THE OHIO STATE UNIVERSITY

SCHOOL OF
EARTHSCIENCES

March 2016 News Notes

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Alumni Change Lives

Rowan McLachlan is a PhD student working with Prof Andréa Grottoli. Here she describes how the Friends of Orton Hall helped to advance her studies.

With the help of Friends of Orton Hall, I conducted three weeks of fieldwork experience and training at the Hawaii Institute of Marine Biology (HIMB) as a research assistant for fellow graduate student, Ms. Kerri Dobson.

Preparing coral fragments for respirometry measurements on Coconut Island.

Kerri's research relates to the ability of tropical reefs to recover following a coral bleaching event. Coral reefs worldwide are threatened due to ocean acidification and increasing seawater temperatures, yet the potential for coral to adapt or acclimatize to global change is poorly understood. Coral skeletons are composed of the mineral calcium carbonate, which dissolve under acidic conditions, thus leading to weakening of the reef structure and reduced coral calcification (growth) rates. Similarly, elevated temperatures pose great risk to reefs due to the increased frequency and intensity of coral bleaching events. Coral bleaching is a detrimental heat stress response in which coral lose their symbiotic algae and turn white (hence bleach). These algae use sunlight to produce energy, which they then transfer to their coral host. This symbiotic relationship is incredibly important to corals, as the algae provide their hosts with up to 100% of their daily food requirements. Kerri's research hypothesizes that (1) ocean acidification increases coral recovery time from bleaching; and (2) zooplankton feeding increases recovery rates from bleaching. Two species of Hawaiian coral were used in this study: Porites compressa and Montipora capitata. Coral fragments were collected from two different locations, and were maintained in experimental aquaria at HIMB. To test the aforementioned hypotheses, we exposed coral to four different treatment conditions that varied in acidity (ambient vs. low pH) and feeding regime (fed coral vs. non-fed).

During the three weeks of fieldwork, we measured various aspects of coral physiology, including respiration, photosynthesis and feeding rate. Cumulatively, this data will be used to generate a metabolic "carbon-budget" for each species, in response to different treatments. This will be used to track how different species are coping with the stressors, and identify potential adaptive strategies that they may implement. By understanding how coral utilize their available energy sources in the face of different environmental stressors, one can begin to predict how coral will fair in a future of elevated seawater temperature and ocean acidification.

During this fieldwork excursion, I was trained in a variety of methods and techniques that I myself will implement in future when I begin my own research. For that reason, this trip was invaluable to me as a graduate student, and I would like to thank by Friends of Orton Hall for supporting me in this incredible research opportunity.

Sawyer and Cook Attend Gordon Conference

SES assistant professors Ann Cook and Derek Sawyer attended the Gordon Research Conference on Natural Gas Hydrates in Galveston, TX Feb. 28 – March 04, 2016. Post-doc Jess Hillman and graduate students Li Wei (PhD), Chen Yang (MS) and Katie Treiber also attended and presented their research.

Left-to-right Front Row: Chen Yang (MS), Katie Treiber (MS), Li Wei (PhD) Back Row: Derek Sawyer (assistant professor), Jess HIllman (post-doc), and Ann Cook (assistant professor)

The week featured a wide range of current topics on gas hydrates including field programs to assess gas hydrate formation, accumulation and destabilization in the Arctic, Gulf of Mexico, North Atlantic, eastern and western Pacific and Indian Oceans.

The conference was preceded by a two day seminar specifically designed for early career scientists, allowing graduate students and post-docs to share their research and establish connections in the field. Each of the graduate students had a uniquely beneficial experience to recount.

Katie Treiber: "I presented a poster on the geophysical interpretation of gas hydrate at my research site in the Gulf of Mexico. What surprised me most about the conference was how interdisciplinary the study of gas hydrate is. Many researchers came from such fields as chemistry, microbiology, and flow assurance, and listening to these presentations gave me several ideas for how to expand the scope of my own research."

Chen Yang: "I presented my current research results on the petrophysical and geophysical interpretation of a hydrate reservoir at one potential site in the northern Gulf of Mexico. The poster session was great; it gave me the chance to discuss my research topic and see some impressive new methods using seismic data in hydrate research. I hope to use these methods in my future work."

Li Wei: "The processes responsible for hydrate formation are not well understood, and more quantitative means of predicting hydrate accumulation are in need. I work on 1D numerical modeling to predict the formation of gas hydrate in marine sediments, which I presented as a poster at the Gordon Research Seminar and Conference. The meeting is a large gathering for scientists and engineers working on gas hydrate from different aspects, and it's a great opportunity to meet, communicate and be inspired by others within one's specialty."

All of the graduate students would like to thank the School of Earth Science for this amazing opportunity. Travel and research was funded by two research grants from the Department of Energy, National Energy Technology Laboratory.

GEOS Chapter Update

On Tuesday March 8th, the Geoscience in Energy at Ohio State (GEOS) Student Chapter and & the SGE Honor Society came together to host Orton Museum Curator Dale Gnidovec (see photo below) and David Dyer from the Natural History Unit of the Ohio History Center. Students learned about different paleontological samples and the guests' experience as curators. Many thanks to Dale and David!

The last meeting of the Spring semester will be on Tuesday April 5th. Students will elect a new Executive Board, and go over the different events and opportunities as the summer approaches. The new leadership will guide the chapter into the summer to prepare for recruitment season in September.

The student chapter will be hosting Dr. Larry Garmezy, AAPG Distinguished Lecturer on Monday April 11th. The short course Dr. Garmezy will lead is Fundamentals of Basin Evaluation and Quantitative Prospect Assessment. We are very excited to have this opportunity to learn about the fundamentals of petroleum systems.

Contact us at aapg@osu.edu if you have interest in interacting with the chapter or for more information on all things GEOS in 2016!

Stayed tuned and GO BUCKS !!!

Shell Undergraduate Research Experience Interns for 2016 Announced

In 2016, for the ninth year in a row, Shell Exploration and Production Company has generously funded "Shell Camp" at Ohio State to support Earth Sciences undergraduate students pursuing research in the School of Earth Sciences. Earth Science undergraduate research interns will work with faculty members as part of ongoing research programs, attend specialized training to develop core competencies for success, and interact with Shell staff to learn more about careers in the energy industry.

The students chosen for 2016, their faculty research mentors, and their research projects are:

Brian Ares, advised by Wendy Panero, will investigate "Hydrous content of phase CAS in the lower mantle and transition zone."

Yuyu Li, advised by Michael Barton, will investigate "Pressure and depths of crystallization of magmas, Island of Hawaii."

Alan Mason, advised by Derek Sawyer, will be using both his musical training and his Earth Science major while "Investigating temperature and sound velocity anomalies observed in ocean water offshore North Carolina, U.S.A."

Alec Moore, advised by Andréa Grottoli, will investigate "Inferring adaption or acclimatization from physiological variation among Hawaiian coral species across naturally occurring temperature and pCO2 gradients."

Sean Newby, advised by Matthew Saltzman, will be using stable isotopes in "Refining the age of the Knox Unconformity in the Middle Ordovician in central Virginia using the seawater 87Sr/86Sr curve."

Collin Oborn, advised by Michael Barton, will determine the "Pressures of magma crystallization from Iceland's Northern Volcanic Zone."

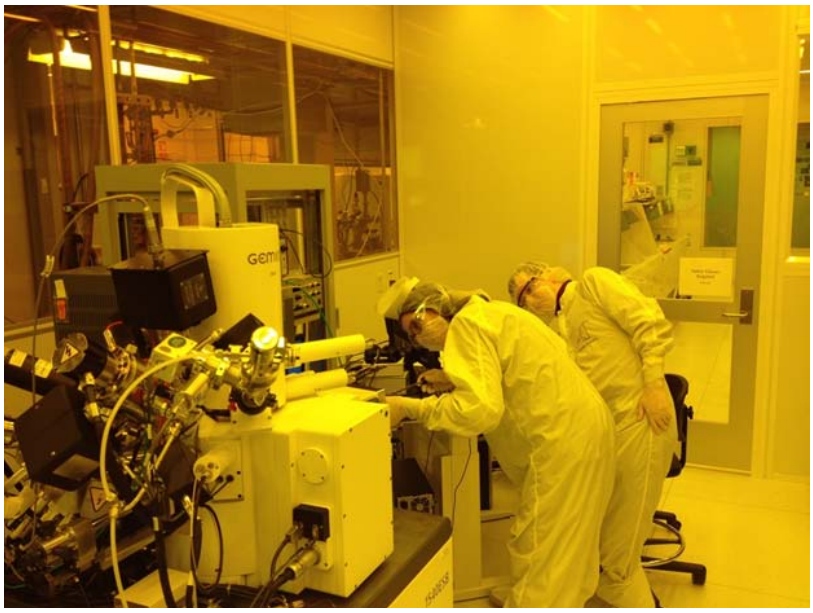
Elsa Saelens, advised by Berry Lyons, will analyze "Minor elements in Antarctic stream water: Determining amounts of water from the hyporheic zone."

In addition to working on their chosen research projects, the students will participate in weekly cookouts and research meetings with all the other interns. The students will also have a weekly technical development workshop led by the faculty and staff of Earth Sciences. Workshops will include topics such as XCT, use of SES geochemical facilities, introduction to geomicrobiology, discovering an oil field, fault identification, remote sensing in Earth sciences, geographic information systems, scientific abstract writing, and scientific poster creation and presentation. The program will culminate on Thursday, July 14 with a poster session in 291 Mendenhall Laboratory at 1 to 4 pm. All are welcome to attend the poster session. The SURE program is coordinated by Professor Anne Carey and overseen by a faculty committee that also includes Professor Frank Schwartz and Director W. Berry Lyons.

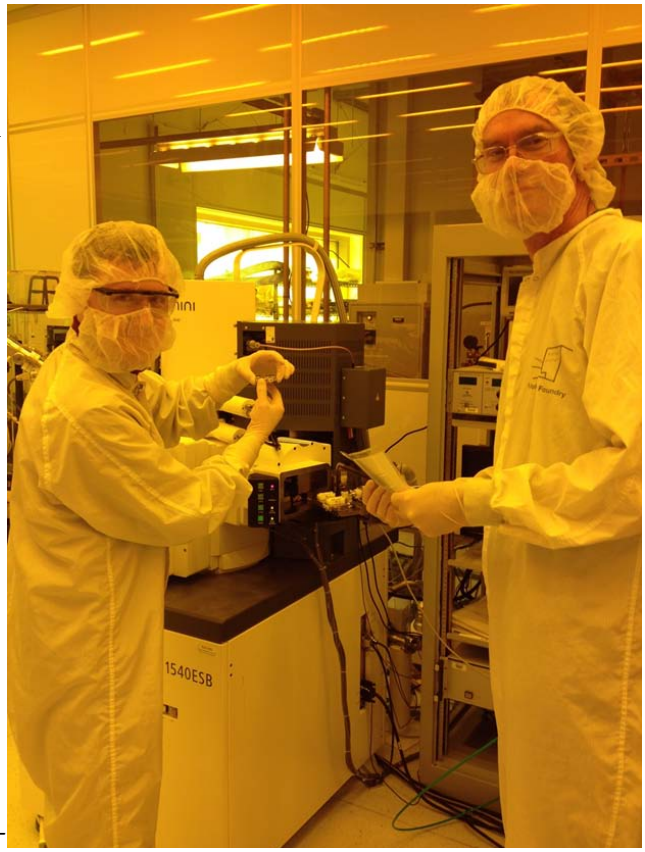
Expected outcome of this program will be the production of a cohort of students with enhanced interest in careers in the energy industry who have a suite of scientific and professional tools at their disposal.

Cole Group Research at the Molecular Foundry at LBNL

Ph. D. student Alex Shift and Dr. Julie Sheets in Prof. Cole's group used a dual-beam focused ion beam/scanning electron microscope at the Molecular Foundry at Lawrence Berkeley National Laboratory to examine, in 3-D, a number of samples from the Utica and Marcellus formations. Prior to this trip Alex conducted small and ultra-small angle neutron experiments at the NIST Center for Neutron Research on a number of shale and sandstone samples to quantify a number of pore features such as pore size, pore volume, fractal behavior and pore connectivity.



The above photo is of Dr. Julie Sheets and PhD student Alex Swift loading a shale sample into the dual-beam focused ion beam (FIB)/scanning electron microscope (SEM) at the Molecular Foundry at the Lawrence Berkeley National Laboratory (LBNL) in CA. This instrument takes a small sample of rock, in this case the Utica shale, ion mills a region between 10 and 20 nm thick, takes a high resolution SEM image and repeats this process hundreds of time. Then these individual images can be combined with properimage processing to produce a detailed high resolution 3-D image of the volume. This 3-D rendered volume can then be used to assess the distribution of different mineral phases, organic matter and pores. Further once the pore network is quantified simulations can be performed on the flow and transport of fluid constituents such as methane or water. For shale all of this kind of behavior occurs at scales generally below 1 micron.



The image to the right is of Alex and Dr. Tim Kneafsey, staff scientist and our collaborator at LBNL He provided excellent training as well as contributed to the measurements Julie and Alex made on this unique instrument. The group also received training and much support from Stefano Cabrini, Nanofabrication Facility Director, Molecular Foundry, LBNL.

Brevia

Prof Cole accompanied Dean Chris Hadad and Suzanne Rinker, Senior Director of Development in the College of Arts and Sciences to Dallas-Ft. Worth to visit with alumni. Prof. Cole gave a talk updating alumni on the status of SES with special emphasis on Energy at a dinner hosted by Janie Rector who provides funds for the Rector Scholarships in SES. In addition to Janie, Prof. Cole met with Kenny Kremm (B.S. 1977), Pat Neat (M.S. 1975), M. William Cappell (B.S. 2014) and Mike Morgan (B.S. 1969). Mike and Cindy Morgan have been major contributors to the OSU Field Camp.

A memorial to Prof Emeritus Walt Sweet was published online by the Geological Society of America (link).

Prof Cole presented an invited talk on application of neutron scattering in earth science at the 40th Anniversary Symposium for the NIST Center for Neutron Research in Gaithersburg MD.

Prof Thompson was featured in a story in EcoWatch (link).

Recently Prof. Cole and his collaborators at the University College London, Prof. Alberto Striolo and Ph.D. student Anh Phan, published a paper in the Philosophical Transactions of the Royal Society on “Factors governing the behavior of aqueous methane in narrow pores”.