Spindletop in Texas in 1901 that sparked the formation of the Gulf Oil Company and heralded the heyday of the petroleum industry in the 20th century.

To carry on the family tradition, John and his uncle, Jim "Big Red" Duff, drilled the first well in western Pennsylvania to produce natural gas from the Lower Devonian Oriskany Sandstone, discovering the Blackhawk Pool in Beaver County in 1935. It was his first discovery. Throughout his long career, John drilled numerous wells and made many other discoveries in Pennsylvania, Ohio, West Virginia, and Virginia. Of course, his endeavors weren't always successful. Like all great wildcatters, John drilled a few dry holes over the years as well.

Besides drilling oil and gas wells, John also made many professional presentations throughout career and wrote or edited numerous reports and publications dealing with geology and oil and gas resources, particularly in the Appalachian region. He organized and edited the 1948 Appalachian Basin Ordovician Symposium, which was published by the American Association of Petroleum Geologists. His most famous paper, arguably, was *The Anticlinal Theory of Oil and Gas Accumulation: Its Role in the Inception of the Natural Gas and Modern Oil Industries in North America,*" which was published in *Geologists and Ideas: A History of North American Geology,* a special centennial volume published by the Geological Society of America as part of their DNAG series in 1985.

John Galey was not just an oilman. Recognizing the importance of geology in the proper planning and development of cities, John organized, secured National Science Foundation funding for, and chaired the President's Conference on Environmental Geology in 1971. He guided a group of distinguished geologists, engineers, architects, and planners in developing a comprehensive plan for the development of new kind of "concept town" that was programmed to grow from nothing into a 300,000-population city over ten years in a planned, environmentally responsible manner.

Despite his work in the office and field planning, promoting, and drilling wells, John also spent an immense amount of time working with many local, regional, and national geological organizations, including:

- American Association of Petroleum Geologists (served on numerous national committees and the AAPG Advisory Council; Member, House of Delegates; Certified Petroleum Geologist, Division of Professional Affairs; Trustee, AAPG Foundation. He also played a key role in the formation of the Eastern Section of AAPG and served as its first president. The society presented him with its one and only Founder's Award in 1987. In recognition of his many contributions to local, regional, and national AAPG, the society conferred on him a Distinguished Service Award in 1974 and honorary membership in 1980. Finally, in 1990, AAPG bestowed upon him its highest award, the Sidney Powers Medal, for his achievements and unselfish service to geology and its practical application to the betterment of mankind)
- Geological Society of America (Fellow)
- American Institute of Professional Geologists (Charter Member; President, 1968; recipient of the prestigious Ben H. Parker Medal, its highest award, 1978
- Pittsburgh Geological Society (Founder and Charter Member; President, 1948; Honorary Life Member, 1970)
- Pennsylvania Gas Association (Director and Honorary Life Member)
- Pennsylvania Natural Gas Men's Association (Member and Past President)
- American Petroleum Institute (serving in numerous capacities)
- Carnegie Museum of Natural History (Emeritus Trustee)

What many have called "the cutest dinosaur ever," an almost intact embryonic skull of a titanosaurian sauropod just a couple of centimeters long, has been found in a well-preserved egg from an enormous Cretaceous nesting ground full of dinosaur eggs in Patagonia, Argentina. The paleontologists who discovered the egg nests described the titanosaurians as having had stereoscopic vision and an unusual, thickened horn-line prominence on the front of the face, which was lost in adulthood. The specimen in question is the first three-dimensionally preserved embryonic skull of a sauropod sauropodomorph. The facial anatomy, including the elongated horn, implies that hatchlings of the giant dinosaurs might have differed in where and how they lived in their earliest stages of life, although the scientists did not rule out that these features might be unusual enough to represent a new kind of titanosaurian dinosaur.

Magnified photo of a titanosaur embryonic skull showing the peculiar thickened horn-like prominence on the front of the face that might have assisted with hatching.

The paleontologists used synchrotron microtomography to study the inner structure of bones, teeth, and soft tissues of the embryonic dinosaur, allowing the team to find many hidden details, including tiny teeth preserved deeply in tiny jaw sockets, partly calcified elements in the braincase, and what appear to be the remains of temporal muscles. The imaging also allowed them to reconstruct the most plausible appearance of the skull in titanosaurian sauropods prior to hatching. The scientists suggest that the baby sauropods may have hatched out of the egg with the help of the thickened prominence rather than using a boney egg-tooth. There was also evidence that the embryonic dinosaurs used calcium derived from the eggshell long before they were ready to hatch. The hatchlings emerged with a temporary moncerotid (single-horned) face, retracted openings on the nares (nose), and early binocular vision. This all points to the embryos having a specialized craniofacial anatomy prior to the post-natal transformation of the skull in adult sauropods.

http://www.sci-news.com/paleontology/titanosaurian-embryo-08798.html

Based on some new research, Earth's ocean system is soaking up more carbon than most scientific models have heretofore suggested. Previous estimates of the carbon flux between the atmosphere and oceans did not account for temperature differences between the water's surface and a several feet below. The new study, by including these data, found a significantly higher net flux of carbon into the oceans from the atmosphere. The British team responsible for the research calculated CO_2 fluxes from 1992 to 2018 and found as much as 2 times as much net flux in certain times and locations, compared to uncorrected models.

Half of the CO_2 the world emits doesn't remain in the atmosphere. It is taken up by the oceans and terrestrial vegetation sinks instead. There is a large database of near-surface CO_2 measurements called the *Surface Ocean Carbon Atlas* that has been used to calculate the flux of CO_2 from the atmosphere into the ocean. But previous studies that have done this have ignored the small temperature differences between the surface of the ocean and the shallow depths where the measurements are made.

The team explained that this is an important difference because CO_2 solubility strongly depends on temperature. The team used satellite

New research shows more atmospheric CO_2 is taken up by Earth's oceans than previously thought.

data to correct for the temperature differences, resulting in big differences in the data. They found that by using this method they got a substantially larger flux entering the ocean, accounting for about 10% of global emissions from burning fossil fuels. The revised estimates substantially agree with an independent method of calculating how much carbon dioxide is being taken up by the ocean much better than previous estimates. The independent method uses a global ocean survey by research ships over the span of decades to calculate how the inventory of carbon in the ocean has increased. Since the independent method and the new method agree pretty well, the researchers have more confidence in them.

https://phys.org/news/2020-09-ocean-carbon-uptake-widely-underestimated.html

Hugh Henry Brackenridge, a frontier citizen of Pittsburgh as well as a writer, lawyer, judge, and justice of the Supreme Court of Pennsylvania, founded the Pittsburgh Academy in what is now downtown Pittsburgh in 1787. The Academy began as a preparatory school in a log cabin but, although Pittsburgh was still pretty much a "boondock" community, it began to grow following the Revolutionary War, which meant that it would soon need a proper university. Brackenridge obtained a charter for the school from the state legislature on February 28, 1787. Three years later, a two-story brick building was erected at

Third Street and Cherry Alley (now Cherry Way) to house the expanding school. Shortly afterward, it became apparent that more advanced education was needed in the area. In 1819, the state amended the academy's charter to confer university status and the Pittsburgh Academy became the Western University of Pennsylvania. The name implied that it was to be the western version of its sister school, the University of Pennsylvania in Philadelphia.

Portrait of Hugh Henry Brackenridge, founder of what eventually became the University of Pittsburgh.

By 1830, the university had moved into a new, three-story building near its original building, on Third Street between Smithfield Street and Cherry Alley. Thomas Mellon, founder of Mellon Bank, graduated in 1837 and later taught at the university. The Great Fire of 1845 destroyed the buildings and most of its records and classes were transferred to what is now Trinity Cathedral until a new building could be constructed. Unfortunately, that building also was destroyed by fire, causing the university to suspend operations for a few years until the administration could regroup and rebuild. The next university building was erected at the corner of Ross Street and what is now Forbes Avenue, site of the current City-County Building, in 1854 and in 1855 classes resumed. By 1891, the university was so large that it outgrew its downtown campus and moved to Allegheny City (the North Side), and then to Observatory Hill, site of Allegheny Observatory, which has been an integral part of the university since 1867.

In 1908, the university was renamed the University of Pittsburgh, at least partly to avoid confusion with its sister institution in Philadelphia. It had grown so large that its Observatory Hill campus could not contain all of its students and classes; departments were scattered throughout the city. As a result, the university purchased 43 acres of the Schenley Farm east of downtown in 1907 and began relocating its many departments to what would become the Oakland neighborhood of Pittsburgh. Later, the university acquired the 14-acre Frick property, also in Oakland, and began plans for a series of neo-Gothic Revival buildings centered on a high tower. Although the Great Depression intervened, the Cathedral of Learning was completed and dedicated in 1937. Today, at 535 feet high, it is the second tallest university building in the world.

Illustration of the original Pittsburgh Academy log cabin in 1787 in what is now downtown Pittsburgh.

Aerial photo of Oakland and the University of Pittsburgh campus in the mid-1950s. The Cathedral of Learning, the tallest gothic style building and at one time the tallest university building in the world, dominates the vista.

Although geology was taught as part of the natural sciences curriculum from 1864 until 1896, there was neither a geology department nor a geology degree. In 1896, the School of Mines began offering a BS degree in geology. The faculty consisted of Dr. Marshman E. Wadsworth, Dean of the School of Mines, who was also Professor of Mining Geology, and his colleague Ray P. Farrington who was Instructor of Mining Engineering and Geology. The faculty eventually grew to six, by 1912 consisting of Dr. Marshman, Earl Douglas, Instructor in Vertebrate Paleontology, Harry N. Eaton, Instructor in Geology and Petrology, Henry Leighton, Instructor in Mining Geology and Mineralogy, Otto E. Jennings, Instructor in Paleobotany, and Dr. Charles R. Eastman, Professor of Paleontology. Although the curriculum focused mainly on undergraduate education, the first graduate geology degree was awarded in 1912 to Harry Eaton. Finally, in 1917, geology became a degree program in the College of Liberal Arts.

Photo of Dr. Marshman E. Wadsworth, Dean of the School of Mines and Professor of Mining Engineering and Geology at the University of Pittsburgh in the late 1800s and early 1900s.

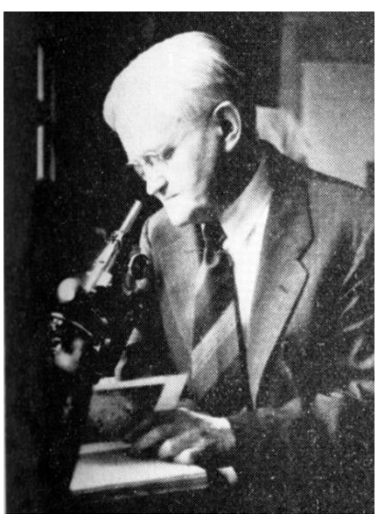


Photo of Henry Leighton, who was Chairman of the Pitt Department of Geology from 1931 to 1945.

Henry Leighton, who was primarily a mineralogist, made many contributions to the geology of Pennsylvania, particularly in Carboniferous stratigraphy, economic geology, geology of clays, and the history of the clay-working industry. He was named Acting Head of the Department of Geology in 1928 and promoted to Department Chairman in 1931, a position he held until 1945 when Dr. Richard E. Sherrill replaced him. Sherrill served until his death in 1952. Over the years, many eminent geologists have taken on the responsibilities of Department Chair, including PGS members such as Dr. Chilton E. Prouty (1952-1957), Dr. Norman K. Flint (Acting Head, 1957-1960), and current PGS member Dr. Thomas A. Anderson, who served during two separate intervals as Department Chair (1985-1999 and 2008-2010).

Over the years, the Department of Geology went through several name changes. In 1960, it became the Department of Earth and Planetary Sciences in association with a program expansion that included geophysics, geochemistry, and planetary science. Confusion by the public about the “Earth” part of the name (people called to request assistance with gardening and type of soils, for example) helped rename it as the Department of Geology and Planetary Sciences in 1979. An emphasis on undergraduate education in environmental geology and environmental science in the 1980s eventually led to the name being changed once again in the last half of the 2010 decade to the Department of Geology and Environmental Sciences, the name it retains today.

Texas researchers recently discovered evidence that the Younger Dryas, the cooling episode that occurred at the end of the Ice Age about 13 ka, was not the result of a meteorite impact as had been reported previously. Their evidence came from Hall’s Cave in the Texas Hill Country of central Texas. The team performed isotopic analyses of the cave sediments, which preserved unique geochemical signatures from ancient volcanic eruptions. Their analyses focused on parts-per-trillion measurements of osmium and levels of highly siderophile elements, which include rare elements like iridium, ruthenium, platinum, palladium and rhenium. The researchers determined the elements in the

Texas sediments were not present in the correct relative proportions to have been added by a meteor or asteroid that impacted Earth. Instead, the signatures from the analyses and the relative proportions of the elements matched those previously reported in volcanic gases.

Excavations of Hall's Cave in Texas exposed sediments for geochemical analysis that span from about 6,000 to about 20,000 years, leading researchers to find evidence for a volcanic origin of the Younger Dryas.

In addition, the signatures were not unique. They actually occurred four times between 9 ka and 15 ka years ago, reflecting a period of major volcanic eruptions that likely came from major eruptions in the Aleutians, Cascades, and even Europe. When a volcano erupts, the aerosols can spread globally, reflecting solar radiation away from Earth, which leads to global cooling for as long as five years. The team speculated that Earth's climate was on the verge of warming at the beginning of the Younger Dryas when the volcanic eruptions, combined with glacial discharge into the North Atlantic Ocean and enhanced snow cover combined to result in intense Northern Hemisphere cooling.

Volcanic eruptions generally cause their most severe cooling close to the source and typically in the year of the eruption; there is substantially less cooling in the years following the eruption. Since the Younger Dryas lasted about 1,200 years, a single volcanic eruption, although an important initiating factor, would not have had enough impact to keep the Northern Hemisphere from warming. Other Earth system changes such as additional eruptions, ocean cooling, and additional snow cover would have been needed to sustain the Younger Dryas for that length of time. If nothing else, this new research emphasizes that Earth's climate variability since the last Ice Age can be attributed more to Earth-bound drivers than to extraterrestrial mechanisms.

https://scitechdaily.com/sediment-discovered-in-texas-cave-upends-meteorite-explanation-for-global-cooling/

Scientists have wondered for years how life survived on Earth billions of years before oxygen was readily available. Now they think they know – it could have been arsenic. Yes, the notorious toxic compound may have been the breath of life during the early years of our planet. Scientists have been studying a microbial mat in the Laguna La Brava, a hypersaline lake in Chile's Atacama Desert that is permanently free of oxygen. This may be the only place on earth where photosynthesizing microbes thrive in an environment absolutely absent of oxygen.

Microbial mats of the kind that fossilized into stromatolites have been abundant on Earth for at least 3.5 ga, but there was no oxygen for photosynthesis for the first billion years of their existence. How these microbes survived in such extreme conditions is still unknown, but by studying both stromatolites and microbes living in extreme conditions ("extremophiles") today, researchers have come up with a handful of possibilities. Iron, sulphur, and hydrogen had been suggested as possible replacements for oxygen. However, it with the discovery of "arsenotrophy" in California's hypersaline Searles Lake and Mono Lake, arsenic has also become a possibility. More recently, studies of stromatolites from Western Australia revealed that Precambrian photosynthetic microbes trapped light and arsenic to survive. The same could not be said of iron or sulphur. Even more recently, researchers discovered an abundant life form in the Pacific Ocean that also breathes arsenic.

The Laguna La Brava microbes closely resemble a sulphur bacterium found in an arsenic-rich lake in Nevada. It appears to photosynthesize by oxidising the compound arsenite into arsenate. More research is needed to verify whether the

Microbial mats (top) found in Laguna La Brava in Chile might give scientists a better idea of how the microbes that formed stromatolites (bottom) lived.

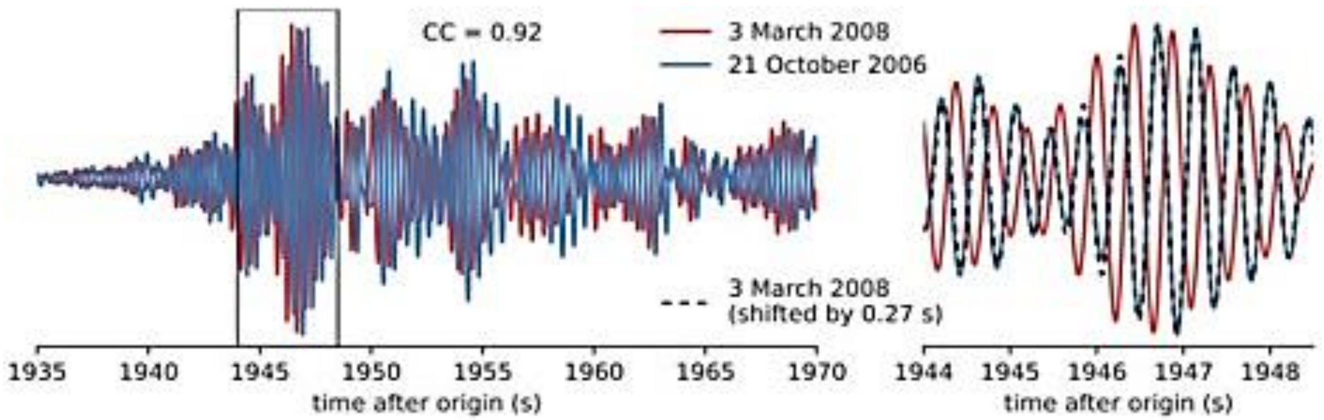
Laguna La Brava microbes also metabolize arsenite, but the initial research has discovered that the rushing water surrounding the mats is heavily laden with hydrogen sulphide and arsenic. If the recearchers are correct, the Laguna La Brava microbes would be the first life forms to “breathe” arsenic in a permanently and completely oxygen-free microbial mat, similar to what is expected in Precambrian environments. As such, its mats are a great model for understanding some of the possible earliest life forms on our planet.

https://www.livescience.com/life-on-earth-before-oxygen.html

New research has shown that seismic surveys can actually measure mall *temperature* changes in the *deep ocean. This* idea, using acoustic waves from a man-made source, actually was made decades ago but died out after some unsuccessful trials. Now a team of geophysicists has determined that earthquakes can be used as seismic sources, thereby removing the logistics and expense of generating sonic bursts to generate measurements and alleviating concerns about the effects on marine life. During an earthquake, the P-wave is analogous to a sound wave, compressing rock in the same direction it’s traveling. So the rock behaves like a massive speaker, producing a very low-frequency sound wave in the air or water.

But this process can work in reverse as well. For example, an earthquake below the seafloor just off a coastline can create a sound wave that travels across the ocean basin, re-entering the seafloor rock of the opposing coast. This phenomenon can be detected by seismometers as vibrations that arrive extremely late since the wave travels much more slowly through water than through rock. Inasmuch as this wave arrives after the P- and S-waves, it is called a tertiary or T-wave. The travel speed of the T-wave is sensitive to water temperature – the warmer the water the slower it goes. It is also slightly sensitive to salinity changes and current movement, but the researchers say temperature dominates. Seismometers can detect very small differences in timing, so they can in effect measure temperature changes < 1°C. Two measurement are needed to calculate temperature change, however; you need the seismic records two nearly identical earthquakes (“repeaters”). Fortunately, they don’t need to be huge, so finding two isn’t as difficult as it sounds.

The researchers used a seismometer station on a small atoll in the Indian Ocean where the tectonic plate boundary is very active, meaning there’s no shortage of earthquakes to measure. Between 2004 and 2016, the seismometer measured over 4,000 earthquakes of magnitude 3.0 or higher that occurred near Sumatra. The researchers carefully processed all of these events to find repeaters similar enough to do the temperature calculation. They found over 2,000 repeaters based on 900 earthquakes. If the Indian Ocean in this area warmed 1°C, T-waves from the earthquakes would take 5.4 seconds longer to reach the seismometer. Although the observed changes were smaller than that, they were coherent. The researchers noticed that there were both an annual cycle and a gradual warming trend that look similar to more traditional datasets,

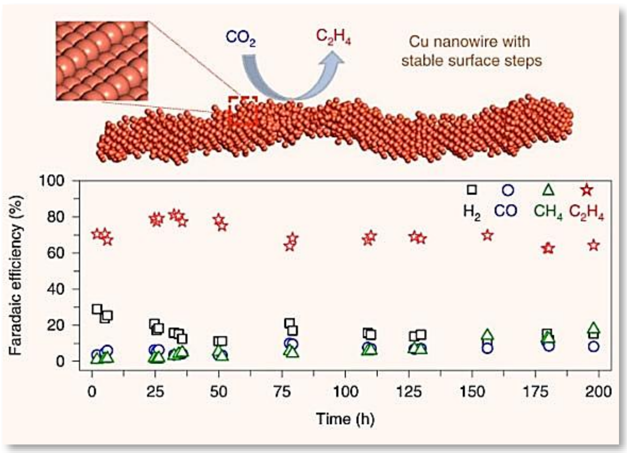


Examples of two, almost identical earthquake seismic signals, with the T-waves taking slightly longer to arrive in the one on the right due to warmer ocean water.

but the trend they calculated was slightly larger. This technique demonstrated that measuring temperature change in a completely independent way is valuable on its own. Besides, instead of relying on a limited number of point measurements from a float, it integrates the average temperature change through that entire volume of water. It also measures deeper, harder to access parts of the ocean. The researchers also suggested that hydrophones could be even more sensitive, taking advantage of smaller earthquakes. Maybe the most interesting thing about this research, however, is that existing seismometer data can be understood using this technique. It is now possible to go searching for historical measurements as well as future ones, and without needing to deploy, new more expensive instruments

https://arstechnica.com/science/2020/09/seismic-sound-waves-crossing-the-deep-ocean-could-be-a-new-thermometer/

A team of researchers from the US has developed a new method of turning CO_2 into ethylene for generating plastics, solvents, cosmetics, and other products used globally. They used copper nanowires with rich surface steps to catalyze a chemical reaction that reduces CO_2 emissions to generate ethylene (C_2H_4). Although using copper to catalyze this reaction had been known for a long time, it was never really efficient enough for industrial production. In addition, it suffered from two problems: 1) the initial chemical reaction also produced H_2 and CH_4, both of which are undesirable in industrial production; and previous attempts resulted in short-lived ethylene production because conversion efficiency tailed off as the system continued to run. In order to overcome these two problems, the team focused on the design of the copper nanowires with highly active steps. The researchers found that the step pattern across the nanowires' surfaces remained stable under the reaction conditions, which is highly important for both the system's durability and selectivity in producing ethylene, instead of other end products. They also demonstrated a CO_2-to-C_2H_4 conversion rate of greater than 70%, which was far more efficient than previous designs that yielded at least 10% less under the same conditions. The researchers ran the new system for 200 hours, with little change in



Copper nanowires with rich surface steps can be used efficiently to produce ethylene from carbon dioxide.

conversion efficiency, a major advance for copper-based catalysts. This new process has the potential to transform ethylene production into a greener industry using CO_2 that otherwise would end up in the atmosphere. Considering where we are in terms of climate change, the development of materials that can efficiently turn greenhouse gases into value-added fuels and chemical feedstocks is a critical step in mitigating global warming while turning away from extracting increasingly limited fossil fuels.

http://www.sci-news.com/othersciences/chemistry/carbon-dioxide-ethylene-conversion-08861.html

Frank W. Preston (1896-1989) was born in Leicester, England where, as a boy, he explored the English countryside on foot and bicycle, collecting bird's eggs and learning to preserve bird skins. Thus began his interest in science. His father was not a well-educated man, but he encouraged Frank in his schoolwork, especially when the boy won a scholarship to secondary school and qualified by competitive examination to enter Oxford. Unfortunately, he and his family did not have the resources necessary to attend Oxford, so he and formal schooling parted ways when he was 16. Despite the lack of formal training, Frank still managed more than most. In 1916, without having attended any classes, but by examination and publications alone, he obtained a BSc in Civil Engineering with first class honors from London University at the age of 20. Upon receiving his degree, Frank worked as a civil engineer in Loughborough, England, until he was drafted into the British Army. He wore glasses to correct his myopia, but he was also color-blind and had loss of hearing in one ear. These problems exempted him from military service during World War I. In 1925, he got his PhD and 26 years later a DSc, all from London University.

Although people in several disciplines claimed Frank Preston as one of their own, he regarded himself primarily as a glass technologist. During World War I, he became interested in the optical glass industry because of England's need for lenses for aerial photography. As a result of this experience, he traveled to Rochester, New York, in 1920 as a consultant to Eastman Kodak on the forming and polishing of glass. About a year after he received his PhD, he returned to the US and established Preston Laboratories in Butler, Pennsylvania. He became known as a problem solver for glass companies such as Corning Incorporated. He even invented a glass-melting furnace that allowed Corning to create its famous line of Corelle glassware.

Photo of Dr. Frank W. Preston, one of the founders of PGS, and the avid naturalist who spearheaded the formation of the Western Pennsylvania Conservancy and Moraine State Park.

Frank held scores of patents, which included a revolutionary innovation in melting glass by electricity. He was an authority on the propagation of cracks in glass and the diagnosis of causes of breakage. As a result, he was frequently called upon as an expert witness in lawsuits. He consulted with many glass manufacturers who considered his forte to be troubleshooting problems they were incapable of solving. It was said that, when he entered a factory to deal with a technical problem, he began with the assumption that multiple causes were at work. If there had been a single cause, he said, the people on the scene would have solved it. Starting with his work in England, he published numerous technical papers over a 60-year period.

Most of his papers were published mainly in the Journal and the Bulletin of the American Ceramic Society. His professional reputation was such that he was invited to be an official observer at the atomic bomb test at Bikini Atoll in 1946. And although he received many honors from scientific groups, none made him happier than being named "hereditary Freeman of the City of Leicester" in 1987. He was the only person to have been honored with this title *in absentia*.

Frank eventually moved Preston Laboratories to Meridian, located just south of the Muddy Creek and Slippery Rock creek valleys in Butler County. It was there that he became well known as an avid conservationist. He enjoyed walking throughout the valleys, exploring and mapping their geological and geographic features. He encountered glacial erratics and periglacial bogs, and determined the migration pathways of mammoths and mastodons during the Pleistocene. Despite the area having been turned into a barren landscape by the oil and coal industries in the 1800s and early 1900s, he saw that it had a rich history of glacial features. This spurred him to work on preserving the area for future generations. He helped form the Western Pennsylvania Conservancy (WPC) and spearheaded the purchase of the land that became Moraine State Park. The WPC worked with the state to reclaim the land and Muddy Creek was dammed to form Lake Arthur. Work on the lake was completed in 1970 when Moraine State Park opened to the public.

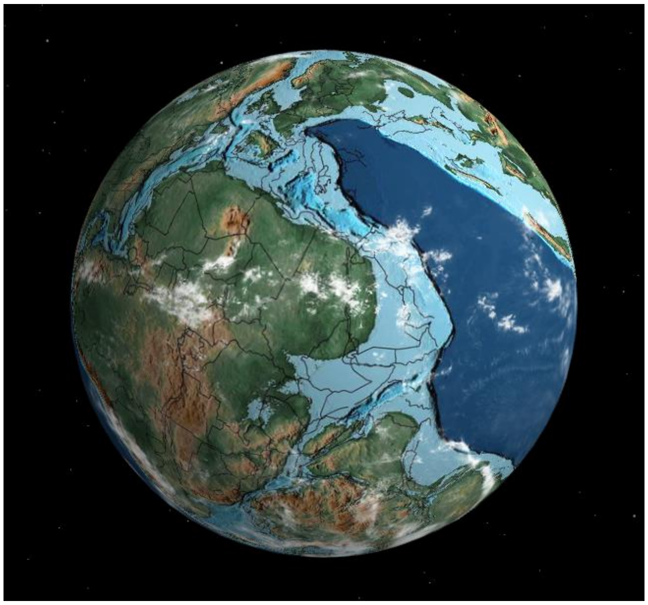
Frank embodied the personification of the staid Englishman, including having a dry sense of humor. Although reluctant to give presentations, he was known as an engaging speaker. One anecdote had him delivering a "speech" to a natural history society by singing Middle English ditties about birds. He spoke several languages in addition to the Greek and Latin he learned as a child. It was said that while introducing a speaker from South Africa to a gathering of scientists, he gave part of his introduction in Swahili. And he had a penchant for submitting papers for publication with humorous titles alluding to non-scientific sources. He had no use for television and regularly avoided reading newspapers, but he always had an opinion on a subject if you were willing to listen.

Frank W. Preston, PhD, Dsc, was not a geologist by training or vocation, yet he stimulated a great deal of interest in the subject of the glacial history of Moraine and McConnells Mills state parks that is still being explored today. His interest in the subject was such, however, that he willingly and avidly became one of the Founders and Charter Members of the Pittsburgh Geological Society. In 1970, on the 25th anniversary of PGS, he also became an Honorary Life Member of the Society.

PGS WEBSITE OF THE MONTH:

https://dinosaurpictures.org/

Make sure you check out the interactive globe hyperlink.



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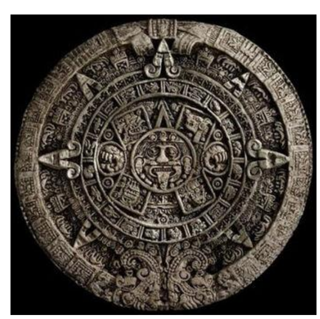
Fun Fact Having Nothing to Do with Geology



The Mayan calendar dates back to at least the fifth century BC, and by 900 AD it had been refined into a complex, but highly accurate calendar that is even more precise than the modern calendar used today.

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