

May 2019 News Notes

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Alumni Change Lives

Melisa Diaz is a PhD student under Dr. Berry Lyons studying environmental geochemistry. She is also a recipient of the prestigious National Science Foundation Graduate Research Fellowship (NSFGRF). Here, Melisa shares how Friends of Orton Hall and other funds helped her share her research with the scientific community and further her studies.

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“This year, I received support from Friends of Orton Hall (FOH) to attend the annual Geological Society of America (GSA) conference in Indianapolis, Indiana. At the conference I shared preliminary results of [my dissertation work](#) in a talk titled, “Distribution of water-soluble salts along the Shackleton Glacier, Antarctica and implications for soil habitability.” For this interdisciplinary and collaborative work, we have measured water-soluble salt concentrations from 3 transects at 11 locations along the Shackleton Glacier (83.5°S) in the Transantarctic Mountains. This landscape represents a wide range of soil environments, particularly with respect to the age of soil surfaces (i.e. advance and retreat of the East Antarctic Ice Sheet) and surface material accumulations. We hope to ultimately understand how ecosystems [structure and assemble](#) following large scale changes in climate.”

“Aside from the chance to discuss this work with the scientific community, [GSA 2018](#) was a gateway to meet other polar scientists. Several Antarctic scientists, particularly those who had conducted research at the Shackleton Glacier camp during the winter 2017-2018 field season, met for a lunch at the beginning of the meeting. We were able to reconnect off the ice and share updates from the diverse projects hosted at the camp. This opportunity to network with both PIs and students on a personal level strengthens the Antarctic community and offers more opportunities to collaborate in the future.”

Professor Babcock and the Case of the Ancient Sea Creature

A discovery nearly 30 years in the making has recently shone light on an ancient aquatic species from hundreds of millions of years ago. A paper by SES's own Professor Babcock was recently highlighted by the College of Arts and Sciences Daily Post:

“ [Professor Babcock] discovered a new species that lived more than 500 million years ago—a form of ancient echinoderm that was ancestral to modern-day groups such as sea cucumbers, sea urchins, sea stars, brittle stars and crinoids. The fossil shows a crucial evolutionary step by echinoderms that parallels the most important ecological change to have taken place in marine sediments.



The discovery was published recently in the [Bulletin of Geosciences](#) and provides a clue as to how creatures were able to make the evolutionary leap from living stuck to marine sediment grains—which were held together by gooey algae-like colonies, the original way that echinoderms lived—to living attached to hard, shelly surfaces, which is the way their modern-day descendants live now on the bottom of the ocean.

“In all of Earth’s history, the Cambrian is probably the most important in the evolution of both animals and marine ecosystems, because this was a time when a more modern style of ecosystem was first starting to take hold,” Babcock said. “This genus of the species we discovered shows the evolutionary transition from being a ‘mat-sticker’ to the more advanced condition of attaching to a shelly substrate, which became a successful model for later species including some that live today.”



Totiglobus spencensis lived in the Cambrian Period—about 507 million years ago. (The Earth, for the record, is about 4.5 billion years old.) A family of fossil hunters discovered the fossil in shale of Spence Gulch, in the eastern part of Idaho, in 1992.

Iron and Nutrients in Coastal Antarctic Streams

In the Southern Ocean, primary productivity—the rate at which living organisms such as phytoplankton produce organic compounds—is limited by low concentrations of iron. Although earlier studies in the Ross Sea have shown the most important sources of this nutrient include icebergs, windblown dust, and melting sea ice, seasonal streamflow from ice-free areas is another potential contributor. To date, however, the amount of iron these streams supply to coastal Antarctic waters has been poorly constrained.

Now [Olund et al.](#) have measured iron concentrations in four streams that flow from the McMurdo Dry Valleys, the southern continent's largest ice-free area, into the Ross Sea to determine their potential impact on coastal water biogeochemistry. These streams, which flow only from 4 to 10 weeks per year, were sampled along their lengths from late December 2015 through late January 2016.



Berry Lyons (left) and Sydney Olund collect water samples from Adams Stream in Miers Valley of the McMurdo Dry Valleys, Antarctica. Researchers are trying to learn how much potentially bioavailable iron, an important nutrient for phytoplankton, gets transported from these streams to the coastal waters of the Ross Sea. Credit: Elsa Saelens

The results indicate that two of the streams, Commonwealth and Wales, contribute an average of 240 moles of filterable iron to the Ross Sea each year, an amount that is several orders of magnitude less than the contributions from other sources. The team also discovered that the ratio of iron to other vital nutrients, including nitrogen, phosphorous, and silicon, differs substantially from the ratios found in coastal phytoplankton communities. This finding indicates that seasonal streams are important sources of both phosphorous and iron for the Ross Sea's plankton communities.

By increasing our understanding of iron fluxes into the seas surrounding Antarctica, this study highlights the importance of local nutrient inputs to the Southern Ocean. In addition, because primary production can boost the uptake of carbon dioxide and the consequent sequestration of carbon in marine sediment, this study has implications for understanding future changes in productivity and the cycling of carbon in the region as increased melting augments the flux of iron to the sea via these coastal streams.

2019 Spring & Summer Baccalaureate Degrees

On May 5th, 2019 twenty students received their baccalaureate degrees in Earth Sciences at Ohio State's Spring 2019 commencement ceremony. Two more Earth Science majors will receive their degrees at the Summer 2019 commencement ceremony in August.

Congratulations to all the Spring and Summer 2019 graduates in Earth Sciences!

Student	Subspecialty	Advisor	Thesis Title	Distinction
Rebecca Anderson	Geological Sciences	Anne Carey	Petrographic Analysis and Chemical Weathering Sources in the Choshui River Watershed on the High-Standing Island of Taiwan	Research Distinction
Jonathan Bell	Geological Sciences	Audrey Sawyer	Spatial analysis of fluoride in groundwater in the Singida region (Tanzania) and laboratory experiments to identify potential sources	Research Distinction
Seth Bryson	Geological Sciences	Mike Barton	Determination of Oxygen Fugacity using Olivine-Melt Equilibrium: Implications for the Redox States of Volcanic Arc Basalt Mantle Source Regions	Research Distinction
Kira Eaton	Geological Sciences	Loren Babcock	Lethal and sub-lethal Predation on Cambrian Trilobites from North America	Research Distinction
Peter Gordineer	Petroleum Geology & Geophysics	Berry Lyons	Investigation of Fracture Trace Analyses and Remote Sensing Applications in the Singida Region, Tanzania	
Beau Humphrey	Geological Sciences	Mike Barton	Pressure in the Southern Part of the East Pacific Rise	Research Distinction
Kain Lager-Lowe	Geological Sciences	Derek Sawyer	Three-Dimensional Seismic Interpretation of Near-Sea-floor Salt Bodies and Fluid Expulsion Features Adjacent to the Mississippi Canyon, Gulf of Mexico	

Baccalaureate Degrees Cont.

Sasha Larocque	Petroleum Geology & Geophysics	Tom Darrah	Geochemistry of Naturally Occurring Methane from Two Canadian Case Studies	Research Distinction
Michael Madson	Geophysics	Audrey Sawyer	Analysis Of Hydrogeologic Data From an Observation Well at Mirror Lake, Columbus, Ohio	
Mitchell McCarthy	Petroleum Geology & Geophysics	Mike Barton	Crystallization pressures along the East Pacific Rise between 9.5° and 14°N	Research Distinction
Jacob Meyer	Geological Sciences	Loren Babcock	Origin of Septarian Concretions in the Huron Member of the Ohio Shale (Devonian), Delaware County, Ohio	
Zachary Miculka (Summer 2017)	Geological Sciences	Frank Schwartz	Qanats Ameliorate Impacts Due to the Desertification of the Libyan Sahara	Research Distinction
Karina Peggau	Earth System Science	Liz Griffith	Carbonate Clumped Isotopes of the Honey Creek Travertines in the Arbuckle Mountains, Oklahoma	
Nicholas Reineck	Petroleum Geology & Geophysics	Loren Babcock	Experimental Study of Sediment Type and Organic Content on Fossil Trackway Preservation	Research Distinction
Stuart Skopec (Summer 2017)	Geophysics	Mike Barton	Modelling of Fractional Crystallization of Basalts Within Kilauea, Hawaii	Research Distinction
Alexandra Smith	Earth System Science	Andrea Grottoli	Natural Variability in the Contribution of Heterotrophic Carbon and Nitrogen to Tissues of Hawaiian Corals	Honors Research Distinction
Elliot Thompson	Petroleum Geology & Geophysics	Mike Barton	Descriptions of Pillow Basalts from Iceland	

Baccalaureate Degrees Cont.

Prescott Vayda	Geological Sciences	Loren Babcock	Exceptionally Preserved Fossils from the Silica Shale Lagerstätte (Middle Devonian) of Ohio, Michigan, and Indiana: XCT Reveals Detailed Anatomical Information	Research Distinction
Adrien Van Wagenen	Geological Sciences	Tom Darrah	Geochemistry of the Equatorial Mid-Atlantic Ridge	
Alexandra Wallace	BA			
James White	Earth System Science	Bryan Mark (Geography)	Preserved Charcoal as a Proxy for Wildfire Activity in Great Basin National Park	Honors Research Distinction
Gus Wulsin	Petroleum Geology & Geophysics	Tom Darrah	A Comparison of Groundwater Sampling Methods for Dissolved Gases	Research Distinction

Since Ohio State's switch to the semester calendar in 2012, more than 40% of the Earth Science undergraduate majors have defended their senior thesis and graduated with Research Distinction or Honors Research Distinction.

Graduation with distinction requires four total hours of 4999 or 4999H research and the successful completion of an oral examination on the thesis in front of a faculty committee. A high rate of graduation with distinction continues with more than 60% of the students graduating this semester with Research Distinction. Two of the spring and summer Earth Sciences graduates are receiving their B.S. degrees with Honors Research Distinction and 12 with Research Distinction.

Congratulations to all the Spring and Summer 2019 graduates in Earth Sciences!



Graduating senior Becky Anderson pictured with her Earth Sciences themed mortarboard.

In Memoriam

Professor Rodney T. Tettenhorst

February 1st, 1934 - April 28th, 2019

Professor Emeritus Rodney T. Tettenhorst died on April 28th, 2019 while hospitalized following cardiac arrest. Dr. Tettenhorst received his B.S. in 1955 and M.A. in 1957 from Washington University in St. Louis. In 1960, he received his Ph.D. from the University of Illinois, and in the same year he joined the Department of Mineralogy (subsequently Geology and Mineralogy, Geological Sciences, and currently the School of Earth Sciences) at The Ohio State University. His research was on the structure and crystal chemistry of clay minerals, which led to publications in international journals and invited presentations.

He was a consultant with Battelle Memorial Institute, Roxane Laboratories, and other organizations. He was active in the Clay Minerals Society, in which he held several official positions. In 2002 he retired and joined the Emeritus Faculty. While a member of the regular faculty, Dr. Tettenhorst maintained a clay mineralogy laboratory and X-ray diffractometer, which were interwoven into both his teaching and research. Many students in geology and materials science were well-served by his hands-on, interactive courses in introductory mineralogy, clay mineralogy, and advanced crystallography. In addition, from the mid-1970s through mid-1980s, Dr. Tettenhorst was an Ephraim field camp faculty mainstay. Later in his career he designed a laboratory-based course in Gemology, but in his fashion of never approaching a problem halfway, he insisted upon becoming a certified gemologist with the Gemological Institute of America.

He was an old-school teacher who was known to declare “I would give my Mother a ‘B’ if she deserved one”. He was a life-long lover of birds (see his children’s names below), and a champion softball pitcher. He is survived and dearly missed by his children Robin, Jay and Guy, his seven grandchildren, and many friends. Donations in Dr. Tettenhorst’s memory to the [Orton Geological Museum](#) are welcomed by his family, as would be any “Dr. T” stories (please send to jtettenhorst@cfl.rr.com).

Graduate Student Awarded GSA Grant

Teresa Avila is a graduate student here in the School of Earth Sciences, advised by Dr. Matthew Saltzman. Recently, Avila was the recipient of a GSA Graduate Student Research Grant. The primary role of the [GSA research grant](#) program is to provide partial support of master's and doctoral thesis research in the geological sciences for graduate students enrolled in universities in the United States, Canada, Mexico and Central America.

In 2018, \$778,594 was awarded to 381 graduate students (52% of the 730 who applied), with an average grant of \$2,044. Avila's project uses strontium isotope geochemistry of conodont microfossils in order to investigate the link between silicate weathering in the Devonian period and global cooling. The samples will be collected in Erlangen, Germany, and the lab work will be done here in the TIMS lab at Ohio State.



Graduate Student Awarded Michael S. Johnson Grant



Chris Conwell is an Earth Sciences graduate student advised by Dr. Matthew Saltzman. Recently Conwell was awarded the Michael S. Johnson Grant through the AAPG Grants-in-Aid program. The award is given to a graduate student undertaking geoscience research in the states of CO, ND, SD, MT, WY, NE, and UT. The scholarship is founded by [Michael S. Johnson](#), a well-known and long-time geologist in the Denver area, who is active professionally both in the Rocky Mountains and internationally.

Conwell's research correlates Ordovician strata in the subsurface (core) of Ohio to an outcrop in Northern Virginia using isotope stratigraphy. This research, which represents a collaborative effort with fellow grad student Datu Adiatma, provides an important test of the sequence stratigraphic framework of the Sauk-Tippecanoe transition which is a target for oil production in the Appalachian Basin.

Progress on Mirror Lake Educational Well Field

The Mirror Lake Water Science Learning Lab would like to extend its sincere thanks to our generous alumni! We are very grateful to you for reaching out to express interest and support in helping us acquire geoprobe services to further our research. We have received an estimate for geoprobe services totaling just under \$9,000, and Mike and Cindy Morgan have generously offered to match donations up to \$5,000 to meet our goal. To give to the Mirror Lake Lab Fund, please contact Professor Audrey Sawyer at sawyer.143@osu.edu for more details, or donate online using the following [link](#). Our hope is to collect soil samples and install the new well field this summer so classes can begin to use the well field in labs this fall! Activities will include mapping the water table and surveying wells.



Students described borehole cuttings and observed drilling at the Mirror Lake Water Science Learning Lab during installation of our deep groundwater well in 2018.

Brevia

Recently Professor David Cole helped organize and participated in a National Academy of Sciences workshop held at the Petroleum Museum of the Permian Basin in Midland Texas on “Environmental Legacies and Water Considerations”. The event was sponsored by the NRC Roundtable on Unconventional Hydrocarbon Development. Great work Dr. Cole!