THE OHIO STATE UNIVERSITY

SCHOOL OF
EARTHSCIENCES

August 2016 News Notes

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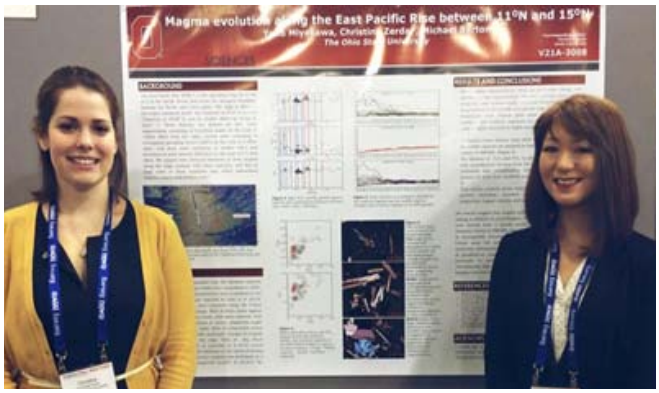
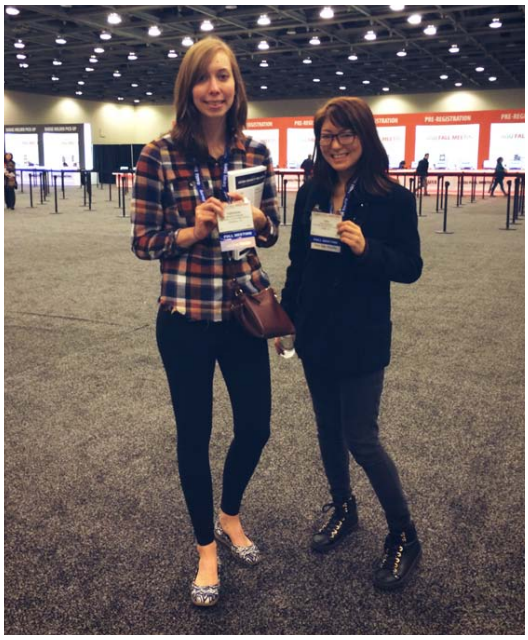
Alumni Change Lives

Yoko Miyakwa (BS 2016) did undergraduate research with Prof Barton. Here she describes how Friends of Orton Hall helped to further his studies. If you are interested in giving to support the Friends of Orton Hall or other funds, please visit our giving page (link).



With the help of FOH, I attended the AGU Fall Meeting in San Francisco to co-present a research poster entitled "Magma evolution along the East Pacific Rise between 11°N and 15°N." In our research, we hypothesized the geochemical changes of lavas would correlate with the varying degrees of segmentations along the crust. However, when examining the major oxide concentrations and the normalized trace element plots, it was found that magma evolution is more complex. The results suggest that mixing and crystallization occurred, but, there is also the possibility of a different magma source that influenced the magma evolution in this area. The poster session provided constructive feedback from numerous meeting participants who provided possible indications where this research project could be expanded. We received constructive criticism that compared our work with existing research. Dr. Emily M. Klein, a geochemist from Duke University's Nicholas School of the Environment, who also reviewed the poster, agreed with our conclusions, and offered suggestions for future work. The future work suggested could involve quantitative chemical variation diagrams, examination of additional thin sections, and correlation of geochemical characteristics with calculated pressures of partial crystallization to determine whether unrealistically high pressures are an artifact of processes such as magma-crust interaction.



It was an unforgettable experience to present a research poster at AGU. I attended as many talks as time would allow that were interesting as well as complex beyond my understanding. I saw firsthand the new projects well-known companies are developing and met with others to learn about their areas of research. Thank you for the chance to engage with others in my field on a national level. I look forward to possible future collaborations to continue this research.

Audrey Sawyer on Hidden Water Pollution in US Coastal Areas

Congratulations to Earth Sciences assistant professor Audrey Sawyer whose first-authored paper in *Science* was published on August 4! Her study, written with co-authors Cédric David and Jay Famiglietti at NASA's Jet Propulsion Lab, shows regions of the United States coastline where submarine groundwater discharge occurs making the coastal ocean likely to suffer effects from dissolved constituents in the groundwater. These regions are shown in the map, below.

Prof Sawyer and colleagues have created the first-ever map of key regions of "submarine groundwater discharge," where freshwater and seawater mix unseen below ground. The previously hidden sites mark areas of vulnerability for ocean contamination and drinking water contamination.

Those interested in learning more about this topic are encouraged to read the OSU news story on the subject as well as the complete article in Science and a Science podcast featuring Audrey.

GEOS Chapter Update

Welcome back, SES students! The Geoscience in Energy at Ohio State (GEOS) student chapter will hold its first meeting on Tuesday, September 6, at 5:00 p.m. GEOS is a combination of the American Association of Petroleum Geologists (AAPG) and the Society of Exploration Geophysicists (SEG) student chapters, and is designed for students with an interest in the petroleum industry. On the agenda for this meeting will be introductions, potential club events, and future monthly meeting times. Both new and returning students are welcome to attend; pizza will be provided!

For questions on the chapter, please contact us at aapg@osu.edu.

Faculty Profile: Andréa Grottoli

I was interested in science and everything to do with aquatic environments from a young age. I spent my summers in northern Canada on the shores of Lake Huron and was an avid camper, hiker, and canoer. As an undergrad at McGill University, I majored in Biology and got involved in research with a limnology group in my junior and senior years. For my senior thesis I studied the effects of flow and nutrients on zooplankton in the Ottawa River and the St. Lawrence Seaway. This early introduction to academia and field-based research in aquatic environments was pivotal in setting my career path in motion. I pursued a PhD at the University of Houston in Biology studying the effects of coral biology on the underlying coral skeletal isotope composition. I was able to determine that coral skeletal carbon isotopes could be used to reconstruct past changes in cloud cover in some tropical sites. Given that corals can grow for several hundred years, this new proxy record can now be used to reconstruct centuries of cloud cover in the tropics where instrumental records do not exist. This melding of biology with stable isotopes opened up a whole avenue of research at the intersection of geology and biology. As a post-doctoral researcher in the Department of Earth System Science at the University of California – Irvine, I further developed my paleoceanographic skills by investigating the changes in ocean circulation in the central Pacific based on the radiocarbon record of a long-lived coral from Fanning Island. As an Assistant Professor at the University of Pennsylvania and then at the Ohio State University, I began to merge my biology and isotope geochemistry skills in unique ways so as to shed light on how the tropical oceans have changed over the past 100 years, and to investigate the effects of climate change on coral biology. My paleoceanographic research has taken me to Puerto Rico, Panama, and Palau where my team has been able to reconstruct the history of upwelling, river discharge, and the El Niño Southern Oscillation based on the isotopic and elemental records archived in coral skeletal records. My biological research has taken me to Hawaii and Mexico, where my work has focused on determining why some corals are more resilient and/or better able to recover from heat-induced stress events called "bleaching events". Prolonged bleaching can lead to decreased coral health, decreased growth, and death. Such events are becoming more frequent and severe as global temperatures increase. However, some corals always survive. Using a suite of biological and geochemical tools, my team has identified three characteristics of resilient corals: they have high energy reserves like fats, they are able to eat more zooplankton, and they are able to shuffle the types of endosymbiotic algae that they host. The most

Coral bleaching in Hawaii, 2014 (photo credit Chris Wall)

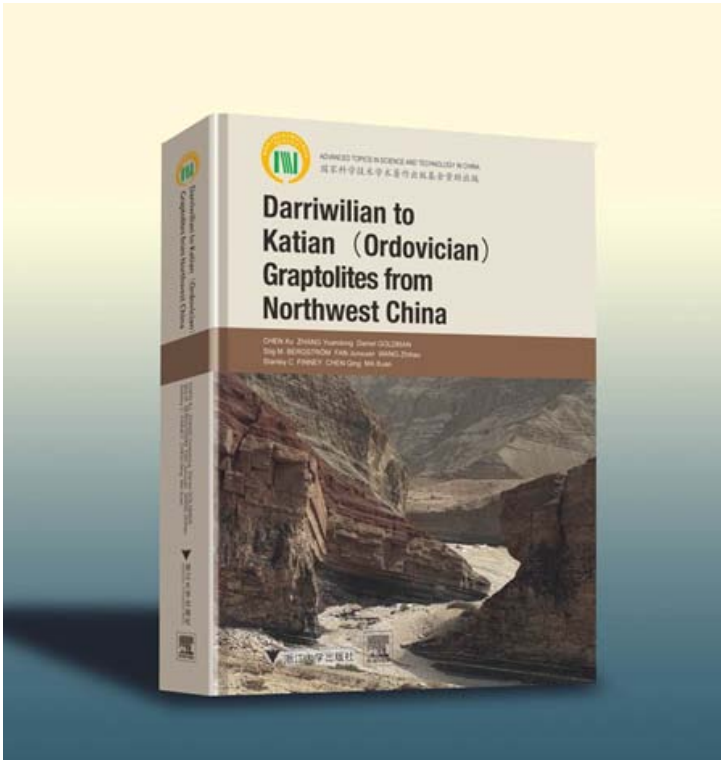
Grottoli team in Hawaii doing coral research. Clockwise from bottom left: Dr. Andréa Grottoli, Kerri Dobson (PhD student), Jamie Price (PhD student), Margaret Otto (Junior undergraduate student), Katiri Snyder (Senior undergraduate student), Rowan McLachlan (PhD student). Additional undergraduate student research group members not pictured: Alec Moore (Senior), Emily Sambuco (Senior), Sarah Solomon (Junior), Chloe Criswell (Junior), John Armstrong (Junior), Katherine Giesy (Junior).

resilient corals have at least two of these traits. Our current research in Hawaii is focused on determining if corals can adapt to rapid shifts in baseline temperature and acidity, and if so, how fast. Results from this ongoing research will enable us to better identify resilient corals for conservation efforts based on their biology and/or geographic origin, as well as provide better constrained biological and geochemical parameters for models of reef persistence into the future. I am very excited about this research and hopeful that we will be able to find short-term solutions to managing and preserving coral reefs so that they can have more time to adapt and hopefully survive a rapidly warming and rapidly warming and acidifying ocean.

Currently, I am a Full Professor in the School of Earth Science, an OSU Faculty Senator, an OSU Senate Executive Committee member, and an OSU Senate Steering Committee member. I am also an elected council member and a Fellow of the International Society for Reef Studies. I have been recognized with numerous awards including the F.W. Clarke Award in Geochemistry, and the Mid-Career and Best Paper Awards from the International Society for Reef Studies. I teach Principles of Oceanography, Advanced Oceanography, Stable Isotope Biogeochemistry, and Planet Earth (Geology for non-majors). I have also co-taught Carbonates before and hope to get back to that soon. I greatly enjoy teaching students and learning from them. In addition, I currently have three PhD students, four undergraduates conducting senior thesis research, and four additional undergraduate student volunteers in my lab. This dynamic team of students, as well as the long line of graduate and undergraduate students that preceded them, is the backbone to the success of the research in my lab. The caliber of the graduate and undergraduate students at OSU is amazing! Three of the undergraduates are part of a year-long internship program in my lab that is supported by the HWH Foundation. The core of my research program is supported by the National Science Foundation. To learn more about the research in my lab, please visit my website at http://u.osu.edu/grottoli.1/ or contact me directly at grottoli.1@osu.edu. To support graduate and undergraduate coral research in my lab, please donate at the Coral Research Fund (link).

New Text by Professor Bergström

Professor Emeritus Stig M. Bergström is co-author of a recently published book entitled 'Darriwilian to Sandbian (Ordovician) graptolites from northwest China' (Elsevier, 388 pp., hundreds of color illustrations, link) that is the most comprehensive work on this important index fossil group in the last 50 years. The volume includes not only descriptions of more than 100 graptolite species (many new) but also chapters on biostratigraphy, paleogeography, depositional environments, conodont biostratigraphy, and the relations of the study successions to the giant Ordovician petroleum occurrences in the Tarim Basin, which is a part of the very remote study area in the Taklimakan Desert and the southern slope of the Tien-shan Mountains. It is of interest to note that the research team of this multi-year project includes, apart from Dr. Bergström, two geologists with OSU relations, namely Stan Finney (OSU Ph.D. 1976) and Dan Goldman (OSU Post-doc in the 1990s), both internationally leading graptolite workers.



Brevium

Prof Andrea Grottoli was quoted in a recent article on a video of a coral bleaching (link). Congratulations, Andrea!