



Atlanta Geological Society Newsletter

ODDS AND ENDS

Dear AGS members,

As the Dogwood Festival is behind us and we are fully in Spring, I note how mild of a winter we had. It wasn't particularly cold and wasn't particularly wet. I see that Lake Lanier is about 8 feet below full pool and hope that this does not become a problem later in the year.

Speaking of problems, I hear from our Treasurer John Salvino, that we are running behind on our membership renewals. I don't believe our funds are critically low just yet but like the water level at Lanier, without some influx of dues, things could become critical soon. The AGS does depend upon members for support but more importantly, there are numerous benefits derived from membership. There are the ten meetings a year with a wide range of geology topics. Our newsletter has 10 issues a year with an even wider range of topics. There's the chance to talk with old acquaintances prior to the meetings and meet some new folks. And just walking into the Fernbank Museum rotunda with those dinosaurs is bound to lift your spirits.

I was speaking with a friend who's husband is a geologist but doesn't attend the AGS meetings. She said the first thing they do when going on vacation is to get out the Roadside Geology of (insert state here). I said, why wait till you're on vacation to enjoy geology? We all remember the joy of discovery of new geology topics. That could start again next Tuesday! There's enough that we all deal with that I think it is a good thing, once a month, to get together and talk about geology.

Hope to see you Tuesday!
Ben Bentkowski, President

November Meeting

Join us **Tuesday, April 25, 2017** at the Fernbank Museum of Natural History, 760 Clifton Road NE, Atlanta GA. The meeting/dinner starts at 6:30 pm and the meeting starts approximately 7 p.m.

This month's presentation is: **Mineral Characterization in Environmental Science**, presented by Randy Boltin. Please find more information about Mr. Boltin's bio on the next page.

Please come out, enjoy a bite to eat, the camaraderie, an interesting presentation and perhaps some discussion on the importance of accurate mineral characterization. Also, the differences that can exist between mineralogical, industrial and regulatory definitions for minerals.

The membership form with the electronic link for dues payment is at the back of the newsletter.

And a reminder that this Saturday is the March for Science in Candler Park, if you're interested. BB

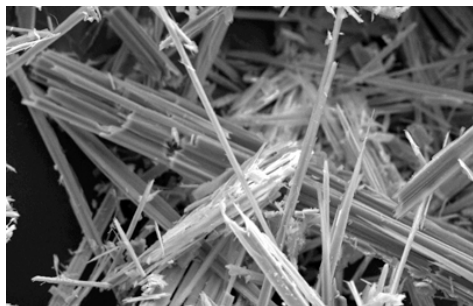
Mineral Characterization in Environmental Science, Randy Boltin MVA Scientific Consultants, Inc. Atlanta Geological Society April 25, 2017 Fernbank Museum of Natural History, Atlanta

Mr. Boltin holds an M.S. in Geology with a Minor in Soil Science from North Carolina State University (1985). His Master's thesis, "Geology of the Hollister 7½-Minute Quadrangle, Warren and Halifax Counties, North Carolina: Metamorphic Transition in the Eastern Slate Belt", involved extensive field mapping and the application of a variety of analytical procedures, including polarized light microscopy, x-ray diffraction, x-ray fluorescence and electron probe microanalysis. Mr. Boltin received his Bachelor of Science in Geology from the University of South Carolina in 1979.

Mr. Boltin has over 30 years' experience in polarized light microscopy and has been employed with MVA Scientific Consultants, Inc., since 1990. In his current position as Senior Research Scientist, Mr. Boltin conducts analysis of geological, forensic, industrial and environmental samples by light and electron microscopy and infrared spectroscopy. Mr. Boltin also serves as a lead assessor and consultant for the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP). He has conducted NVLAP assessments of laboratories performing analysis for asbestos by polarized light microscopy (PLM) for conformance with ISO 17025 since 1988.

Given the economic and public health implications, it is hard to overstate the importance of accurate mineral characterization in environmental impact studies associated with the mining industry and end-use products. Exacerbating the problem is the fact that notable differences can exist between mineralogical, industrial and regulatory definitions for a term and this can lead to significant confusion for mineral analysts and regulators, often with the minerals industry and public caught in the middle. High profile examples to be discussed in this presentation include "asbestos" associated with talc and vermiculite mining and the resulting consequences for miners, their families and consumers. The question of crystalline silica from an analytical perspective will also be addressed.

Asbestos



Talc



This Months Atlanta Geological Society Sponsor



Atlanta Environmental

Client First Focus

AEM is a woman-owned small business founded in 1988 and headquartered in Atlanta, Georgia. We are a full-service environmental consulting and engineering firm. The firm's long-term success can be attributed to providing high-quality, cost-effective consulting services with the primary goal of exceeding each client's expectations. AEM's success is evidenced by client longevity, with AEM having worked with some clients for decades and successfully delivering a multitude of complex projects.



Staff

Our highly qualified staff has expertise in the areas of engineering, geology, hydrogeology, environmental science, chemistry, risk assessment, biology, and regulatory affairs. We provide environmental consulting services under all regulatory programs, and most project managers are registered professionals (i.e., PGs or PEs) in their respective fields. We maintain a high staff retention, with many employees whose tenure exceeds 20 years! This longevity is a result of fostering a productive, efficient, respectful, and caring work environment for our employees.

Geology/Hydrogeology

Hydrogeological Investigations
Geophysical Investigations
Monitoring Well Installation
Groundwater Sampling Programs
Groundwater Modeling

Groundwater Remediation
Soil Remediation
Groundwater Control/Recovery
Aquifer Testing
Remedial System Operation



Why Earth Optimism?

A focus on conservation in this issue of *Science* appears on the eve of Earth Day, which is being celebrated by scientists in meetings and public events worldwide. Conservation professionals, who have long condemned attacks on the environment, will gather for Earth Optimism events to highlight conservation achievements. Separately, but simultaneously, marches for science will highlight science's achievements but also decry that science, scientists, and evidence-based policy-making are under attack. Although distinct in emphasis, these events speak with the same voice.

Science is an intrinsically optimistic endeavor, and many of its achievements have dramatically improved human well-being. This is why support for science remains strong. Nature conservation should be optimistic too (why bother otherwise?), but it often is not. Conservation has been called a crisis discipline, and Earth Day in the United States was born of crisis—the 1969 Santa Barbara oil spill. Since then, doom and gloom have become the norm in conservation messaging, which is why focusing on conservation's achievements, including those benefiting people as well as the planet, represents an important shift. In the end, support for both science and conservation depends on them delivering positive outcomes.

Environmental scientists' continuing focus on problems is, however, understandable. Australia's Great Barrier Reef is undergoing a second consecutive year of bleaching, having suffered unprecedented mass mortality from excessively warm waters last year. Surging rubber prices and land-concession deals have resulted in the loss of over 1.4 million ha of Cambodian forests in just 14 years. At most, 30 vaquitas (endemic porpoises from the Gulf of California) now remain, thanks largely to gill nets set for endangered totoabas, whose swimbladders are prized in Chinese luxury markets. Ignoring such stories for the sake of optimism would be foolish in the extreme.

Nevertheless, science has helped conservation notch up important successes. Poison baiting of alien rodents that threaten seabird populations has been completed across South Georgia, one of the most important seabird islands on Earth. Researchers have announced progress toward a vaccine to protect remaining Tasmanian devils against lethal devil facial tumor disease. Release of scimitar-horned oryx—declared extinct in the wild in 2000—has brought to 35 the number that are now free-ranging in Chad, including the first wild birth this century. Although some of these achievements may seem limited in scope, much of conservation depends on the accumulation of small-scale advances across the planet.

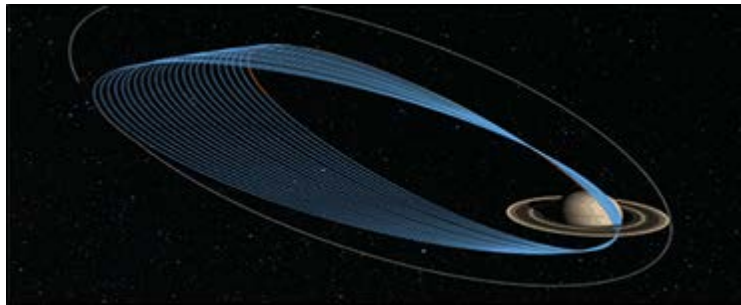
Moreover, there are larger-scale successes to celebrate too. In Brazil, the rate of Amazon deforestation is down to about one-third of its 2004 peak. Marine Protected Areas now cover over 5% of the oceans—up from around 1% a decade ago. Threats posed by climate change to species and ecosystems are being reduced by increases in solar and wind power, as exemplified by large Chinese investments in renewable energy, set to exceed \$300 billion by 2020. These wins are partial, equivocal, patchy, and reversible; for example, Amazon deforestation is increasing again. Much more change in how we interact with the planet is needed. Identifying and learning from successes enables replication and scaling-up, which buys time while harder problems are tackled.

Another key ingredient for major change is hope. After all, Martin Luther King Jr. famously said, “I have a dream,” not “I have a problem.” Studies show that presenting people with huge problems without solutions leads to disengagement. Without examples of conservation succeeding, hopelessness could itself emerge as a driver of extinction. Directing more effort toward identifying, understanding, and celebrating conservation success, drawing on insights from the natural and social sciences, is key to securing the knowledge, time, and public engagement needed to reverse the tide of loss.

<http://science.sciencemag.org/content/356/6335/225.full>

Cassini Embarks on Twilight Mission at Saturn

On its final orbits, Cassini will thread the perilous gap between Saturn's rings and its cloudbtops. This month, NASA's Cassini spacecraft, which has spent the past 13 years exploring Saturn and its moons, will start the beginning of its end, threading the gap between the gas giant and its rings in the first of 22 week-long orbits that will culminate in September with a fiery and fatal plunge into the atmosphere. The Grand Finale, as NASA is calling the forays, should help answer questions about Saturn's atmosphere and interior. But most of all, it should end a debate about the mass of the water ice rings, which is a big clue to their age—whether they are 4.5 billion years old, nearly as old as the planet, or much younger.



<http://science.sciencemag.org/content/356/6334/120>

Big Space Rock to Streak Past Earth

An asteroid stretching 650 metres (2,000 feet) across is on track to whoosh past Earth on Wednesday April 19, 2017 at a safe—but uncomfortably close—distance, according to astronomers. "Although there is no possibility for the asteroid to collide with our planet, this will be a very close approach for an asteroid this size," NASA's Jet Propulsion Laboratory said in a statement.

Dubbed 2014-JO25, the asteroid will come within 1.8 million kilometres (1.1 million miles) of Earth, less than five times the distance to the Moon. It will pass closest to our planet after having looped around the Sun. 2014-JO25 will then continue on past Jupiter before heading back toward the center of our Solar System. Smaller asteroids whizz by Earth several times a week. But the last time one at least this size came as close was in 2004, when Toutatis—five kilometres (3.1 miles) across—passed within four lunar distances. The next scheduled close encounter with a big rock will not happen before 2027, when the 800-metre (half-mile) wide asteroid 199-AN10 will fly by at just one lunar distance, about 380,000 km (236,000 miles).

The last time 2014-JO25 was in our immediate neighborhood was 400 years ago, and its next brush with Earth won't happen until sometime after 2600. The April 19 flyby is an "outstanding opportunity" for astronomers and amateur stargazers, NASA said. "Astronomers plan to observe it with telescopes around the world to learn as much about it as possible," the US space agency said. Besides its size and trajectory, scientists also know that its surface is twice as reflective as that of the Moon. It should be visible with a small optical telescope for one or two nights before moving out of range. 2014-JO25 was discovered in May 2014 by astronomers at the Catalina Sky Survey near Tucson, Arizona.

Also on Wednesday, a comet known as PanSTARRS will make its closest approach to Earth at a "very safe" distance of 175 million km (109 million miles), according to NASA. The comet has brightened recently and should be visible in the dawn sky with binoculars or a small telescope.

Asteroids are composed of rocky and metallic material, whereas comets—generally smaller—are more typically made of ice, dust and rocky stuff. Both were formed early in the history of the Solar System some 4.5 billion years ago.

<https://phys.org/news/2017-04-big-space-streak-earth-wednesday.html>

Detecting Molecular Hydrogen on Enceladus

Planetary bodies with global oceans are prime targets in the search for life beyond Earth owing to the essential role of liquid water in biochemical reactions that sustain living organisms. In addition to water, life requires energy and a source of essential chemical elements (C, H, N, O, P, and S). Although there is compelling evidence for liquid water and many of the essential elements on several ice-covered planetary bodies in our solar system and beyond, direct observation of energy sources capable of fueling life has, to this point, remained elusive. Above, Waite *et al.* report that recent flybys of the ice-covered saturnian moon Enceladus by the Cassini spacecraft reveal the presence of molecular hydrogen (H_2) in jets of vapor and particles ejected from a liquid water ocean through cracks in the ice shell. The abundance of H_2 along with previously observed carbonate species suggests a state of chemical disequilibria in the Enceladus ocean that represents a chemical energy source capable of supporting life.

Enceladus is a mid-sized (504-km diameter) satellite of Saturn that has an inferred rocky silicate core covered by an estimated 2- to 60-km layer of water ice. Evidence points to the existence of a global ocean that is likely maintained in a liquid state by heat generated during tidal deformation. The viability of life on planetary bodies such as Enceladus can be assessed through examination of biogeochemical processes on Earth. Sunlight-fueled photosynthesis is the primary source of energy at Earth's surface, but is unlikely in the outer solar system where energy from the Sun is limited, especially at depth in ice-covered oceans. In Earth's oceans, however, there are vast ecosystems where primary production is sustained in the absence of sunlight by chemical energy available from aqueous fluids venting at the seafloor. Some of the most primitive metabolic pathways utilized by microbes in these environments involve the reduction of carbon dioxide (CO_2) with H_2 to form methane (CH_4) by a process known as methanogenesis. Here lies the connection with Enceladus. By operating the Cassini onboard mass spectrometer in open-source mode during a 2015 flyby of Enceladus that intersected the vapor and particle plume, Waite *et al.* were able to minimize analytical artifacts that had compromised H_2 measurements during previous flybys. The new approach allowed them to determine that the plume gas contained 0.4 to 1.4 volume % H_2 along with 0.3 to 0.8 volume % CO_2 , critical ingredients for methanogenesis.

Reconstructing the composition of the Enceladus ocean from the abundance of material in the plume is a difficult task because of unknown chemical fractionation associated with the freezing of saline ocean water in a vacuum as it is ejected through cracks in the icy shell. By making the simplifying assumption that molal abundance ratios in the Enceladus ocean are preserved in the plume, Waite *et al.* developed a geochemical model that predicts a highly alkaline (pH = 9 to 11) sub-ice ocean containing dissolved H_2 and carbonate species in a state of chemical disequilibria. If correct, this observation has fundamental implications for the possibility of life on Enceladus; chemical disequilibrium that is known to support microbial life in Earth's deep oceans is also available to support life in the Enceladus ocean.

The detection of H_2 in Enceladus plumes represents a window into processes regulating the composition of its ocean. Although numerous processes can produce H_2 on Enceladus, Waite *et al.* present convincing arguments that point to water-rock reactions in the silicate core as the most likely source. Thus, liquid water on Enceladus is not only a requirement for life-sustaining biochemical processes, but may also be essential for geochemical processes responsible for the production of H_2 . Indeed, fluid flow and associated water-rock reactions are ubiquitous on Earth in a diverse range

Detecting Molecular Hydrogen on Enceladus (Continued)

of submarine environments that continues to expand as we study the vast unexplored regions of our oceans. Many of these environments produce H_2 during hydrothermal alteration of rocks that contain ferrous iron and/or organic matter. The lower temperature limit for H_2 generation during fluid-rock interaction on Earth is poorly constrained, but highly relevant to assessing the viability of fluid-rock reactions as a source of H_2 on Enceladus, because the availability of heat represents a key variable that may limit the temperature of H_2 generation in the silicate core. In the context of Enceladus' geochemical evolution, the importance of water-rock reactions extends far beyond H_2 generation. As is the case on Earth, where circulation of seawater through the oceanic lithosphere regulates the chemistry of seawater, hydrothermal processing of Enceladus' silicate core has been postulated as a control on the pH, salinity, and abundance of silica in the Enceladus ocean.

Waite *et al.*'s results represent an important advance in assessing the habitability of Enceladus. Many questions remain, however, regarding geological processes on Enceladus that lack Earth analogs. For example, unlike Earth, where plate tectonics delivers magmatic heat and continuously supplies unaltered ultramafic rocks to near-seafloor environments readily accessed by hydrothermal fluids, there is no a priori evidence for plate tectonics or magmatic activity on Enceladus. Sustained H_2 generation on Enceladus requires that hydrothermal fluids have access to organic and ferrous-iron-bearing rocks in the entire silicate core. What are the mechanisms for the formation of permeability and heat that allows the flow of aqueous fluids through the silicate core and back to the ocean? The accumulation of H_2 in the Enceladus ocean is conspicuous in the context of an Earth analog, where H_2 delivered to oxygenated oceans from submarine hot springs is rapidly consumed by pervasive microbial populations in seawater. Is the presence of H_2 in the Enceladus ocean an indicator for the absence of life, or is it a reflection of the very different geochemical environment and associated ecosystems on Enceladus? We still have a long way to go in our understanding of processes regulating the exchange of mass and heat across geological interfaces that define the internal structure of Enceladus and other ice-covered planetary bodies. Future missions to explore oceans beyond Earth will answer many of these questions and further constrain the possibility of life elsewhere in our solar system.

<http://science.sciencemag.org/content/356/6334/132.full>

Airborne laser-guided imaging spectroscopy to map forest trait diversity and guide conservation

Abstract

Functional biogeography may bridge a gap between field-based biodiversity information and satellite-based Earth system studies, thereby supporting conservation plans to protect more species and their contributions to ecosystem functioning. We used airborne laser-guided imaging spectroscopy with environmental modeling to derive large-scale, multivariate forest canopy functional trait maps of the Peruvian Andes-to-Amazon biodiversity hotspot. Seven mapped canopy traits revealed functional variation in a geospatial pattern explained by geology, topography, hydrology, and climate. Clustering of canopy traits yielded a map of forest beta functional diversity for land-use analysis. Up to 53% of each mapped, functionally distinct forest presents an opportunity for new conservation action. Mapping functional diversity advances our understanding of the biosphere to conserve more biodiversity in the face of land use and climate change.

<http://science.sciencemag.org/content/355/6323/385.full>

Rare sample discovered of the mineral majorite that originated at least 235 miles below Earth's surface

Recovered minerals that originated in the deep mantle can give scientists a rare glimpse into the dynamic processes occurring deep inside of Earth and into the history of the planet's mantle layer. A team led by Yingwei Fei, a Carnegie experimental petrologist, and Cheng Xu, a field geologist from Peking University, has discovered that a rare sample of the mineral majorite originated at least 235 miles below Earth's surface. Their findings are published by Science Advances.



The fragment of the metamorphic rock eclogite in which the garnet that encased the ferric-iron-rich majorite sample was found in Northern China.

Majorite is a type of garnet formed only at depths greater than 100 miles. Fascinatingly, the majorite sample Fei's team found in Northern China was encased inside a regular garnet -- like mineralogical nesting dolls. It was brought to surface as an eclogite xenolith in the North China Craton, one of the oldest cratonic blocks in the world. What's more, the majorite was rich in ferric iron, an oxidized form of iron, which is highly unusual for the mineral.

All of these uncommon factors prompted the team to investigate the majorite's origins. They used several different kinds of analytical techniques to determine the chemistry and structural characteristics of this majorite formed deep inside Earth. In order to determine the exact depth of its origin, Carnegie's postdoc Renbiao Tao conducted high-pressure experiments that mimicked the formation conditions of natural majorite. The team pinpointed its origin to a depth of nearly 250 miles (400 kilometers), at the bottom of the soft part of the upper mantle, called the asthenosphere, which drives plate tectonics.

Rare sample discovered of the mineral majorite that originated at least 235 miles below Earth's surface (Continued)

It is extremely unusual that a high-pressure majorite could survive transportation from such a depth. Adding to the strange circumstances is the fact that it was later encased by a garnet that formed at a much shallower depth of about 125 miles (200 kilometers). The nesting-doll sample's existence required two separate geological events to explain, and these events created a time capsule that the researchers could use to better understand Earth's deep history.

"This two-stage formation process offers us important clues about the mantle's evolutionary stage at the time when the majorite was first formed," Fei explained.

The sample's location and depth of origin indicate that it is a relic from the end of an era of supercontinent assembly that took place about 1.8 billion years ago. Called Columbia, the supercontinent's formation built mountain ranges that persist today.

"More research is needed to understand how the majorite became so oxidized, or rich in ferric iron, and what this information can tell us about mantle chemistry. We are going back to the site this summer to dig deeper trenches and hope to find fresh rocks that contain more clues to the deep mantle," Fei added.

<https://www.sciencedaily.com/releases/2017/04/170407143313.htm>

A Magnitude 2.4 Earthquake Occurred Near Sparta Georgia, April 5, 2017

Preliminary Earthquake Report

Magnitude	2.4
Date-Time	6 Apr 2017 01:38:00 UTC 5 Apr 2017 21:38:00 near epicenter 5 Apr 2017 19:38:00 standard time in your timezone
Location	33.263N 83.034W
Depth	6 km
Distances	6 km (4 miles) WSW (255 degrees) of Sparta, GA 24 km (15 miles) S (179 degrees) of White Plains, GA 27 km (17 miles) NE (44 degrees) of Milledgeville, GA 83 km (52 miles) SSE (157 degrees) of Athens, GA 276 km (171 miles) SW (230 degrees) of JAARS, NC
Location Uncertainty	Horizontal: 2.2 km; Vertical 4.0 km
Parameters	Nph = 9; Dmin = 72.4 km; Rmss = 0.35 seconds; Gp = 102° Version = 1
Event ID	se 60185831

For updates, maps, and technical information see:

[Event Page](#) or [USGS Earthquake Hazards Program](#)

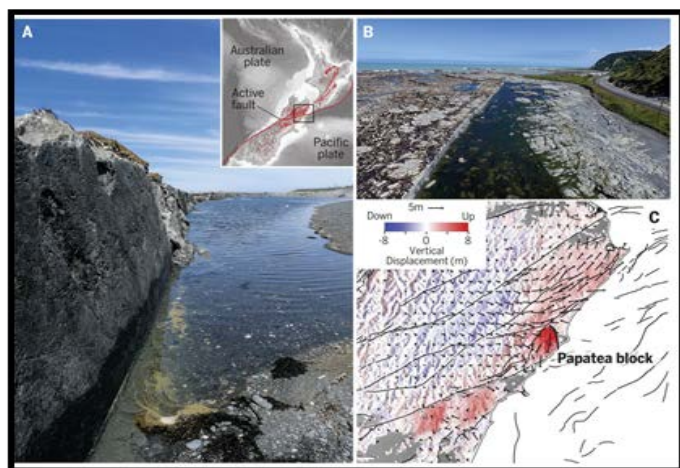
Southeast US Seismic Network
U.S. Geological Survey
University of Memphis

<http://www.memphis.edu/ceri/seismic>

Complex Multifault Rupture During the 2016 M_w 7.8 Kaikōura Earthquake, New Zealand

On 14 November 2016 (local time), northeastern South Island of New Zealand was struck by a major moment magnitude (M_w) 7.8 earthquake. The Kaikōura earthquake was the most powerful experienced in the region in more than 150 years. The whole of New Zealand reported shaking, with widespread damage across much of northern South Island and in the capital city, Wellington. The earthquake straddled two distinct seismotectonic domains, breaking multiple faults in the contractional North Canterbury fault zone and the dominantly strike-slip Marlborough fault system.

Earthquakes are conceptually thought to occur along a single fault. Although this is often the case, the need to account for multiple segment ruptures challenges seismic hazard assessments and potential maximum earthquake magnitudes. Field observations from many past earthquakes and numerical models suggest that a rupture will halt if it has to step over a distance as small as 5 km to continue on a different fault. The Kaikōura earthquake's complexity defies many conventional assumptions about the degree to which earthquake ruptures are controlled by fault segmentation and provides additional motivation to rethink these issues in seismic hazard models.



Observed ground deformation from the 2016 Kaikōura, New Zealand, earthquake.

(A and B) Photos showing the coastal uplift of 2 to 3 m associated with the Papatea block [labeled in (C)]. The inset in (A) shows an aerial view of New Zealand. Red lines denote the location of known active faults. The black box indicates the Marlborough fault system. (C) Three-dimensional displacement field derived from satellite radar data. The vectors represent the horizontal displacements, and the colored background shows the vertical displacements.

Field observations, in conjunction with interferometric synthetic aperture radar (InSAR), Global Positioning System (GPS), and seismology data, reveal the Kaikōura earthquake to be one of the most complex earthquakes ever recorded with modern instrumental techniques. The rupture propagated northward for more than 170 km along both mapped and unmapped faults before continuing offshore at the island's northeastern extent. A tsunami of up to 3 m in height was detected at Kaikōura and at three other tide gauges along the east coast of both the North and South Islands. Geodetic and geological field observations reveal surface ruptures along at least 12 major crustal faults and extensive uplift along much of the coastline. Surface displacements measured by GPS and satellite radar data show horizontal offsets of ~6 m. In addition, a fault-bounded block (the Papatea block) was uplifted by up to 8 m and translated south by 4 to 5 m. Modeling suggests that some of the faults slipped by more than 20 m, at depths of 10 to 15 km, with surface slip of ~10 m consistent with field observations of offset roads and fences. Although we can explain most of the deformation by crustal faulting alone, global moment tensors show a larger thrust component, indicating that the earthquake also involved some slip along the southern end of the Hikurangi subduction interface, which lies ~20 km beneath Kaikōura. Including this as a fault source in the inversion suggests that up to 4 m of predominantly reverse slip may have occurred on the subduction zone beneath the crustal faults, contributing ~10 to 30% of the total moment.

Complex Multifault Rupture During the 2016 M_w 7.8 Kaikōura Earthquake, New Zealand (Continued)

Although the unusual multifault rupture observed in the Kaikōura earthquake may be partly related to the geometrically complex nature of the faults in this region, this event emphasizes the importance of reevaluating how rupture scenarios are defined for seismic hazard models in plate boundary zones worldwide.

<http://science.sciencemag.org/content/356/6334/eaam7194.full>

Behind The Iron Curtain: How Methane-making Microbes Kept The Early Earth Warm

For much of its first two billion years, Earth was a very different place: oxygen was scarce, microbial life ruled, and the sun was significantly dimmer than it is today. Yet the rock record shows that vast seas covered much of the early Earth under the faint young sun.

Scientists have long debated what kept those seas from freezing. A popular theory is that potent gases such as methane -- with many times more warming power than carbon dioxide -- created a thicker greenhouse atmosphere than required to keep water liquid today.

In the absence of oxygen, iron built up in ancient oceans. Under the right chemical and biological processes, this iron rusted out of seawater and cycled many times through a complex loop, or "ferrous wheel." Some microbes could "breathe" this rust in order to outcompete others, such as those that made methane. When rust was plentiful, an "iron curtain" may have suppressed methane emissions.

"The ancestors of modern methane-making and rust-breathing microbes may have long battled for dominance in habitats largely governed by iron chemistry," said Marcus Bray, a biology Ph.D. candidate in the laboratory of Jennifer Glass, assistant professor in the Georgia Institute of Technology's School of Earth and Atmospheric Sciences and principal investigator of the study funded by NASA's Exobiology and Evolutionary Biology Program. The research was reported in the journal *Geobiology* on April 17, 2017.

Using mud pulled from the bottom of a tropical lake, researchers at Georgia Tech gained a new grasp of how ancient microbes made methane despite this "iron curtain."

Collaborator Sean Crowe, an assistant professor at the University of British Columbia, collected mud from the depths of Indonesia's Lake Matano, an anoxic iron-rich ecosystem that uniquely mimics early oceans. Bray placed the mud into tiny incubators simulating early Earth conditions, and tracked microbial diversity and methane emissions over a period of 500 days. Minimal methane was formed when rust was added; without rust, microbes kept making methane through multiple dilutions.

Extrapolating these findings to the past, the team concluded that methane production could have persisted in rust-free patches of ancient seas. Unlike the situation in today's well-aerated oceans, where most natural gas produced on the seafloor is consumed before it can reach the surface, most of this ancient methane would have escaped to the atmosphere to trap heat from the early sun.

<https://www.sciencedaily.com/releases/2017/04/170417131016.htm>

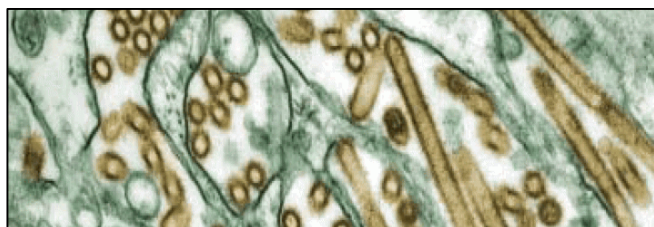
Upcomming Rock, Mineral and Fossil Shows

May 2017

12-14 MARIETTA, GEORGIA: Annual show; Georgia Mineral Society, Cobb Civic Center; 548 South Marietta Pkwy., SE; Fri. 10-6, Sat. 10-6, Sun. 12-5; Free Admission; The Georgia Mineral Society's 49th Annual Mother's Day Weekend Gem, Mineral, Jewelry, and Fossil Show. Exciting auction Saturday at 1 pm. Door Prizes! Special Door Prize for Students! Win a Great Prize for Yourself and for Your School! ; contact Kathy Wiggins, (770)-375-5907; e-mail: showads@gamineral.org; Web site: www.gamineral.org

June 2017

11-12 TELLUS SCIENCE MUSEUM, CARTERVILLE, GEORGIA: 100 Tellus Drive, Cartersville, GA 30120. Phone Number (770) 606-5700. Saturday and Sunday 10:00 to 5:00. GEM, MINERAL, FOSSIL, AND JEWELRY DEALERS from across the country will be set up in the Banquet Rooms and outside on the back lawn. You will see rare and exotic jewelry, ancient fossils, and rocks from around the world that you can purchase for your own collection. Many dealers will even honor the Tellus member discount, saving you 10% off your purchase!



Southeastern Microscopy Society Annual Meeting, May 24-26, 2017

SEMS is a scientific organization comprised of professional microscopists working in the life, medical, and physical sciences. The Society is dedicated to the advancement of scientific research and discovery through the use of microscopy and its associated methodologies.

The SEMS 2017 meeting will be held at the Holiday Inn in Athens Georgia, on May 24-26, 2017.

Register Online Now : [Participant](#)

Visit the "Meetings" tab for additional information and registration to the event. This will be another great meeting, and we hope to see you there!



I would like to announce that our Vice President Steve Stokowski was one of the two Co-Chairs at the 2017 Association of Environmental & Engineering Geologist (AEG), Spring Symposium that was held at the University of Georgia in Athens, GA. The AEG was held on Saturday, April 8, 2017. The theme of the symposium was: Engineering & Environmental Geology in the Southeast. The goal of the symposium was to gather together leaders and students in geo-science, geo-engineering, and related disciplines to discuss their experiences with innovative methods (applied or research) being used in today's projects. For more information about [AEG](#) or [EVENTS](#) just follow the links.



Highway Geology Symposium May 4, 2017

The upcoming 68th annual Highway Geology Symposium will be held in Marietta, Georgia, May 1st through May 4th, 2017, at the Hilton Atlanta/Marietta Hotel and Conference Center. The group rate is \$138.00 for a standard room (plus tax), and includes breakfast for one in the rate (additional person is \$10.54). The TRB Session on Monday is "State of Art Practices in Subsurface Investigations." Fully understanding subsurface conditions is the most critical element of a geotechnical, hydrogeologic or geoenvironmental evaluation and investigation. A wide range of investigative methods, procedures and equipment exist to explore the subsurface and to characterize soil, rock and groundwater conditions. This session will explore the implementation of state of the art methods in the transportation industry. The session will include four 30 minute invited presentations followed by a 30 to 45 minute open discussion on the state of practice in the transportation industry.

Please see the Registration Announcement and 2nd Call For Papers link to the right for additional information about the Symposium. If you are interested in being an Exhibitor or Sponsor for the Symposium, please see that link to the right. New information will be posted as it becomes available. We hope to see you in Georgia.

Register Online Now : [Participant](#) | [Sponsor & Exhibitor](#)

Calling Young Authors: The Highway Geology Symposium has existed for over 64 years and over the years has had much participation by what might be considered "Young Authors". This participation by our younger professionals has been fabulous and is a true benefit to the Symposium and the Mission of HGS. HGS is taking participation of Young Authors to another level by offering a competition with both financial, registration and award recognition. This will be an annual and perpetual award with up to three awards presented. We are very excited about this new opportunity for participation by Young Authors and we encourage you to submit your paper and to present your work at the Symposium. HGS is all about sharing our geologic technical experiences and we look forward to hearing about and learning from your experience. So please see the the link below for guidelines for participation requirements and award details.

Register Online Now : [Participant](#)

April AGS PG Workshop Announcement

Date: April 29, 2017
Time: 10:00am to 12:00pm
Venue: Fernbank Science Center Annex
Speaker: Aisyah Abdkahar, PG
Subject: Mining and Ore geology & GIS, Mapping, and Remote Sensing

Aisyah Abdkahar is a professional geologist who spent the early years of her career in the hard rock mining and exploration sector. Her work has taken her across North America, whether trudging through the bogs in Northern Canada, or in the high mountains of Alaska – all in search for the mother lode. She has worked with various classic and modern exploration techniques in several deposit types, including modern GIS and remote sensing methods. Aisyah holds a Bachelor of Science in Geology from the University of Manitoba in Canada and is currently a Geologist and GIS Manager with TEC Services, performing aggregate and concrete petrography and actively consults with the aggregates industry.

The first topic of the PG Lecture will be on Mining and Ore geology, with a focus on base on precious metals, and various exploration methods utilized in the industry. Resource and ore grade calculations will be discussed, followed by a brief introduction to the mining and exploration industry.

The second topic of the PG Lecture will be on GIS, Mapping, and Remote Sensing, where GIS concepts are introduced, including datum and projections, followed by an introduction to remote sensing and its various applications in geology.

Please join us and [forward this message](#) to anyone interested in becoming a Georgia Registered Professional Geologist, or anyone who might be interested in the topic. Two Professional Development Hours are available for attendees of the class.

The classes are open to all, membership in the AGS is not required, but for \$25 per year (\$10 for students) it is quite a bargain. Please consider joining. The AGS is the most active geologic organization in the Southeast. Two hours of professional development credit are available for attendees.

Thanks,
Ken Simonton, P.G.
kws876@gmail.com
Ginny Mauldin-Kinney, P.G.
ginny.mauldin@gmail.com
Atlanta Geological Society
Professional Registration/Career Development Committee

Fernbank Events & Activities



Earth Day Celebration

Saturday, April 22, 2017

Join us as we celebrate our planet with nature-themed activities, crafts and demonstrations.

[Learn more](#)



Breathwalk Workshops

May 6 and 7, 2017

New program! Learn more about walking meditation during special workshops led by certified instructor Joni Winston.

[Learn more](#)



Educator Appreciation Evening

Friday, May 12, 2017

Educators are invited to enjoy a free evening at Fernbank After Dark.

[Learn more](#)



Botanicals in Alcohol

Friday, May 12, 2017

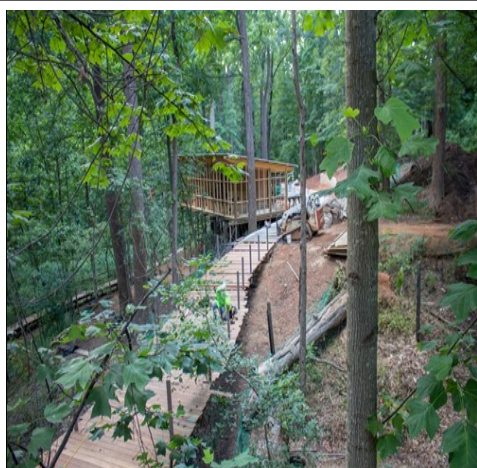
Discover botanicals and their uses in spirits through engaging demonstrations.

[Learn more](#)



FERNBANK MUSEUM

of NATURAL HISTORY



Wildwoods and Fernbank Forest

WildWoods features 10 acres of lush woodlands, highlighted by hands-on exhibits for all ages, tree pods suspended in the canopy, a nature gallery, immersive adventures, and meandering trails emphasizing dramatic slopes and stunning views. This interpretive nature experience serves as the new entrance into Fernbank Forest.

[Learn more](#)



Wild Weather

On view January 28 – May 7, 2017

Wild Weather investigates some of nature's more powerful and destructive forces as you put yourself directly in the path of a tornado, inside the eye of a hurricane and in the midst of a raging winter storm. Get drawn into the science behind tornadoes, hurricanes, heat waves, thunderstorms and winter storms through interactives, multimedia experiences, models and large-scale graphics.

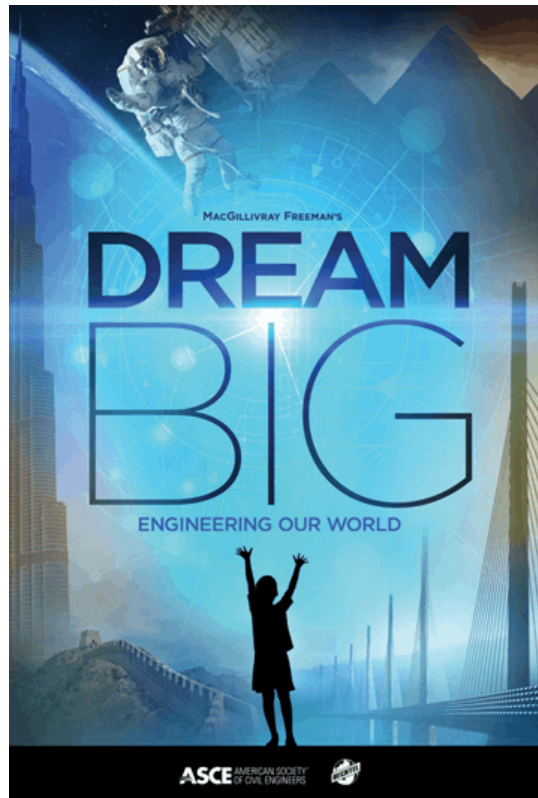
[Learn more](#)



Fernbank Museum of Natural History

(All programs require reservations, including free programs)

Now showing in the Fernbank IMAX movie theater:



[Dream Big](#)

March 4 – June 16, 2017

Take a journey of discovery from the world's tallest building to a bridge higher than the clouds. *Dream Big: Engineering Our World* is a first film of its kind giant screen theatres that will transform how you think about engineering.

AGS Officers

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johnsalvino@bellsouth.net

Past President

Shannon Star George

AGS 2017 Meeting Dates

Listed below are the planned meeting dates for 2017. Please mark your calendar and make plans to attend.

2017 Meeting Schedule

April 25

May 30

June 27 Annual Dinner

July No Meeting

August 29

PG Study Group meetings

Contact Ken Simonton for more details.

April 29

May 27

June 24

July 29

August 26

AGS Committees

AGS Publications: Open

Career Networking/Advertising: Todd Roach

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Kaden.Borseth@FernbankMuseum.org

Field Trips: Open

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ANNUAL MEMBERSHIP FORM

Please print the required details and check the appropriate membership box.

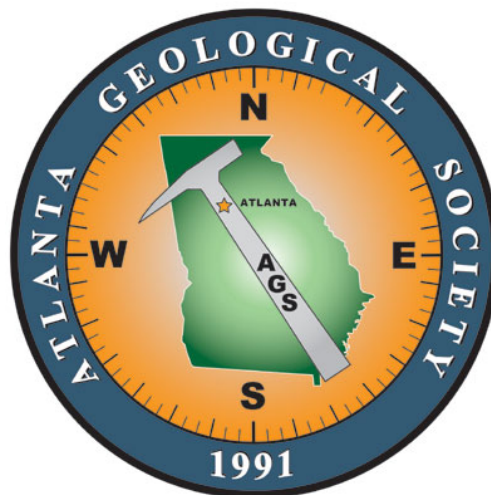
DATE: _____

NAME: _____

ORGANIZATION: _____

TELEPHONE (1): _____ TELEPHONE (2): _____

EMAIL (1): _____ EMAIL (2): _____



STUDENT \$10 ☐

PROFESSIONAL MEMBERSHIP \$25 ☐

CORPORATE MEMBERSHIP \$100 ☐

(Includes 4 professional members, please list names and emails below)

NAME: _____ EMAIL: _____

NAME: _____ EMAIL: _____

NAME: _____ EMAIL: _____

NAME: _____ EMAIL: _____

For further details, contact the AGS Treasurer:

John Salvino johnsalvino@bellsouth.net

Please make checks payable to the "Atlanta Geological Society" and bring them to the next meeting or remit with the completed form to:

**Atlanta Geological Society, Attn: John Salvino
3073 Lexington Avenue
Woodstock, Georgia 30189**

CASH ☐ CHECK (CHECK NUMBER _____)