



**Field Methods Class
Deadwood, SD June 1987**



Who can you identify?

Appalachians Mountains in April for the Mineral and Petroleum Exploration course. Dr. Kate Tierney led a spring break field trip to the San Salvador Island in the Bahamas to observe sedimentary processes in a carbonate depositional environment. Field trips for our courses are generally expensive, so part of this goal is also to find ways to defer the costs of these trips for students while still providing the appropriate training.

In terms of networking, visiting scientists for our Friday seminar continue to provide a venue for our students to talk about their research with other professionals. Another event that is highlighted in this issue is an industry-led workshop that provided training in the principles of sequence stratigraphy, as well as an opportunity to interact with

Strengthening Student Training

by EES Department Executive Officer Tom Foster

One of the top goals of the Earth and Environmental Sciences Department is to continue to improve student success by providing more opportunities for quantitative and field based training, and to facilitate networking opportunities with folks from industry. In the past few years, we have been able to make significant strides in these areas. In this issue of the newsletter, two of our undergraduate majors provide insight into their perspective of the Montana field camp. In addition, we highlight two of our recent course-related field trips. Drs. Bill McClelland and Emily Finzel led an 8-day field trip to the northern

industry professionals. Finally, a new course offered this spring by Dr. Emily Finzel and alumnus Dr. Jim Lucas facilitated student engagement with alumni who are employed in various fields and who dispensed valuable advice about navigating a career. If you are interested in joining this new student-mentoring avenue, please contact us!

Inside this issue...

Faculty profiles:

Jeff Dorale

Associate
Professor

Chris Brochu

Professor

Where are they now?

Julia McHugh

Ph.D. 2012

Jim Lucas

Ph.D. 1977

Time in the field:

Spring Break

Bahamas

**Mineral/Petroleum
Exploration Course**

Appalachians



Faculty Profile:

Jeff Dorale, Associate Professor

I have broad interests in the areas of environmental geology and climate change during the Quaternary. Much of my work is related to caves and the climate records contained within caves. Most of my work utilizes geochemistry in some way. We recently acquired a new instrument for measuring hydrogen and oxygen isotopes in water, and one of my current graduate students is using these isotopes as tracers to understand the connections between soil water and ground water in an agricultural setting.

The cave records we study can be used to reconstruct terrestrial paleoclimates, including temperature, vegetation dynamics, and aspects of hydrology such as flooding. We have also been working in coastal caves on the island of Mallorca in the Western Mediterranean to reconstruct sea level changes during the late Quaternary. Water levels in these cave are directly tied to sea level, and deposits called phreatic overgrowths form on pre-existing features such as stalactites right at the water surface (see picture; photo by Bogdan Onac), and therefore pinpoint sea level. We find these overgrowths at higher and lower levels of the cave representing past sea level stands, and we can date them very accurately with uranium-series techniques.

Over the past decade I have enjoyed teaching a spectrum of courses ranging from isotope geochemistry to field trips. Currently I teach Environmental Science and Oceanography. Until recently I led many Spring Break and National Parks field trips, but I've passed the baton on that. To fill the void this coming summer I will join the group who teaches our field courses in Montana. I enjoy teaching Environmental Science as I believe this course has the potential to open the eyes of students to the importance of understanding human impacts on the environment. It is especially satisfying to receive letters from former students who remark on the things they learned in the course. Of course sustainability is a big buzzword these days and much about it is

greenwash, but I personally strive to live my everyday life in the spirit of true sustainability. I either walk or ride my bike the 2.5 miles to work every day in a conscious effort to reduce my transportation footprint (and be healthier). Our food choices also have a big impact. Iowa contains less than one percent of its original native prairie, much of that space now grows corn and soybeans (requiring massive fertilizer and herbicide applications, and promoting soil erosion), and more than half of that corn crop is fed to livestock in confinement conditions. Cheap beef, pork, and chicken therefore have huge environmental costs. My personal response is to hunt and fish for most of the meat me and my family consumes. Deer, pheasant, crappie, and catfish are mainstays in our home. Last summer I was in southeastern Alaska doing research, and while there decided to go salmon fishing for a day (see top left picture). The entire time we were fishing we were surrounded by feeding humpback whales! I also brought home 30 pounds of the best salmon a human can possibly attain!



Phreatic overgrowths on stalactites from the Island of Mallorca, recording the stable sea level of the past 3,000 years. Photo courtesy of Bogdan Onac.

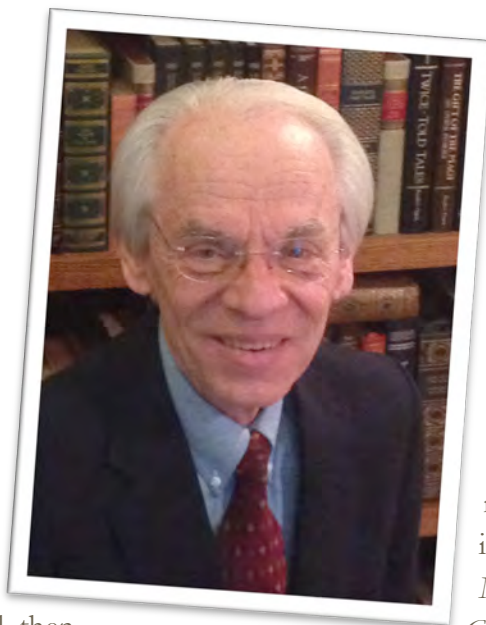
Jim Lucas

Ph.D. 1977

While growing up in Mankato, Minnesota, I hiked and collected rocks within the Glacial River Warren valley (now known as the Minnesota River Valley) and later attended Minnesota State University, where I began a wide-ranging career in earth science. After finishing my Bachelor's degree at MSU, I taught earth science for a year in South St. Paul, then accepted an NDEA fellowship and moved to Iowa City. I obtained my Master's in the Geography Department, then crossed campus to the Geology Department for my Ph.D., specializing in geomorphology (mostly Pleistocene landforms) and the emerging science of remote sensing. Emeritus professors Dick Baker and Lon Drake were on my committee. I assure you that the stories they and Emeritus professor Holmes Semken still tell about me are greatly exaggerated.

Before graduating, I worked for the late Dr. Jim Taranik at the Iowa Geological Survey on a NASA Landsat investigation that used computer-enhanced imagery from the Jet Propulsion Laboratory for land-use classification around Ottumwa. I printed many of the colored images for the project in the photo lab across the hall from Emeritus Professor Gil Klapper's office. Dr. Klapper often humored me about all the commotion in the lab, especially when something went wrong.

After Jim Taranik left the IGS, I taught the Department's Geologic Remote Sensing course. Later I joined him at the EROS (Earth Resources Observation System) Data Center in Sioux Falls, South Dakota. Taranik and I worked together, along with Iowa alum Cynthia Sheehan, to produce a springtime photo mosaic of the Midwest using



about 80 Landsat images. It clearly showed the beachlines of Glacial Lake Agassiz, the Iowa erosion surface, and the recessional moraines of the Des Moines lobe. That project earned us our fifteen minutes of fame when the Des Moines Register did a Sunday edition color feature on the project. The mosaic subsequently was published in National Geographic's *Atlas of North America: Space Age Portrait of a Continent*.

After I left Sioux Falls, I worked as a VP and later owner of a Texas oil and gas exploration company that specialized in using remote sensing to develop prospects. When oil dropped to \$10 a barrel in the late 1980s, I had to get a real job. I joined Lockheed Martin in Las Vegas, Nevada, where I was the program manager of their Remote Sensing and Data Integration contract with EPA, which included staffing EPA's Center of Excellence for GIS. I also worked on major proposals to the federal government with Lockheed Martin partners such as Space Imaging and Raytheon. In the mid 1990s, I was promoted to Director of Commercial Remote Sensing for Lockheed Martin's NASA contract at the Stennis Space Center in Mississippi. My Directorate of about 100 scientists, engineers, and support personnel guided the development and commercialization of remote sensing innovations. Part of that responsibility was overseeing operations of the NASA Learjet that flew remote sensing missions carrying a broad array of standard and experimental sensors.

In the early 2000s, I made the difficult career choice to move back to Mankato, where my parents were ill and needed my help. As a program development director for Computer Sciences Corporation, I worked out of Mankato, (continued on page 5)

Graduate Student Profile:

Stephan Oberney – PhD student

Advisor: Dr. Bradley D. Cramer

Research topic: “High-Resolution Event Stratigraphy (HiRES) of the Wenlock—Pridoli Interval in the Eastern United States”

My doctoral research entails the chronostratigraphic analysis of upper Silurian strata within the Appalachian and Michigan basins. The primary focus of this work is to utilize a variety of data from outcrop and subcrop in NY, WV, MI, and OH to try and resolve miscorrelations of the Lockport and Salina groups (Wenlock-lower Pridoli). To improve the temporal constraint and correlation of these units I am utilizing an integrated high-resolution sequence- and biochemostratigraphic (I.e. conodonts and carbon isotopes) methodology, and will also integrate subsurface geophysical data. This research will allow for the correlation of these strata to the globally recognized eustatic and biochemical events that took place during the late Silurian, thereby contributing to future studies focused upon improving our understanding of regional influences on the eustatic signal preserved in the rock record, basin evolution, and how the oceanic, atmospheric, and biospheric systems operated in conjunction with one another resulting in global change in deep time.

My master’s research (UI 2015) entailed the chronostratigraphic analysis and subsurface mapping of Pennsylvanian aged strata in and around metropolitan Kansas City, Kansas. Through this research I effectively recalibrated units in the Zarah Subgroup (upper Pennsylvanian), of the Missourian Stage, improved our understanding of midcontinent depositional history, and highlighted the need for revision to the stratigraphic nomenclature of eastern Kansas.

Experience I value at UI: The most rewarding aspect of my time here at the University of Iowa has been the opportunity to conduct research on topics I feel are important for the general public and science as a whole. Under the guidance of Dr. Bradley Cramer, I have assisted the mining industry in Kansas to resolve the complex stratigraphic nature of strategic aggregate resources in and around Kansas City. This work has the potential to help lower the cost to taxpayers and general consumers significantly in the coming years. As a result of this work, I have now been given an opportunity (through my current dissertation research) to extend that training to other basins with important hydrocarbon and mineral deposits. While at UI I have grown as a scholar through the support of faculty and fellow graduate students, broadening my foundation within the geological sciences, and have had the opportunity to train future UI geologist while working as a teaching assistant for several field courses. Furthermore, over the last four years, I have received numerous invaluable opportunities—funded by the Department of Earth and Environmental Sciences—to communicate my research to local governing boards and the scientific community (both nationally and internationally).

Future Plans: Science, as a whole, is very important to me. Therefore, I plan to continue to contribute to our understanding of the Earth and its history in some capacity. Upon completion of my doctorate degree in May 2019 I intend to continue to apply the knowledge I have gained while at the University of Iowa through employment within the private (mining or oil) or survey sectors where I can assist in resolving complex stratigraphic issues important for regional and national economic vitality.



Alumni Profile:

Julia McHugh, Ph.D. 2012

I completed my Ph.D. work in Department of Geoscience in 2012 (now, the Department of Earth and Environmental Sciences) with Dr. Christopher Brochu. My dissertation research was focused on understanding the impact of the Permo-Triassic mass extinction on amphibian evolution and physiology. Results of this research have been published in the *Journal of Vertebrate Paleontology*.

After leaving Iowa, I was employed as the senior research assistant to the Vertebrate Paleontology and Anatomy Track in the School of Biomedical Sciences at Oklahoma State University-Center for Health Sciences in Tulsa. I spent two years in Oklahoma, growing my research, outreach, and teaching skills. I trained in additional lab and field techniques, assisted faculty on research projects, as well as conducted independent research, built a new community volunteer program for the paleontology program, and became an instructor for the Osher Lifelong Learning Institute. In 2014, I became the curator of paleontology at the Museums of Western Colorado in the Fruita/Grand Junction area. As do most employees of small museums, I wear many hats. I curate, research and build our collections, overseeing our paleontological field program which engages the general public on active scientific expeditions. My



recent research on tooth replacement in the sauropod *Apatosaurus* is in review with the journal *Volumina Jurassica*. I also serve as lab and collections manager, exhibit designer, and site manager for the Dinosaur Journey Museum, while also assisting with community festivals, outreach, and fundraising events. One of my more significant achievements during my short tenure: I co-authored a BLM grant that funded the construction of additional collections space at the museum, increasing our paleontological collections area by almost 30%. Additionally, my appointment carries teaching duties in the Department of Geology at Colorado Mesa University, where I have designed and instructed introductory and upper division courses in paleontology. I am active in the surrounding community and currently serve on the board of directors for the Fruita Area Chamber of Commerce and the Dinosaur Diamond National Scenic Byway.

Jim Lucas (continued from pg. 3)

(continued from page 3) commuting to Washington, D.C., and to client facilities around the country. Subsequently I developed an independent consulting practice, working with petroleum, aerospace, and environmental companies to improve their science and engineering management practices and to enhance their ability to attract and retain young professionals.

A few years ago I moved back to Iowa City, where I still

consult intermittently, do some pro bono management consulting for nonprofit organizations, and frequent the Friday afternoon talks at the Department. In an ironic twist, my career path led me back to teaching in the Department, where I have been assisting Dr. Emily Finzel in a new course: Career Path Planning for Earth and Environmental Sciences. I can tell you that the students look different after all these years, but their career anxieties and aspirations are still the same.

Undergraduate Student Profile:

Emma Kroeger – BS anticipated 2017

Advisor: Bill McClelland

Research Topic: My research has focused on generating more geochronological data for a data starved area of the world – the Canadian Artic. My sample suite comes from some Cambrian rocks on the eastern edge of Ellesmere Island right across from Greenland. In order to retrieve the ages we milled the rocks to sand-sized particles and used mineral separation techniques including the Gemini shaker table, electromagnet separation, finishing with heavy liquids. Once picked and mounted the samples were shot with an LA-ICPMS in order to date them using U-Pb. We have been able to find both similarities and dissimilarities to other samples suites in the area and are working on piecing together the provenance history.



Experiences I value at UI: I certainly have enjoyed the large variety of geoscience courses here at Iowa and especially value the field trip based classes. The Earth and Environmental Sciences department is really just like a family. The faculty really cares about your interests and questions and everyone has different life experiences and can offer advice on almost everything. There are also vast amounts of opportunities as far as getting involved with real science in this department. I have particularly enjoyed my opportunity working for Dr. McClelland in the geochronology lab.

Future Plans: I plan on gaining experience in industry by working in various areas such as mineral exploration in order to explore my interests and the world a little more before going to back to school to attain my Masters' degree.

What made you competitive in your field?

I think having a "hard" science degree helped me stand out in my field. It helped me get my first jobs and give me some level of credibility. A lot of people are entering the workforce with degrees that no one really understands. As a hiring manager, I do not know what the course work consisted of. I think the fact that I am willing to try things and even fail has helped me to be bold and lean in in corporate America. Grit and determination come into play. Social skills and some level of emotional intelligence help more than any degree. Being a good public speaker and writer may be the number 2 skill behind the emotional intelligence stuff.

What were your lucky breaks?

The small world of Chicago and people knowing people. That must have been my biggest lucky break. I took advantage of opportunities as they presented. I worked the long hours when I needed to. Took on more. Always thought about if there was a better way to do something. Volunteered for extra assignments.

What type of preparation would have made you more successful?

A better understanding of the options OUTSIDE of academia and oil and gas. I think that the environmental side of the industry was still very young, but I think there are so many doors a Geology or Geoscience degree can open, if you just know to knock. A better understanding of business and how profits and losses can impact your daily life with billable hours would have been super helpful.

Career Advice

by Mary Clare J. Maxwell (B.S. 1995, M.S. 1997)

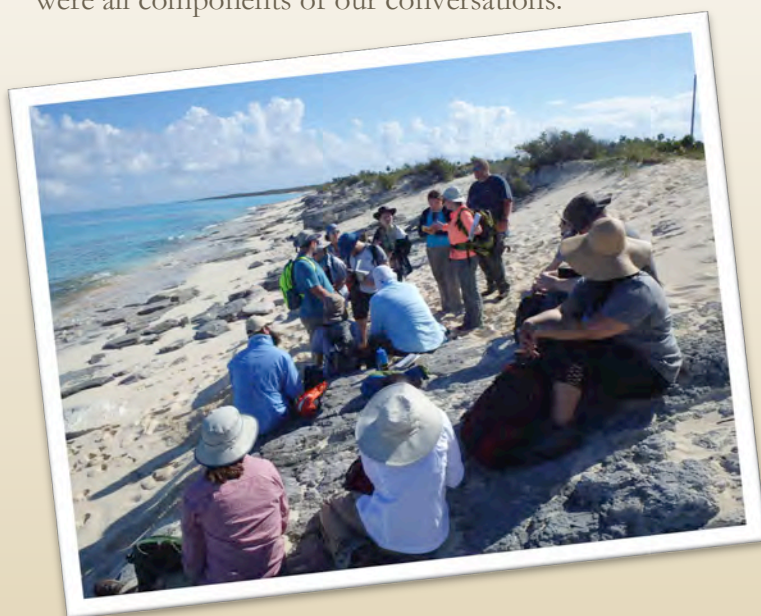


Spring Break Field Trip – The Bahamas

This year, as part of our ongoing initiative to increase the number of field opportunities available to students, Kate Tierney ran a spring break field trip to San Salvador Island, Bahamas. Fifteen undergraduate and graduate students took part in the course, taking advantage of the great opportunity to observe Pleistocene and Holocene sedimentary processes in a carbonate depositional setting. Our field-based, hands-on learning experience permitted students to observe an ideal carbonate platform, and make connections between the classroom setting and real world processes and scales. Students were also taught how we, as geoscientists, tie field observations from one location—such as a remote island in the Atlantic—to other localities around the globe in our endeavor to understand modern day Earth climate and geological processes.



Though the primary focus of this trip was the carbonate depositional setting, significance was also placed upon drivers of sea level change, recent paleo-climate models derived from ice and ocean sediment cores (such as the Antarctic Vostok Ice Core) and the extension of that information to observations on the island. How the age of the geological units on the island were constrained through biostratigraphic and chemostratigraphic methodologies, the island's hydrological cycle, and how modern processes are utilized as analogs for deep-time were all components of our conversations.



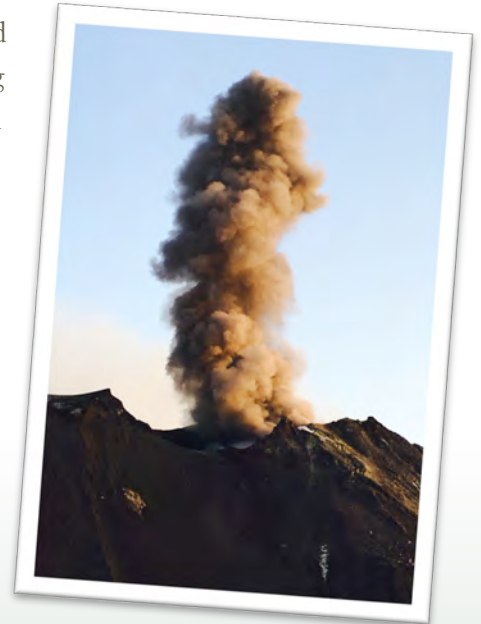
Students were also given lessons on the geopolitical nature of the island: its significant role during WWII as a Naval submarine communications outpost, its long history of slavery and failed attempts at agriculture after the American Revolutionary War, and its historical importance as the first landing site by Christopher Columbus and the discovery of the New World. These lessons highlighted the ecological and hydrological delicacy of the island, man's impact, and the importance for proper environmental and hydrological management.

Italian Volcanoes

by Dr. Ingrid Ukstins

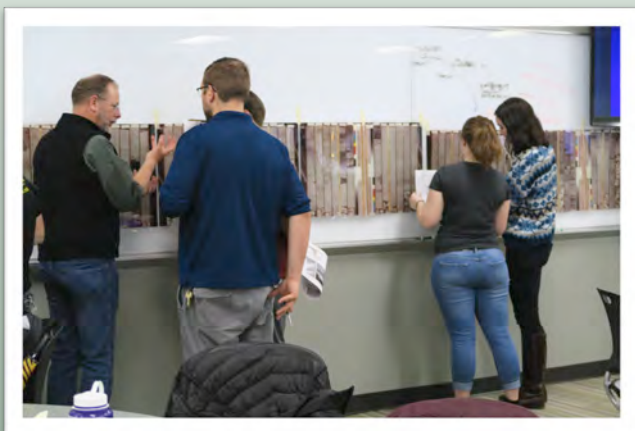


I attended the third workshop on Volcano Geology in Sicily, Italy, from July 3 to 10. The workshop, which had 50 participating scientists selected by the organizers, focused on the challenges of mapping complex volcanic systems, and we were lucky to have a tremendous amount of Field time with many of the Italian Geological Survey scientists who mapped the volcanoes we were looking at. We started the workshop on Mt. Etna, and spent 3 days visiting the volcano, including the Valle del Bove depression and NE Rift. One notable day had us take a ski lift to the top and a 3,000 foot boot ski down the scoria slope on the eastern side. We then took a ferry to Vulcano and used that as our base for the remaining 5 days, having daily Field trips to Vulcano itself as well as other Aeolian Islands of Lipari and Stromboli, including a spectacular evening ascent to Stromboli's active crater to watch the strombolian explosions as the sun set. The small format workshop was excellent for meeting a whole host of international scientists, and discussing volcano mapping on actively erupting volcanoes was a particularly special opportunity for me, since I usually work in old, cold and a lot less actively exploding systems.



Sequence Stratigraphy: An applied workshop for oil and gas exploration

Tim Demko, Senior Research Advisor at ExxonMobil Upstream Research Company, and Dr. Emily Finzel led a two-day workshop on April 1-2, 2017, focused on applying shallow marine sequence stratigraphic concepts utilizing cores, well logs, and seismic. The workshop was attended by undergraduate and graduate students and consisted of all-day classroom-based exercises and a 1/2-day field trip to a local quarry.



Perspectives from Field Camp

by Drew Hutchinson and Tori Solbrig, B.S. Geoscience majors



Last summer we had the unforgettable experience of our first geologic field camp in Montana. Geologic Field Methods has been one of the most worthwhile classes that we have taken here at the University of Iowa. It's one of the few classes that actually prepares us for what we may experience in the field as real geologists. It's a refreshing experience to apply what we have been learning in books to the real world. All the pictures and hand samples that we have been looking at in lectures and labs were now right in front of us! It's a different type of learning that most students in other majors don't get to experience.

During this course, students begin to learn the basics on how to create geologic maps, how to use a GPS, how to deal with outdoor conditions, and many other useful skills. Students spend the entire day (rain or shine) out in the field, hiking up and down ridges and discovering the geology of Montana. It's a great introductory field course that provides a solid foundation to expand upon.



Perhaps one of the most enjoyable parts about taking this course were the friends we made. Before the Montana trip, both of us had only known a few other students in the department. But after spending three weeks in a dorm together, everyone became great friends. Besides making friends with our peers, we were able to build relationships with our teaching assistants and professors.

These familiarities with our professors led us both to gain research positions upon returning from Montana.



Both of us are more than excited to travel back to Montana this summer and take Field Analysis. We are mostly looking forward to traveling to Sun River Canyon, an absolutely stunning location specific to only the Field Analysis course. We are eager to continue learning about the geology of Montana alongside our fellow students!

Graduate Student Profile:

Brennan van Alderwerelt – PhD candidate

Advisor: Dr. Ingrid Ukstins Peate

Research topic: Over the last four years my research has focused on the diversity of lava compositions erupted at monogenetic (i.e. minor) volcanoes in northern Chile. Volcanism in this region of the Andes is dominated by andesitic stratovolcanoes and vast amounts of ignimbrite erupted from caldera complexes. However, minor volcanoes that occur along zones of crustal weakness have produced lavas with compositions not found in larger eruptions. Study of minor lavas has the potential to illuminate melt sources and crustal processes lost in larger magma batches and adds to our characterization of the deep crust and upper mantle beneath South America. In 2014, I sampled several monogenetic volcanoes as part of a UI expedition to the Atacama Desert, Chile. My work since has included analyzing the geochemistry, isotopic composition, texture, and phenocryst architecture of these rocks. The results of my research include updated mapping of the study area, geothermobarometry models, and a conceptual cross-section identifying multiple potential melt sources behind the diversity of lavas in the central Andes.



Experience I value at UI: First and foremost, the EES department has provided me with many opportunities to acquire and hone a broad skillset. My valued experiences have included lecturing, traveling, creating lesson plans, sample processing, grant writing, clean-lab chemistry, using high-tech scientific equipment, fixing high-tech equipment, computerized image analysis, purchasing obscure scientific supplies, building an international network, running an electron microprobe, and fieldwork under any conditions. I could go on all day. It is teaching, however, that has impressed upon me the most – lab, lecture, and field. Teaching a subject to another is the purest path to understanding it for yourself.

Future Plans: Ultimately, I hope to find myself teaching higher education. Igneous petrology and volcanology are my favorite aspects of Earth Science to practice, but I love to be involved with any sort of teaching regarding our complex planet. Given the current climate, my path back to academia may be indirect and protracted, but I'm determined to share my knowledge and skills.

Earth & Environmental Sciences Alumni Advisory Board Meetings

Future Meeting Dates

Starting in 2017, we will revert back to the Friday-Saturday meeting format. We have decided to implement this change in order to better integrate student involvement by introducing a career fair and poster session on Friday afternoon after a morning meeting, followed by a special alumni speaker at our weekly seminar.

2017 Friday, October 13 to Saturday, October 14

2018 Friday, October 12 to Saturday, October 13

2019 Friday, October 4 to Saturday, October 5



Faculty Profile: Chris Brochu, Professor

Most of my lab's work explores the evolutionary history of crocodyliforms – alligators, crocodiles, gharials, and their close extinct relatives. Crocodyliforms are a fantastic group for anyone interested in integrating the earth and life sciences – we can sample every living species and include information from the group's rich fossil record dating back to the Jurassic. We can track their response to tectonic and environmental change over long spans of time. Crocodyliforms were also surprisingly diverse – far from being unchanged “living fossils,” there were hooved forms, marine forms with flippers, and forms adapted for eating plants or hard-shelled prey. Some had horns, and others defy explanation.

Recent projects have focused on origin of Crocodylia in the Late Cretaceous; Late Cretaceous and Cenozoic crocodylians in North America and the Neotropics; conflicts over the relationships of crocodyliforms with long, narrow snouts; and the history of crocodylians in Africa and the western Indian Ocean over the past 30 million years. This is based primarily on fossils and specimens of modern crocodylians in museum collections, though I have done some field work in Utah, Texas, and Venezuela.

Within the department, I serve as the Director of Undergraduate Studies. I teach a large-enrollment course for non-majors entitled “The Age of Dinosaurs,” which is intended to be an introduction to the scientific method and an exploration of how science and the media interact. I teach upper-level courses on vertebrate paleontology and honors freshman seminars on dinosaur art. I will be serving as chair of the CLAS Faculty Assembly next year. I'm also an alumnus of the department (BS 1989).

Mineral and Petroleum Exploration Field Trip

The Mineral and Petroleum Exploration course, led by Dr. Bill McClelland and Dr. Emily Finzel, took a field trip to the northern Appalachian Mountains on April 8-15, 2017. Seventeen undergraduate and graduate students participated in the trip. The overall goal was to complete a structural and stratigraphic transect in the context of mining and hydrocarbon resources from northern Maryland to central Pennsylvania.





Department of Earth & Environmental Sciences
The University of Iowa
115 TROWBRIDGE HALL
IOWA CITY, IA 52242

EARTH & ENVIRONMENTAL SCIENCES

SPRING 2017

Share your perspective

Please share the wisdom you've accrued throughout your career with our students by answering one or more of the questions below. Your responses will be included in the next newsletter. Send them to geology@uiowa.edu and indicate whether you would like it to be anonymous or attributed to you. Thanks for sharing!

What has been the hardest task in developing your career?

What was the most important aspect of success in your first job?

What advice would you give students for overall career success?