THE OHIO STATE UNIVERSITY

SCHOOL OF
EARTHSCIENCES

September 2017 News Notes

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Alumni Change Lives

Michalea King is a second year graduate student working under the supervision of Prof Ian Howat. Here she describes how the Friends of Orton Hall fund helped further her graduate studies.

My dissertation is on variability in the speed and discharge of Greenland outlet glaciers. Receiving financial support from The Friends of Orton Hall enabled me travel to Boulder, Colorado, to both present this research at the International Glaciology Society's Annual Symposium in Polar Ice, Polar Climate, and Polar Change, and to participate in a Polar Science Communication Workshop. The workshop, hosted by the Association of Polar Early-Career Scientists (APECS), bought together polar science graduate students and early-career professionals with communication experts. We worked through challenges common to communicating with the public, the media, and other scientists. I learned new methods to more effectively communicate science to a broad range of audiences, and I am excited to implement these strategies in the upcoming year. At the symposium, I gave my first conference talk to approximately 100 scientific members of the polar science community. This was an ideal setting to receive feedback on my research and presentation style, learn about the exciting and relevant work being done in glaciology, and to network with polar scientists from around the world. I was also asked to participate on a 4-member panel for a discussion on science communication that occurred during the symposium. The time I spent at both the events was tremendously rewarding and productive, and I returned to Columbus having grown as a scientist. I am grateful to the Friends of Orton Hall for their investment in young scientists, and for making my participation in these events possible.

The research our team is conducting on glaciers in Greenland is an important part of understanding how mass loss from ice sheets contributes to global sea level rise. In addition to surface melting and runoff, ice is lost through the flow of marine-terminating glaciers, which transport ice from the inland ice sheet into the surrounding ocean. The speed of these glaciers is directly related to how much ice can be exported, or

discharged, from the ice sheet. Our research combines data from several satellite optical and radar products to create continuous time series of flow speed for every major glacier in Greenland. Using these records of flow speeds in conjunction with available data of glacier thickness changes, we can estimate how much ice is discharged from each individual glacier, as well as the entire Greenland Ice Sheet. High resolution records of ice discharge allow us to track how the magnitude of ice loss varies throughout the year, much like recording the "pulse" of the ice sheet. Developing a better understanding of how seasonal patterns of glacier flow speed and discharge have changed over time is integral to monitoring the health of the ice sheet going forward. Thank you to the Friends of Orton Hall for the travel grant funding that provided the opportunity to present findings of this timely and important research, thus helping further my scientific career.

Field Camp 70th Anniversary and Alumni Reunion

In the early part of 2017 Terry Wilson started discussions about having an alumni reunion in Sanpete Valley on the 70th anniversary of the establishment by Dr. Edmund Spieker of the OSU field station at Ephraim in central Utah. The last such reunion was held in 1997 on the 50th anniversary.

Dr. Edmund Spieker, 1920

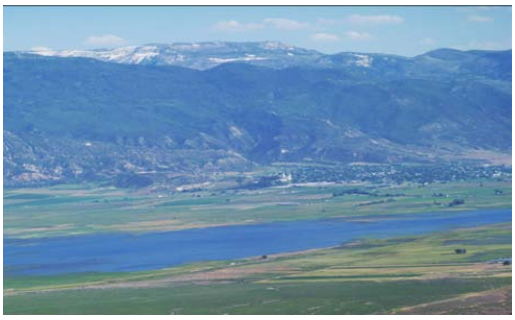
In the 1920s and early 1930s Dr. Spieker conducted the pioneering geological survey of this region, a time when he worked with the USGS. In 1924 he joined the faculty at OSU and in 1947, while chairman, he moved the field camp from Tennessee to Utah, recognizing from his earlier work that Sanpete Valley would be an ideal training ground for students to learn the techniques of field observation, mapping and interpretation. Sanpete Valley remains that ideal site for the School's students.

The 70-year list of field station alumni numbers 1611 participants. In response to a preliminary announcement, 326 field camp alumni indicated they were interested in participating in the proposed three-day field excursion to the most interesting and memorable of the geological locations around Sanpete Valley. The intent was not only to re-visit the geology, but also to enable interaction among the alumni, and between alumni and students at this year's field camp. Seventy-two alumni, including some spouses and children, attended the field trip. Field camp participation ranged from the years 1956 to 2015. Three former field camp directors helped lead the trip – Jim Collinson, David Elliot, and Terry Wilson. Renee Faatz (Mauche), an OSU graduate who is now a professor at Snow College, helped with the arrangements at Snow College and in Sanpete Valley. Cristina Millan, an OSU graduate who has taught field camp several times, did most of the organizing and correspondence, and we are all greatly indebted to her.

The Providence field is sited in the center of the photo (Photo by Chuck Vorce)

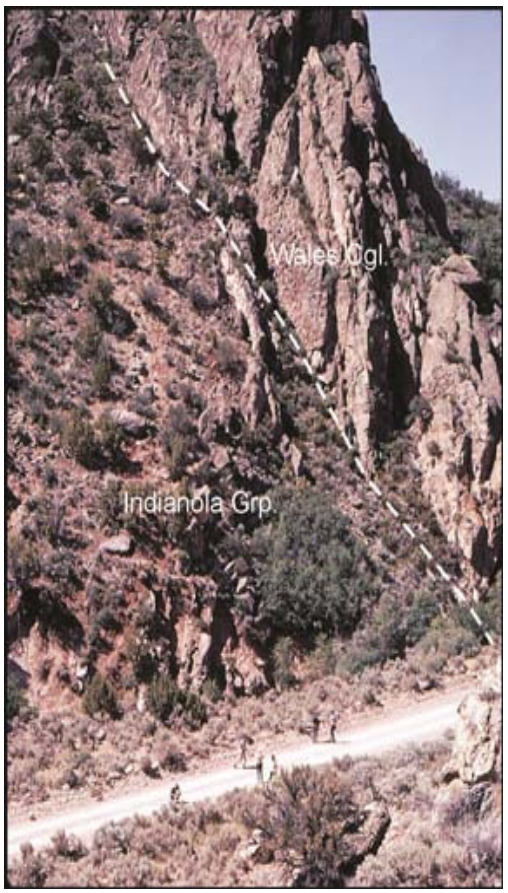
On Wednesday June 21st we gathered in Ephraim and met at an icebreaker held at the Ephraim Arts Center in the old stone storehouse (Ephraim Co-op) on the corner of Main and 100 North. The next day we started out with a visit to view the site of the Providence oil field in the Arapien Hills south of Mayfield, and then met at the LDS shelter in Sterling for a display of the geology of the oil field (including core, well logs, maps and cross-sections), largely provided by the Utah Geological Survey. After lunch, we travelled to the Canyon Range, and hiked up to the top of Oak Creek Canyon to view the Canyon Range thrust and the syn-orogenic conglomerates lapping onto the thrust sheet. In the evening we were treated to an excellent catered barbecue at the Nebo Loop campground.

Much of Thursday was spent viewing parts of the "South Cross Section" between the Gunnison Reservoir and Sixmile Canyon, a classic traverse of the principal structures associated with the frontal zone of the Sevier thrust belt in central Utah. Of course, we could not miss the unconformity exposed in Salina Canyon, and so travelled there to refresh our memories, followed by supper at a genuine Mexican restaurant in Salina. In the evening we gathered in a Snow College auditorium for a slideshow and "show and tell" with anecdotes from earlier days.



Sanpete Valley, Manti, and the Wasatch Plateau (Photo by Terry Wilson)

Friday morning we viewed the Rock and Dry Graben from the middle of Sanpete Valley and then climbed the north-facing wall of Dry Canyon to see the folded unconformity within the graben. We enjoyed a sack lunch in Upper Maple Canyon between the towering cliffs of the orogenic conglomerates. Unfortunately we did not have time to visit Wales Gap, a locality well known to OSU field students. However, we did drive across Sanpete Valley to Fairview and up onto the Wasatch Plateau. Skyline Drive was not yet open, so we could not reach the best place to view the Wasatch Monocline - but it was a great place for a short hike and an excellent view of Sanpete Valley. In the late afternoon we drove back to Fairview to have a catered dinner together with field camp students and staff at the Skyline Mountain resort between Fairview and Mount Pleasant.



Sunday we dispersed, and it seemed that everyone was enthusiastic and happy with the Reunion. A copy of the field guide is available for download (link). Photos by participants can be viewed here (link). The commemorative booklet prepared for the 75th Alumni Field Camp reunion is available here (link), and includes a list of the participants. An account of the geology of the Providence field is given in: Chidsey et al., 2011, Petroleum Geology of Providence oil field, central Utah thrust belt, in Sprinkel et al., Sevier thrust belt, northern and central Utah and adjacent areas: Utah Geological Association Publication 40, p. 213-231.

A group photo of most of the partipants is below. A version with everyone in the photo labeled has been posted here (link). Note: in the labeled version of the photo, there was one person we couldn't identify. Please download and see if you know who it is!

70th Fieldcamp Reunion participants at Gunnison Reservoir.

Faculty Profile: Professor Anne E. Carey

My childhood days were spent on the Maryland piedmont, in the Washington D.C. suburb of Bethesda, Maryland. There, as far as I knew, all rocks were white. Quartzite made a nice landscaping contrast to the green grass and was favored by everyone in the neighborhood of Bethesda. The only other rocks I thought about were the slates that served as the sidewalks of Wilkes Barre, Pennsylvania, where my parents grew up and my grandparents still lived. I didn't like those rocks because they made the sidewalks too hard to roller skate on. Water was my love—swimming, rowing, sailing, body surfing. And thus, my early years in science were spent as a research assistant in what is now the Department of Chemistry and Geochemistry at the Woods Hole Oceanographic Institution in Woods Hole, Massachusetts where I studied ocean water. I got to go to sea on R.V. Knorr, R. V. Chain, and R.V. Atlantis II. On those ships, I participated in marine geology, geophysics, and geochemistry research cruises that took me to West Africa, South Africa, Bermuda, Puerto Rico, Alaska, Hawaii, Kwajalein, Nova Scotia, Portugal, and probably some other ocean ports I've now forgotten. My research, under the direction of the late Vaughan T. Bowen, was primarily in support of a now-abandoned DOE program studying possible subseabed disposal of radioactive waste. I learned to love some of those elements far down the periodic table that most people ignore. I have published work on uranium, thorium, plutonium, and used some of the other actinides as tracers and tools in my research, both as a B.S. research assistant at WHOI and later for my M.S. degree at MIT where I worked with François Morel on sorption of these alpha-emitters to phytoplankton and to iron oxides.

That S.M. degree in environmental engineering led to three years of environmental consulting research in a small company in Cambridge, Massachusetts, called Gradient Corporation, just 2 miles down Massachusetts Avenue from MIT. My work there mostly concerned groundwater and Lake Ontario contamination with dioxins from the decades of chemical manufacturing and disposal near Niagara Falls, New York. An interesting aspect of the research was that Gradient's public health specialists and toxicologists determined that the primary route of dioxin exposure to humans was fish consumption by avid anglers who caught and ate a lot of fish. It was interesting and fun and educational but three years of the consulting rat race led to graduate school in the Ph.D. program in Hydrologic Sciences at the University of Nevada, Reno where I first studied dioxin photochemistry but found that experiments with bags of air felt something akin to studying the emperor's new clothes. Finally, I got back to water and combined salt and fresh water in research on salt water intrusion into coastal aquifers, studying under the direction of Steve Wheatcraft in the Mackay School of Mines. My dissertation research utilized a variety of geochemical tracers to understand flow systems and to develop conceptual models of coastal aquifer dynamics. My dissertation research also investigated the importance of physical chemistry of non-ideal ionic solutions in controlling solute transport in the brackish transition zone between seawater and coastal freshwater aquifers.

Even while enthralled by groundwater studies at Nevada, I never lost interest in surface water bodies and I arrived at Ohio State to add some watershed hydrology expertise to what was then the Department of Geological Sciences. The work I have conducted since 1999 at Ohio State with my students and colleagues has primarily concentrated on small streams and I have quantified the transport of materials in streams of

New Zealand, Taiwan, Philippines, Dominica, Panama, Nicaragua, Spain and Italy. Mountainous rivers in these locations deliver small volumes of water but significant amounts of dissolved and particulate material to the ocean.

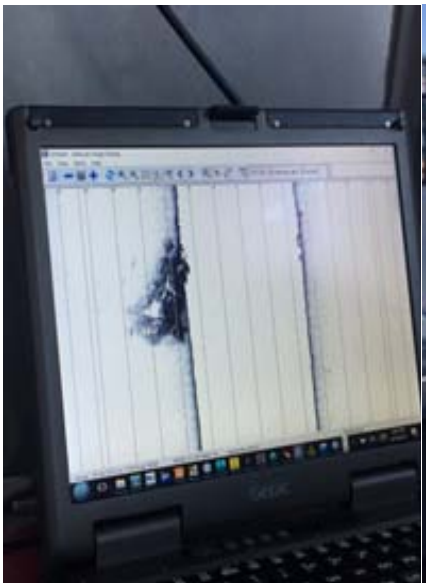
My group has spent the last decade quantifying mineral weathering in small, mountainous streams and in laboratory settings that mimic conditions in those streams. Chemical weathering of silicate minerals, the transport of weathering products in streams, and the eventual precipitation of carbonate minerals in marine sediments serve as a major mechanism resulting in geologically long-term for sequestration of atmospheric carbon dioxide. Transport of organic carbon in streams, both dissolved and particulate, is a less well understood, but another potentially important set of processes removing carbon from the atmosphere over intermediate geologic time scales. Our field and laboratory studies have shown the importance of these small "flashy" streams, which act much like chutes, in delivering material quickly to the ocean. In addition to our studying transport of particulate and dissolved material from the ocean, my students, colleagues, and I have also conducted studies of mass balances in continental watersheds that have determined hydrologic and nutrient mass balances of large and small watersheds and have determined nitrate fluxes into coastal environments. Techniques utilized in these studies include quantitative nutrient budgets, water quality modeling, isotope geochemistry and radiochemical mass balances. My studies show the importance of hydrologic and biological controls on nutrient transport and storage in watersheds. These studies have been conducted in Alabama, New Zealand, Taiwan, and the entire Mississippi River basin. Perhaps the most important issue facing hydrologists in the next few decades is the impact of climate change on the hydrologic cycle and on water resources. Although I anticipate that my future research will continue to integrate physical, chemical and geologic principles in the study of such problems as water quality and landscape development, a portion of my new research efforts will be to investigate climate change related problems, too. I look forward to continuing work with my great students and colleagues in the School of Earth Sciences at The Ohio State University.

Multibeam Sonar Mapping Class Field Trip to Lake Erie

As part of a new course being taught this semester by Dr. Derek Sawyer, 11 SES graduate students participated in a weekend field trip (Sep. 15-17th) to collect multibeam sonar dataset off South Bass Island in Lake Erie.

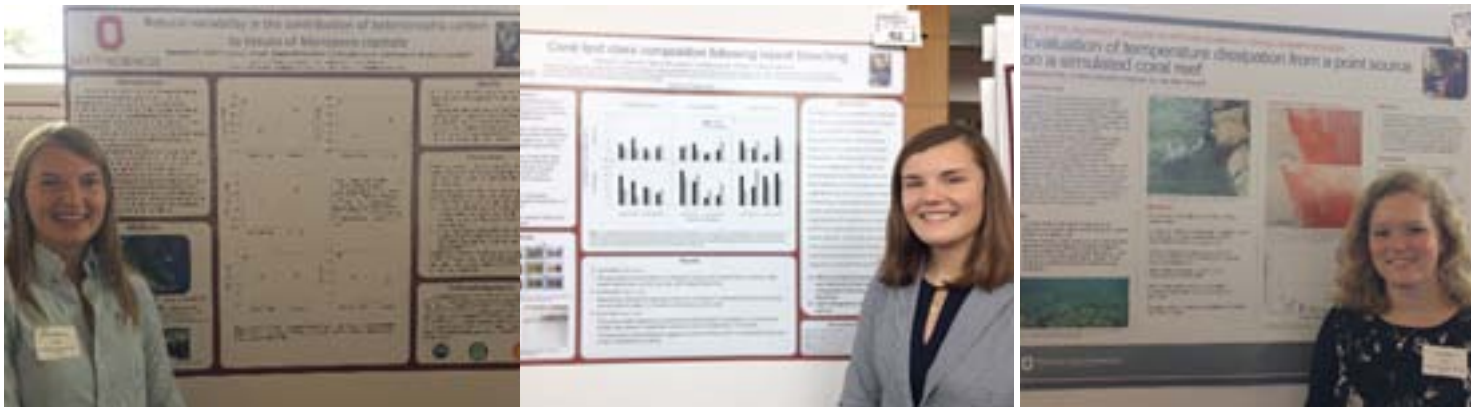
The course is a graduate level seminar on the theory and application of multibeam sonar systems capable of generating high-resolution maps and backscatter intensity of bed topography and morphology in lakes, rivers, and marine environments. In addition to a traditional seminar format with weekly readings and discussions, the highlight of the seminar is the weekend field trip to Lake Erie in the early part of the semester to acquire data which will be processed throughout the rest of the semester. The class will also leverage the newly released and extensive multibeam data acquired in the search for missing Malaysia Airlines Flight MH370 in the Indian Ocean.

The weather and lake conditions were ideal for the weekend field trip. The class camped at South Bass Island State Park and utilized Ohio State's Stone Laboratory's Biolab vessel throughout the day on Saturday. The class spent 8 hours in the area offshore South Bass and Gibraltar Islands and acquired detailed data over rock reef structures, a large lakebed hole, and a shipwreck. The class will process the data throughout the remainder of the semester. The class thanks the School of Earth Sciences for financial support and Captain Arthur Wolf, Justin Chaffin, and Matt Thomas of Stone Lab for helping make the field trip a success.



SES Students Participate in the Fall 2017 OSU Undergraduate Research Forum

Undergraduate research is a strength in the School of Earth Sciences. This fall, undergraduate students Alexandra Smith (BS Earth Sciences), Sarah Solomon (BS Evolution, Ecology, and Organismal Biology), and Margaret Otto (BS Environmental Engineering) all presented research at this fall's OSU Undergraduate Research Forum on corals under the supervision of SES Professor Dr. Andréa Grottoli. The scope of these projects ranged from isotope biogeochemistry of corals, to the biology of coral bleaching, to heat-flow dissipation patterns on reefs. Such an interdisciplinary approach to research in SES is what creates such an enriching environment for student creativity and learning.

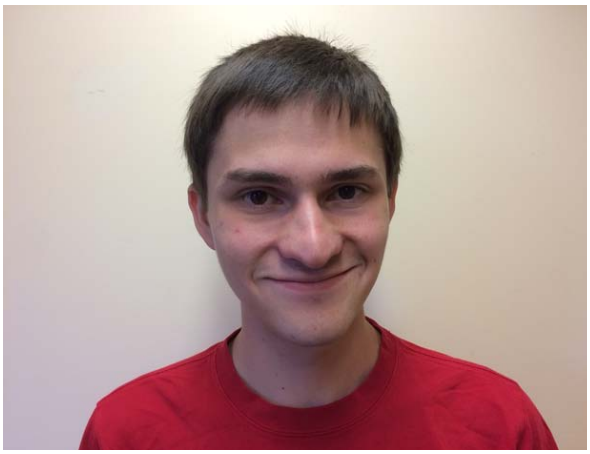


Undergraduate students Alexandra Smith (left), Sarah Solomon (center), and Margaret Otto (right) presenting their research findings at the OSU Undergraduate Research Forum. All three were mentored by SES Professor Andréa Grottoli.

CIGLR 2017 Postdoctoral Fellowship Recipient

Dr. Yuanyuan Jia at the Division of Geodetic Science, School of Earth Sciences, Ohio State University, has been awarded a prestigious two-year postdoctoral fellowship by NOAA'S Cooperative Institute for Great Lakes Research (CIGLR), located at Ann Arbor, Michigan. She is completing her postdoctoral fellowship research at OSU's School of Earth Sciences, working with C.K. Shum at OSU and Philip Chu at NOAA's Great Lakes Environmental Research Laboratory (GLERL). During her 2-year fellowship, she is investigating the use of satellite data to complement the Great Lakes Observing System (GLOS) and to improve the forecast reliability of the Great Lakes Operational Forecast System (GLOFS). Yuanyuan received her M.S. and Ph.D. degrees in Geodetic Science from the Ohio State University. She is an expert in the applications of synthetic aperture radar interferometry, satellite altimetry, as well as other active and passive satellite remote sensing measurements to study permafrost active layer thickening, lake, wetland, and river level changes, and subsidence of deltaic regions.

SES Student Awarded Hollings Undergrad Scholarship from NOAA



James White, BS with Honors Research Distinction expected in Spring 2019, has been awarded one of the 110 Hollings Scholarships given by the National Oceanic and Atmospheric Agency this year. James has received a $20,000 scholarship covering the 2017 and 2018 academic years and an additional $10,000 summer internship at a NOAA facility or with a NOAA-funded researcher. NOAA Undergraduate Scholarship recipients are recognized for high achievement in NOAA-mission related fields. Scholarship winners this year attend 64 different universities in 33 states, chosen among the more than 550 applications received. James is the sole scholarship recipient from Ohio State this year.

James is following the Earth System Science track and is pursuing a double major in Earth Sciences and Atmospheric Sciences. James attended field camp this summer and has been pursuing research in glaciology and glaciochemistry. The NOAA Hollings Scholarships were created in 2005 upon the retirement of Senator Ernest "Fritz" Hollings of South Carolina who served in the U.S. Senate for 36 years and who was a champion for ocean policy and conservation and had major roles in enacting the Coastal Zone Management Act and the Marine Mammal Protection Act (both in 1972) and the Oceans Dumping Act (1976) and the Sustainable Fisheries Act (1996). Congratulations to James!

Brevia

Prof Andrea Grottoli was lead-author on a piece on Climate Change for the March for Science-Columbus (link). The piece was co-authored by SES professors CK Shum, Michael Durand and Lonnie Thompson, along with several other OSU co-authors. The piece is available here (link).

The Orton Museum and the Orton Library put a temporary exhibit in the Main Library on campus about geologic day trips in Ohio. You can see more information and a photo of the exhibit here (link).