

September 2015 News Notes

- Alumni Change Lives
- Faculty Profile: Ian Howat
- Coastal Hydrogeology Field Trip
- A Quest for the Oldest Ice on the Third Pole
- USEEL: A New Field Lab to Study Shale Resources
- SES Graduate Student Featured in *Eos*
- An Old Fossil Goes on Exhibit
- Brevium

Alumni Change Lives

Erin Lathrop received her B.S. in this Spring. Here she describes how Friends of Orton Hall and other funds helped further her studies.

I was privileged to receive multiple scholarships and funding from the School of Earth Sciences throughout my undergraduate career at Ohio State. I was twice awarded the Marcus J. & Lottie C. Lieberman Scholarship in Geological Sciences. This allowed me to devote more time to school and research. In the summer of 2013, I was able to attend Ohio State's field camp due to awards from the Edmund Spieker Memorial Scholarship Fund and the School of Earth Sciences Field Experience Travel Fund. It was at field camp where my love of geological fieldwork was ignited. In October of 2014, with the help of funds from the Friends of Orton Hall, I attended the Geological Society of America Annual Meeting and Exhibition in Vancouver, BC. I presented my undergraduate research on marine sediments that I completed under Dr. Larry Krissek. My research concentrated on using core samples from IODP Expedition 339 to study how mineralogy can be used as a



proxy for paleoclimatology in contourite deposits from the Gulf of Cádiz, and to relate changes to the history of Mediterranean Outflow Water through glacial and interglacial periods. While attending the GSA conference, I also had the opportunity to network with professional geologists in my area of interest and gather information on graduate schools. I attended as many sessions as I could and ended up meeting my future graduate school advisor.

Last month, I started graduate school in geology at Utah State University. I am working with Dr. Carol Dehler to study the Mesoproterozoic carbonate rock record of the Bass Formation in the Grand Canyon. Without the Ohio State Earth Sciences alumni support I received while working on my undergraduate degree I would not have had the opportunities that have shaped my geologic interests and set me on my current path. I am extremely grateful to the Friends of Orton Hall and Ohio State Earth Sciences alumni. The support that the SES community provides to their students is sincerely appreciated.

Faculty Profile: Ian Howat

My interests in Earth Science started when I was teenager, rock climbing on the crags of New England. I was fascinated by the structures of the rocks and topography and the processes that formed them. I received a B.A. (there was no B.S.) in Geology at Hamilton College (fun fact: Edward Orton graduated from Hamilton 151 years before me, in 1848). As an undergraduate, I participated on two research cruises off the Antarctic coast and spent a semester studying abroad at the Institute for Antarctic and Southern Ocean Science at the University of Tasmania in Hobart, Australia. While my undergraduate research focused on glacial-marine geology and geomorphology, I became more interested in the dynamics of ice sheets and glaciers, rather than just the markings they left on the land. I also get sea sick. After a 2-year hiatus of being a climbing bum after college, I started a graduate program at the University of California, Santa Cruz with an advisor who studied the behavior of past and present ice sheets and glaciers and their response to climate changes. I was involved in a number of different studies at UCSC, ranging from the changes in the glaciers and snowpack of California to the ice streams of Antarctica, using methods ranging from field-based geophysics to remote sensing and numerical modeling. After I finished my PhD., I was a postdoc for 18 months, split between the University of Washington and the University of Colorado, studying recent major changes in the Greenland ice sheet. I joined the SES faculty in 2008 and am a principal investigator at the Byrd Polar & Climate Research Center.



Howat (left) and Research Associate Dr. Santiago de la Pena (right) installing a snow sensor on the Greenland Ice Sheet to measure the rate of thickness change. Photo by Steve Price.

I like to think of the Earth's ice cover as "climate, solidified." Ice sheets and glaciers lie at the intersection between the atmosphere, the land surface and the oceans, and my job is to better understand the interactions between them. Glaciology is, therefore a highly interdisciplinary science, requiring one to be a "Jack of all trades". To understand the complex interaction of Earth systems on timescales ranging from seconds to millennia, to use wide ranging methods to observe and mathematically model physical behavior, and to go to, literally, the ends of the Earth to do it. My job, therefore, is highly varied. One day I may be processing satellite imagery showing the rate at which a glacier is flowing while the next I may be dangling out of helicopter to place a motion sensor on a deeply crevassed glacier in Greenland. The objective of all of my work is to enable us to better predict how glaciers will respond to future climate changes, which is important because the rapid loss of ice sheets would greatly accelerate the rate at which sea level rises. This century it is possible that sea level will rise faster than in any time in the past several thousand years, destroying low-lying coasts and leaving hundreds of millions of people homeless. Any solution to this problem will require better information regarding what we can expect ice sheets to do in a warmer world.

Coastal Hydrogeology Field Trip



Students describing cuttings during well installation.

Nutrient inputs to coastal waters have contributed to frequent harmful algal blooms in recent decades. To learn first-hand about coastal water quality, undergraduate and graduate students took a field trip to Lake Erie as part of ES 5194 (Group Studies in Coastal Hydrogeology, taught by Prof Audrey Sawyer). Our field trip itinerary followed the flow of nutrients from farm to faucet, with particular attention to groundwater transport. The central activity was a two-day experiment to measure nutrient inputs to the coast from direct groundwater discharge. While much of the nutrient load to Lake Erie is delivered in runoff during storms, the groundwater component is difficult to measure and is often overlooked. We deployed seepage meters offshore and installed shallow wells onshore to measure rates of groundwater seepage to the Lake Erie shoreline near Maumee Bay. We also collected groundwater samples for nutrient concentrations. Undergraduate student Kevin Parks said about the experience, “I collected new data for my senior thesis that weekend, and I really valued the hands-on field experience.” The dataset from this field trip will be used to understand the role of groundwater in water and nutrient budgets for Lake Erie.

Our field trip was capped with a tour of Collins Park Water Treatment Plant in Toledo, Ohio, where we learned how Lake Erie water is converted to drinking water. “The tour was a good reminder--protecting water quality at the source is one of the most important strategies for maintaining safe drinking water,” noted graduate student Trevor Browning.

Thank you to our alumni whose generous donations make field trips like this one possible.



ES 5194 class posing with two seepage meters on the beach.

A Quest for the Oldest Ice on the Third Pole

The Tibetan Plateau or Third Pole (TP) covers over 5 million km² and contains ~46,000 glaciers. These glaciers constitute one of Earth’s largest stores of fresh water which feeds Asia’s largest rivers and helps sustain 1.5 billion people. A collaborative two-month program conducted by a 60-member team from The Ohio State University’s Byrd Polar and Climate Research Center (BPCRC) and the Institute of Tibetan Plateau Research of the Chinese National Academy of Sciences is currently underway. The main objective of this program in the western Kunlun Mountains in the western TP is to drill 4 deep ice cores through the Guliya ice cap (6,700 masl), both on the summit as well as on a lower, thicker (>300 meters) dome.

The ten members of the BPCRC team, along with 7 tons of equipment including ice core drills, snowmobiles, generators and ice sounders, traveled from Lhasa to Ali (Gar) on the far western border of Tibet, and then to the base camp established by the Chinese team at the margin of the Guliya ice cap. The project is being covered on location by CCTV film crew and Jane Qui who will be working on a story for *Science* and *Nature* magazines on the project and the Third Pole Program; *National Geographic* out of the Beijing office is also covering the project.

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The scientific objective is to reconstruct a climate history through the Last Glacial Cycle (last 100,000 years) by developing continuous high-resolution stable isotope, glaciochemical, dust, trace element, and black carbon records. Through their short (<decadal) to long (>millennial) term time series, these ice cores will provide the long-term context for climatic, atmospheric and environmental variability for one of the least studied places on Earth. Specifically, we propose to address the following objectives: (1) document past and present (last 25 years) abrupt climate change recorded in the Guliya ice cap; (2) determine precisely the age of the ice cap both at the summit and the lower site; (3) analyze the atmospheric and climatological dynamics which have allowed Guliya to survive since the Eemian, while glaciers to the east and south did not exist before the Early Holocene (~10,000 years yrs BP); (4) determine the regional characteristics of climatic and environmental variability during the Eemian (~125,000 years ago) and beyond and how they compare to Eemian and Holocene conditions elsewhere, including the Polar Regions.

USEEL: A New Field Lab to Study Shale Resources

The Ohio State University is developing a field laboratory to study the efficiency of oil and gas extraction from shale in eastern Ohio, as well as the impact on the environment. The laboratory will enable a consortium of academic, industry and regulatory partners to frame and systematically answer the most essential questions relating to optimal management of shale energy resource development.

Development of the field laboratory is being funded primarily by a \$7.3 million grant from the U.S. Department of Energy's National Energy Technology Laboratory. Key partners in the endeavor include the Muskingum Watershed Conservancy District and West Virginia University.

Jeff Daniels, Professor in the School of Earth Sciences is leading the effort, called the Utica Shale Energy and Environment Laboratory, or USEEL. As part of the field laboratory, a new well site will be developed in partnership with a company active in the area, Daniels said. A cooperative agreement between an unconventional oil and gas developer and the laboratory will give researchers and students access to the samples and data needed for thorough studies on the shale resource and water, soil and air impacts.

Daniels said he believes that, as the state's land-grant university, Ohio State is the prime institution to take leadership of such an effort. "It's part of our mission to be actively involved in an activity that has become so important to our state," Daniels said. "On the environmental side, we're the best neutral party to do unbiased field research to help monitor what's going on in the field. On the energy efficiency side, anything we can do to improve the efficiency will also ultimately decrease the environmental impact of shale energy extraction, and gives us the ability to have an influence on the environmental efficacy of the companies involved."

Ohio State faculty who are taking lead roles in the project include David Cole, professor of Earth Sciences and director of the Subsurface Energy Materials Characterization and Analysis Laboratory; Barbara Wolfe, clinical associate professor in the Department of Veterinary Preventive Medicine and chief science officer at The Wilds; Roman Lanno, associate professor of Evolutionary, Ecology and Organismal Biology and Jeff Bielicki, assistant professor of Civil, Environmental and Geodetic Engineering. Other School of Earth Sciences faculty members conducting research as part of the project include Ann Cook, Tom Darrah, Paula Mouser, Derek Sawyer and Frank Schwartz.

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The project includes studies on:

- Basic research to help more fully understand the nature of the Utica shale and its energy resources, including how these resources vary within the Utica shale. One goal is to determine how to increase the efficiency of extracting oil and gas. “If we can improve the efficiency, that decreases the number of holes you have to drill to get the resource out,” Daniels said. “That’s better for everybody.”
- Environmental research on water resources. “The question is, how do you conserve, preserve and enhance water resources at the same time as you’re drilling and producing energy?” Daniels said. “We’ll be looking at this on a broad scale.”
- Monitoring potential changes in the ecosystem associated with drilling and production, , and how best to mitigate any damage.
- Potential environmental changes from shale drilling, including air quality, noise, light and dust generated from well sites

Daniels said that some research of this type is currently being conducted in Ohio and other locations, but it’s been piecemeal. “This will be a complete subsurface geological characterization,” he said. “We’ll do bore-hole geophysics in the well, so we’ll have a complete analysis of what’s going on in the subsurface. We already do some environmental work on the fluids going into the drill hole and the fluids coming out, but this will be much more contiguous monitoring. Our partnership with Muskingum really gives us the capability of doing extensive work at the interface between water and energy, now and in the future, unlike anything we’re doing at any other site.” The project is being conducted in partnership with West Virginia University, through a shale research partnership established in 2013, and their Marcellus Shale Energy and Environment Laboratory (MSEEL). Other participants include The Wilds; Miami University; Ohio University; the University of Calgary; Environmentally Friendly Drilling Systems and Texas A&M; CSI Technologies; General Synfuels Inc., Schlumberger, TGS International. The project officially began on August 1st, Daniels said. For more information, see <http://useel.osu.edu>.

This article contributed by Jeffery Melaragno, USEEL.

SES Graduate Student Featured in Eos

PhD student Maya Wei-Haas was featured in AGU’s *Eos* magazine, on September 16 ([link](#)). The story, entitled “Riding a ‘Roller Coaster’ at *National Geographic*,” was about Maya’s time in the AAAS Mass Media Science and Engineering Fellows Program. The program allowed Maya the chance to write news articles for *National Geographic*, such as this piece shows videos of crocodile attacks ([link](#)). The photo of Maya at right is from the *Eos* article.



An Old Fossil Goes on Exhibit

The Orton Geological Museum and the Orton Memorial Library of Geology are proud to announce that an amazing fossil has just gone on display in the main reading room of the Geology Library. It's an ichthyosaur. Although they resembled modern sharks and dolphins, ichthyosaurs were neither fish nor mammals but rather reptiles. Their streamlined body shape and dorsal fins are a classic case of



convergent evolution – animals hitting on similar solutions when adapting to common lifestyles. Our ichthyosaur lived during the Jurassic Period, 190 million years ago, so it was swimming in the ocean when such dinosaurs as Stegosaurus and Brontosaurus were walking the land. Ours is a youngster, only about 4 feet long; adults of this species reached 25 feet. Ichthyosaurs were the first major group of reptiles to adapt to the sea, starting early in the Triassic Period. About 102 species are known - some were more than 50 feet long but most were the size of modern dolphins. Most species ate fish and cephalopods (including belemnites and ammonites) as indicated by preserved stomach contents. Ichthyosaurs did not make it to the end of the dinosaur era, becoming extinct about 90 million years ago.

The fossil has been in the collection of the Orton Geological Museum for more than 100 years – we have photographs showing it on exhibit in 1900. Unfortunately, since that time information on where it was found has been lost. It is probably from Lyme Regis, the Jurassic Coast of southern England made famous by Mary Anning. The fossil was in storage in the basement of Orton Hall for decades but was retrieved this summer for display at the annual rock & mineral show of the Richland Lithic & Lapidary Society, a club of “rockhounds” in Mansfield. One of their members built a beautiful wooden case for the fossil; after the show they donated the case to the Orton Museum.

Brevium

Graduate student Jacob Heck has been awarded a signal honor by the National Council of Examiners for Engineering and Surveying (NCEES) - the national nonprofit organization focused on licensing standards for engineers and surveyors. The NCEES has named Jacob one of twelve students selected nationwide for its 2015-2016 Emerging Engineers and Surveyors Group. Most of the other students so honored are engineering students. More details at this [link](#). Congratulations, Jacob!