

# Atlanta Geological Society Newsletter

Next meeting of the Atlanta Geological Society is  
May 26, 2015  
Fernbank Museum of Natural History (Clifton Road)  
Social begins at 6:30 pm – Meeting begins at 7:00 pm

May 2015

## ODDS AND ENDS

Usually, my geologic cup runneth over but this month I've been distracted by biology, specifically microbiology used to remediate groundwater contamination. Sure, knowing the transmissive from the non-transmissive zones is still important. But these bacteria destroy the contamination, which actually is the end goal. This old dog does have some new tricks to learn but as I understand it, it goes like this. The bacterial respire in the compound of concern, use a protein to break a chemical bond which is a source of energy for the bacteria. Then the degraded compound and the freed ion are expired through the cell wall and back into the groundwater. The lab techniques have advanced far enough that they do population diversity studies, identify what conditions are most beneficial and whether or not they have the right proteins to make it all work. Sure, there are a number of old hands that have been doing microbiology their whole careers but there is a new generation of young smart women that are figuring out how to actually get the clean-up accomplished.

Oh, well, I guess it's back to school for me.  
Ben Bentkowski, Newsletter Editor

## MAY MEETING

Join us **Tuesday, May 26, 2015** at the Fernbank Museum of Natural History, 760 Clifton Road NE, Atlanta GA. The meeting social starts at 6:30 pm. This month the speaker is Lucy Taylor Mejia, M.S. The topic of her presentation is **LEAD CONTAMINATION: ENVIRONMENTAL GEOCHEMISTRY OF GOLD MINING VILLAGES IN NORTHWEST NIGERIA**



The abstract for the presentation is included on Page 2 and her bio is on Page 3. Please come and enjoy the social time, and learn from an interesting presentation.

## ABSTRACT

### LEAD CONTAMINATION: ENVIRONMENTAL GEOCHEMISTRY OF GOLD MINING VILLAGES IN NORTHWEST NIGERIA

Artisanal gold mining has contaminated many villages in northwest Nigeria killing >400 children, and affected thousands more. Ore is processed within the village compounds by mortar/pestle or gas powered grinding flour mills, washed, and then mercury amalgamated to recover gold using home cooking pots. After the lead exposure was discovered processed ore and dust samples from children's sleeping areas and play areas were collected from 54 villages by the U.S. CDC and Nigerian colleagues in the summer of 2012. Our team at Georgia State University analyzed the samples using ICP-AES, XRD, Multivariate Statistical Analysis, SEM-EDS, Empirical Bayesian Kriging in GIS, and Carbonate Combustion Analysis.

Various geochemical analyses were conducted to assess the magnitude of Pb exposure. ICP-AES determined Pb concentrations as high as 61,000 ppm. SEM-EDS and XRD analyses of high concentration samples (>400 ppm) revealed the presence of gold, galena, and cerussite. XRD Cluster Analysis revealed one outlier and 3 clusters. Samples with Pb>400ppm Pb had a strong correlation between Pb and S. GIS Kriging maps illustrate geochemical spatial distribution. Carbonate combustion analysis found TIC has a negative correlation to Pb. Approximately 3% of samples contained >400ppm of Pb (U.S. EPA RSSL). Discovery of galena (PbS) and its secondary weathering product cerussite (PbCO<sub>3</sub>), a highly bioavailable Pb-bearing phase, were discovered in these high Pb samples, indicating a continuing threat to human health.

These findings offer fundamental tools for future studies in this region by providing statistical correlations of geochemistry as well as visual illustrations of high risk areas in Northwestern Nigeria. As mining continues to be an essential source of income and livelihood for these people and others around the world, the environmental and health consequences of these actions need to continually be examined and interpreted to better educate the people at risk of hazardous material exposure.

Mejia, Lucy Taylor, "Lead Contamination: Environmental Geochemistry of Gold Mining Villages in Northwest Nigeria." Thesis, Georgia State University, 2015.

[http://scholarworks.gsu.edu/geosciences\\_theses/82](http://scholarworks.gsu.edu/geosciences_theses/82)

## SPEAKER'S BIO:

**Lucy Taylor Mejia** has a B.S. in geology and just received her M.S. in geosciences at Georgia State University. Alongside course curriculum in her undergraduate studies, she conducted research in the clay synthesis lab on the effects of carbonates brines on cation exchange in clay interstratification with Associate Professor Daniel Deocampo and presented at southeastern GSA conference in San Juan, Puerto Rico. In Lucy's graduate studies, she held a research assistantship in the XRD lab at Georgia State University and presented her on-going thesis research at national GSA conferences in Denver, CO and Vancouver, B.C.

Furthermore, she held two summer internships with City of Atlanta's Department of Watershed Management in their GIS division. In addition, she was highly involved in the Geosciences Department student organizations, holding leadership roles in the Geosciences Club, SGE honor society, as well as the AIPG student chapter, received the Brunton Compass Award for top grades at GSU's summer 2012 Field Camp in Dillon, Montana, and received the Outstanding Graduate Student Award 2014-2015.

Currently, Lucy is the treasurer of Atlanta Geological Society and in pursuit of finding a job in the environmental consulting and/or GIS field with particular interests involving obtaining experience and advancing knowledge in waste management, health, energy, soil/groundwater/hydrology investigations, and remediation.



One of the first images of the **May 25, 2015** eruption of Wolf in the Galapagos Islands. Lava flows are clearly visible on the slopes of the volcano. PARQUE NACIONAL GALAPAGOS - ECUADOR / TWITTER <http://www.wired.com/2015/05/new-eruption-started-in-the-galapagos-islands/>

## Professional Geologist Study Group Meeting

Date: Saturday, May 30, 2015                      Time: 10:00 am until 12:00 pm  
Place: Fernbank Science Center  
156 Heaton Park Drive, NE  
Atlanta, Georgia 30307  
[678-874-7102](tel:678-874-7102)                      <http://fsc.fernbank.edu>

Speaker: Dr. Leland Timothy Long, Ph D, PG  
Emeritus Professor of Geophysics  
School of Earth and Atmospheric Sciences  
Georgia Institute of Technology

Subject: Geophysical Exploration

Dr. Long will cover the basic geophysical methods, with emphasis on survey design, data analysis, and capabilities of each technique. The topics will include gravity, magnetic, and seismic refraction. He will also briefly discuss hydraulic fracturing problem with induced seismicity.

Dr. Long received his BS in Geology from the University of Rochester in 1962, his MS in Geophysics from the New Mexico Institute of Mining and Technology in 1964 and his Ph.D. in Geophysics from Oregon State University in 1968. Dr. Long joined the Georgia Institute of Technology In 1968 as a professor of geophysics in the School of Earth and Atmospheric Sciences.

At Georgia Tech Dr. Long taught courses in the earth sciences and in specialized areas of geophysics. In research, Dr. Long has applied seismological techniques to environmental problems and other aspects of geophysics and seismology that might help to understand the cause of earthquakes in the southeastern United States. He has maintained seismic networks and worked extensively with the interpretation of gravity data. Recent projects are focused on the application of seismic surface waves to the characterization of near-surface structures. Dr. Long has been active in promoting the use of seismometers in K-12 earth science education, including organization of teacher's seismology and earth science workshops. He has over 70 publications in major journals and hundreds of conference presentations. With a former student, Ronald Kaufmann, Dr. Long recently published "Acquisition and Analysis of Terrestrial Gravity Data" available from Cambridge University Press. Tim is an excellent lecturer, learn why he has always been popular with his students.

**Please forward this announcement** to anyone interested in become a PG, or that might be interested in the subject. Two professional development hours are available for participants. AGS membership is not required, but we'd love to have you join! Additional information at: [www.atlantageologicalsociety.org](http://www.atlantageologicalsociety.org)

Thanks,

Ken Simonton, PG    John Salvino, PG                      Ginny Maudlin-Kinney  
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Atlanta Geological Society. Professional Registration Committee

## MAPS REVEAL CALIFORNIA'S SENSATIONAL SEAFLOOR GEOGRAPHY

AUTHOR: BETSY MASON. [BETSY MASON](#)

DATE OF PUBLICATION: 05.22.15.05.22.15

<http://www.wired.com/2015/05/new-california-seafloor-maps/>

AN UNPRECEDENTED EFFORT to map the seafloor bordering California's coastline has produced some of the most detailed, beautiful and useful maps of an underwater landscape ever made.

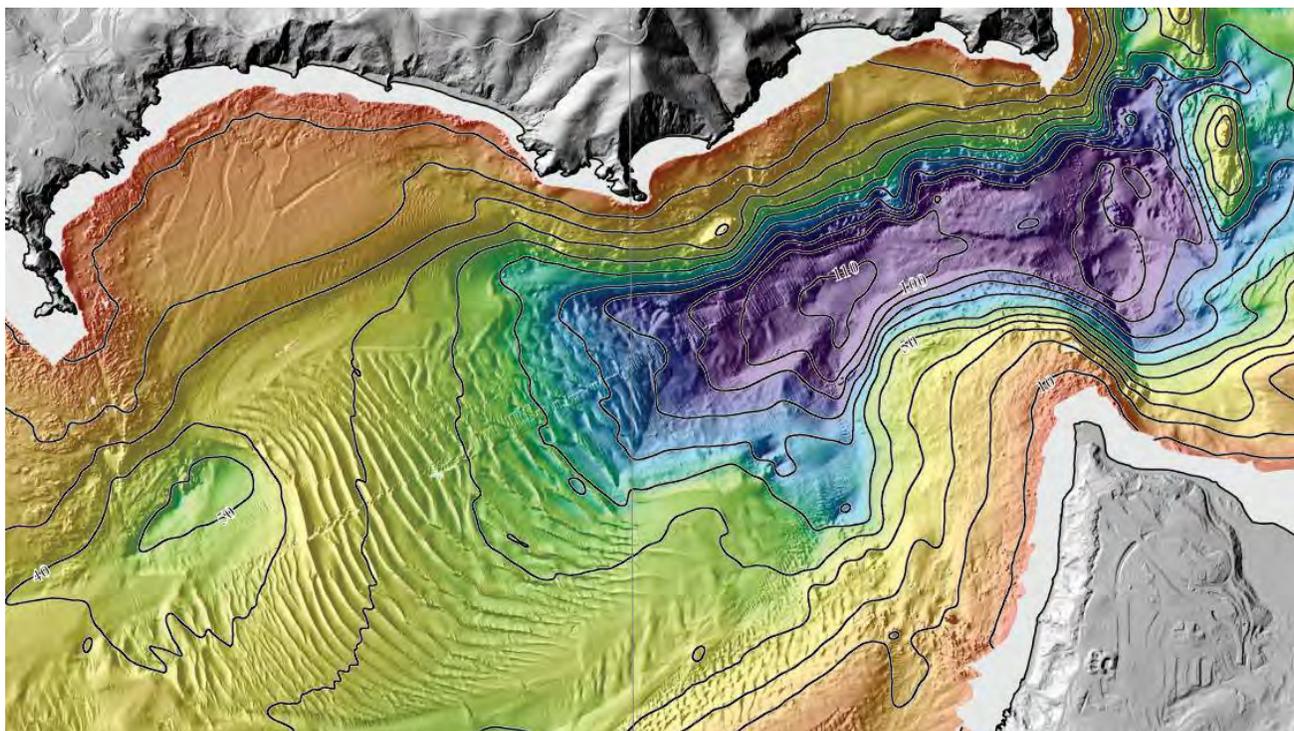
No fewer than 18 state and federal agencies and institutions led by the US Geological Survey banded together to make these maps. A staggering amount of work went into the [California Seafloor Mapping Program](#), and the results are impressive.

"Nowhere else in the world are people pursuing comprehensive seafloor mapping at this scale," said USGS geologist Sam Johnson, the agency's lead scientist on the project. "It's really unprecedented globally."

The maps could be important for studying things like navigation safety, coastal erosion and sea level rise, fisheries, and earthquake and tsunami hazards. The maps have already yielded a ton of new information for scientists, along with a few surprises. For example, in Bodega Bay, the San Andreas fault is actually located about 800 meters away from where it was thought to be.

The scale of the project, started in 2007 by the [California Ocean protection Council](#), is staggering. For 83 blocks of seafloor, each stretching 3 nautical miles from the shoreline, ten different maps are being made of the bathymetry (underwater topography, as seen in the color shaded-relief map of San Francisco Bay at the top of this post), geology, and ocean floor biological habitats. The maps are based on a wide range of data collected since 2007, including swath sonar data, acoustic backscatter, seismic-reflection profiles, [seafloor photos and video](#), and samples of the seafloor sediment. Pretty much the only thing they didn't use are [the Navy's trained dolphins](#).

All the data collection and mapping has been completed, and the USGS is in the process of releasing the maps and related reports to the public. Today the maps for the [Bay Area](#), [Tomales Point](#), and [Drakes Bay](#) were published. A total of [12 blocks have been released](#) to date, and Johnson expects the next ten to be available by October.



The topography of the ocean floor in the Golden Gate area of the San Francisco Bay.  
([full map in high-res](#)) USGS (I like the sand waves. Ed.)

## Sensational Geography

Johnson's group at the USGS studies earthquake and tsunami hazards and is working on producing maps that show in detail where the offshore faults are. For the first time, they can see precisely how long offshore faults are and whether they are connected to each other.

This kind of information is critical because the magnitude of an earthquake is determined by the length of a fault that ruptures. Longer faults are capable of bigger quakes. If two smaller faults that were thought to be separate are actually connected, they could potentially rupture together to cause a bigger earthquake than previously thought. Discoveries of that sort could even change the [USGS's seismic hazard forecast for California](#).

One place the data is already leading to new discoveries is near the Diablo Canyon nuclear power plant in central California. Johnson's team has identified previously unknown faults and new connections between faults, findings that will influence the current understanding of the seismic risk in the vicinity of the [controversial power plant](#).

## MAPS REVEAL CALIFORNIA'S SENSATIONAL SEAFLOOR GEOGRAPHY

(cont.)

Johnson's team is also looking for evidence of underwater landslides, which can be triggered by earthquakes. Evidence of past slides and sites with similar characteristics could help identify where landslides big enough to generate local tsunamis are likely to occur. The scientists have also found evidence for ground failure significant enough to wreak havoc on offshore infrastructure on surprisingly gentle slopes, even ones as shallow as 1 degree.

### Changes to come

The maps show an unwelcome dearth of sediment along the San Francisco peninsula. This is because such a narrow strip of land doesn't provide large drainage areas to deliver sediment to the seafloor. And while this isn't unexpected, it is troubling.

Naked seafloor is a lot more vulnerable to being eroded by ocean currents than seafloor that is covered in a deep blanket of sediment. And this problem is only going to get worse, because as sea level rises, more and more of the California coastline will be threatened by erosion.

There are three ways massive coastal erosion is being handled in other areas, Johnson says. You can just let the coastline retreat and relocate infrastructure further inland, which is expensive and not practical or even possible in some coastal areas. You can build jetties and groins, but this causes a whole new set of problems and introduces huge, unnatural structures into the marine environment. Or you can bring in sediment from adjacent areas that have more of it, and stall the erosion.

Mapping sediment thickness, as shown on the map below, is important for this strategy. And the lack of sediment along the San Francisco peninsula means this method may not be an option. "It was an unknown," Johnson said. "Nobody had mapped the distribution of sediment thickness before like we have on these maps."

One of the most important things these new maps do is create a detailed snapshot of California's coastline as it exists today, Johnson says. This gives scientists a baseline they can use to monitor how things change. The high-resolution data could be particularly useful in evaluating the effects of accidents like the spill that hit the Santa Barbara coastline at [Refugio State Beach](#)

<http://www.wired.com/2015/05/new-california-seafloor-maps/>

## The Geology of the *Beagle* voyage

<http://www.darwinproject.ac.uk/the-geology-of-the-beagle-voyage>

Darwin's hand-tinted geological map of southern South America, made during the *Beagle* voyage. The primary concern that linked much of Darwin's geological work in the *Beagle* years was to understand the challenging



Darwin's hand-tinted geological map of southern South America, made during the *Beagle* voyage.

relation between the levels of land and sea. In this he followed the example of the Scottish geologist Charles Lyell, whose three-volume *Principles of Geology* Darwin read during the voyage. Lyell argued that the history of movements in the earth's crust should be (and could be) explained as the result of earthquakes, volcanoes, erosion, and other processes operating at the same intensity in the past as they did in the present. The earth had existed for long enough, Lyell claimed, that an accumulation of small changes could have enormous effects, even the raising of new continents from the ocean. As Darwin studied the shores of South America and discovered shells inland at thousands of feet above sea level, he became convinced that the continent had been uplifted level, in just such a gradual manner. His conviction was strengthened in February 1835, when he was witness to an earthquake that raised the harbour at Concepcion, Chile, several feet out of the Pacific Ocean.

Some of Darwin's most innovative work during the voyage related to the formation of coral reefs. For the previous two generations, geologists and navigators had sought to explain the origin of the curious ring-shaped reefs that we now call atolls. At the time of the *Beagle's* departure from England, Lyell and many others believed that these reefs had been formed by the growth of corals around the rim of underwater volcano craters. Darwin argued that atolls were formed when islands in the tropical ocean gradually sank, in the reverse of the process that raised South America. Reefs around the shore of such a sinking island could grow upward to keep their surfaces near sea level as long as the island did not recede faster than corals could grow. Eventually the original island would be submerged entirely out of view, while the location of its former shoreline would be marked by a ring of living coral. Darwin's inventive theory of atoll formation proved to be one of the most immediately successful products of the voyage; Lyell himself expressed great admiration for the new explanation and quickly abandoned his previous view.



# FERNBANK MUSEUM

of NATURAL HISTORY



On view June 6 - August 23, 2015

“An interactive sensory feast that both surprises and stimulates” – *Live Science*

Discover the workings of the most complex and fascinating biological structure: the human brain. Explore how the brain controls our senses and emotions, powers our thinking, how the organ ages, and how technological advances may change our brains in the future.

Highlights of the exhibition include interactive stations such as brain-teaser games, an engaging neuron gesture table that shows how brain cells connect and communicate with each other, and a glowing 8-foot tall model of the subcortical brain that illustrates how we process language and decision-making.

Filled with hands-on activities, *Brain: The Inside Story* is a high-energy exploration of topics diverse as the neurochemistry of love, how memory is formed, neuroplasticity and the health of the brain, and the intriguing soon-to-be-reality of the futuristic brain.

Immersive, dynamic, and fun, you're sure to leave this exhibition seeing and thinking of yourself in a whole new light.

Admission to *Brain: The Inside Story* is included with Museum admission and is [FREE for members](#).

*Brain: The Inside Story* is organized by the American Museum of Natural History, New York, in collaboration with Codice. Idee per la cultura, Torino, Italy in association with Comune di Milano – Assessorato Cultura, Italy; Guandong Science Center, Guangzhou, China; and Parque de las Ciencias, Granada, Spain.

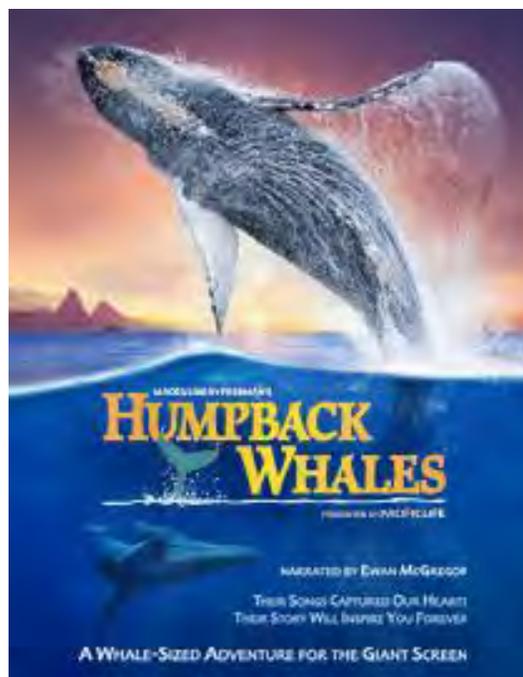
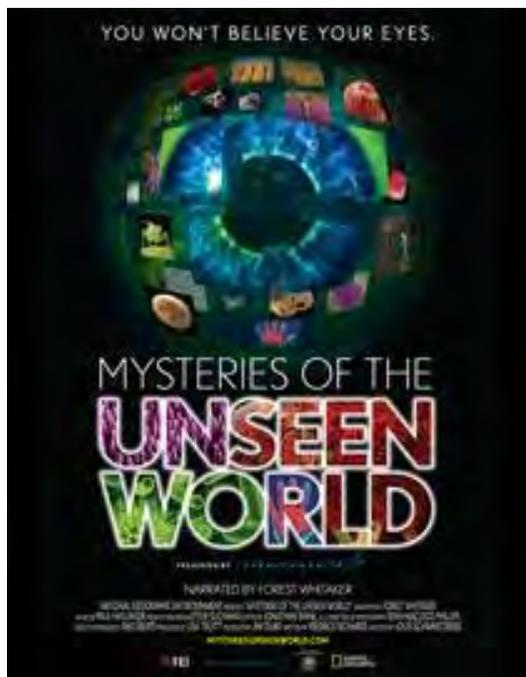
Principal Investor: The Marcus Foundation, Inc. Additional funding provided by Children's Healthcare of Atlanta and the General Motors Foundation in support of STEM learning.



## Fernbank Museum of Natural History

(All programs require reservations, including free programs)

### Now Showing in the Fernbank IMAX movie theater:



### *Humpback Whales*

Take an extraordinary journey into the mysterious world of one of nature's most awe-inspiring marine mammals. Set in the spectacular waters of Alaska, Hawaii and the remote islands of Tonga, this ocean adventure offers audiences an up-close look at how humpback whales communicate, sing, feed, play and take care of their young.

[Learn more](#) Now showing through June 18, 2015

### *Mysteries of the Unseen World*

Go to places on the planet you've never been before and see things that are beyond your normal vision yet are literally right in front of your eyes. *Mysteries of the Unseen World* reveals phenomena that can't be seen with the naked eye, taking audiences into earthly worlds secreted away in different dimensions of time and scale.

Now showing through July 16, 2015\* Run time: 40 min [Learn more](#)

## AGS Officers

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**Treasurer:** Lucy Mejia  
[Lucytaylor360@gmail.com](mailto:Lucytaylor360@gmail.com)

### AGS 2015 Meeting Dates

Listed below are the planned meeting dates for 2015. Please mark your calendar and make plans to attend.

May AGS meeting, May 26, 2015  
 May PG Study Group May 30, 2015  
 Lecturer: Dr. Tim Long, Ph. D., P. G.  
 Subject: Geophysics, seismicity

June PG Study Group June 27, 2015  
 Lecturer: Dr. Jim Meyer, Ph. D.  
 June AGS meeting June 30, 2015  
 AGS Annual Social; Dinner and a Movie

No meeting in July

## AGS Committees

**AGS Publications:** Open

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[tdr@piedmontdrilling.com](mailto:tdr@piedmontdrilling.com)

**Continuing Education:** Currently Open

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 Phone (404) 929-6342  
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**Field Trips:** Open

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Ginny Mauldin-Kenney,  
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**Teacher Grants:** Bill Waggener  
 Phone (404)354-8752  
[waggener80@yahoo.com](mailto:waggener80@yahoo.com)

**Hospitality:** Currently open  
 And in need of a volunteer or two.

**Membership** Burton Dixon  
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[www.atlantageologicalsociety.org](http://www.atlantageologicalsociety.org)

# ATLANTA GEOLOGICAL SOCIETY

[www.atlantageologicalsociety.org](http://www.atlantageologicalsociety.org)

## ANNUAL MEMBERSHIP FORM

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

DATE: \_\_\_\_\_

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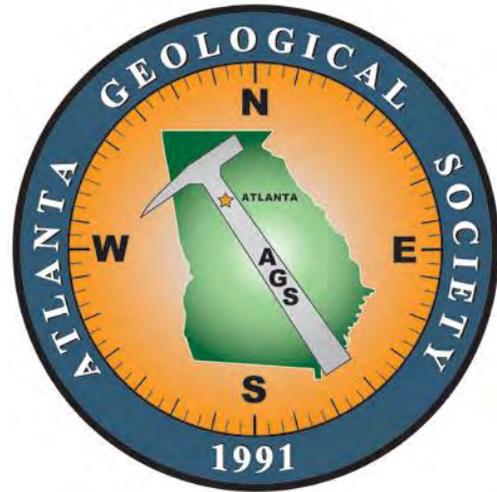
ORGANIZATION: \_\_\_\_\_

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: Lucy Mejia: telephone: 404-438-9584;  
Lucytaylor360@gmail.com

Please make checks payable to the "Atlanta Geological Society" and remit with the completed form to:  
Atlanta Geological Society, Attn: Lucy Mejia  
2143 Melante Drive, Atlanta, GA 30324

CASH

CHECK (CHECK NUMBER: \_\_\_\_\_.)