

# GEOLOGICAL SCIENCES

ALUMNI NEWSLETTER

NOVEMBER 2016



University of Missouri

## ALUMNI NEWSLETTER 2016

<b>From Our Department Chair</b>	2
<b>Faculty</b>	
News	4
Research Grants	5
<b>Visiting scientists/staff recognition</b>	13
<b>Visiting Speakers</b>	14
<b>Conference</b>	15
<b>Field Camp</b>	16
<b>Research</b>	
Selly	18
Undergraduate Program	19
<b>Study Abroad Program</b>	20
<b>Photo Gallery</b>	
Field Trips	23
Field Camp	24
Outreach	25
Alumni Reunion	26
Undergraduate Presentations	27
<b>Students</b>	
La Reunion	28
Soldati Award	29
Geology Club	30
Student Chapter of AEG-AAPG	31
MU Geology Graduate Society	32
Undergraduate	33
Awards	34
Graduate	35
Publications	37
Presentation	38
<b>Development Activities</b>	
Activities	40
Contributions	41
Endowments	43
Faculty Awards	45
Board Members	46
From Our Board Chair	47
<b>Alumni</b>	
News	48
In Memoriam	51
Edited by: Alan Whittington, Tammy Bedford and Marsha Huckabey	

On the cover: Faculty and students at the Pineta Overlook in the Pyrenees, a part of the Spain Study Abroad trip.

## Roster

### Assistant Professors

Noel Bartlow (Stanford University 2013)  
Geophysics and tectonics  
John W. Huntley (Virginia Tech, 2007)  
Paleontology and Paleoecology  
James D. Schiffbauer (Virginia Tech, 2009)  
Paleontology and geochemistry

### Associate Professors

Martin S. Appold (Johns Hopkins University, 1998)  
Hydrogeology  
Francisco G. Gomez (Cornell University, 1999)  
Paleoseismology and neotectonics

### Professors

Cheryl A. Kelley (University of North Carolina, 1993)  
Aquatic geochemistry  
Mian Liu (University of Arizona, 1989)  
Geophysics  
Kenneth G. MacLeod (University of Washington, 1992)  
Paleontology and biogeochemistry  
Peter I. Nabelek (SUNY, Stony Brook, 1983)  
Trace-element geochemistry  
Eric A. Sandvol (New Mexico State University, 1995)  
Seismotectonics  
Kevin L. Shelton (Yale University, 1982)  
Economic geology  
Alan G. Whittington (Open University, 1997)  
Crustal petrology and volcanology

### Director of Field Studies

Miriam Barquero-Molina (University of Texas, 2009)  
Field methods

### Professors Emeriti

Robert L. Bauer (University of Minnesota, 1982)  
Precambrian geology  
Raymond L. Ethington (University of Iowa, 1958)  
Conodont biostratigraphy  
Thomas J. Freeman (University of Texas, 1962)  
Carbonate petrology  
Glen R. Himmelberg (University of Minnesota, 1965)  
Chemical petrology  
Michael B. Underwood (Cornell University, 1983)  
Sedimentology

### Staff

Tammy Bedford, office support assistant IV  
Marsha Huckabey, business support specialist II  
Carol Nabelek, research chemist  
Stephen Stanton, library information specialist II

## From Our Department Chair . . .

It has been a busy year in the department and we are improving our physical facilities for research and teaching in some fairly spectacular ways. But let me start with our greatest asset, which is our people. We just returned from the Geological Society of America meeting in Denver, where almost 20 students and faculty gave presentations. Highlights included undergraduate Clarke Delisle talking about his senior thesis research in Wyoming (undergrads almost never give talks at national meetings!) and Dr. Miriam Barquero-Molina giving an invited talk about the evolution of her Sed-Strat class to a problem-based learning approach. We had an alumni reception at a nearby hotel one evening (thanks to Buddy and Amy Schweig for the suggestion!), which was very well attended. Most of our Denver area alumni are in geotechnical or environmental fields, and these are the fields that our current students are finding jobs in, so this provided some great networking opportunities, especially with the appointment of Aaron Johnson (PhD '03) as the new Executive Director of the American Institute of Professional Geologists (AIPG), based in Denver. The most popular storyteller of the evening was William "Ace" Caneer (FC '49, BS '52, MS '56) who reminisced about campus life more than 60 years ago – our current students were fascinated to see how things have changed!

Another highlight of the year also took place off campus - the study abroad field trip to Spain in late July to early August. This mixed undergraduate – graduate class on “Variscan to Alpine to Neogene geology in Gondwanaland” was led by Miriam Barquero-Molina, in collaboration with John Mies at the University of Tennessee – Chattanooga, who also teaches at Camp Branson every summer. Eighteen undergraduates and four graduate students from MU spent nearly three weeks exploring the geology of the

Pyrenees, for a once-in-a-lifetime field experience. You can enjoy their photos in the expanded color section in the middle of the newsletter.

Back on campus, our undergraduate and graduate students continue to succeed after graduation, with several undergraduates headed to graduate programs, and master's students hired in a range of industries (engineering and environmental, minerals, oil and gas) and academic positions. Page Quinton (PhD '16) is now an assistant professor at SUNY Potsdam. We welcomed new faculty member Dr. Noel Bartlow in January, who has already recruited two graduate students and obtained National Science Foundation (NSF) funding for her research on “slow-slip” earthquakes. Dr. Jim Schiffbauer is getting a new Scanning Electron Microscope funded by the NSF Instrumentation and Facilities program (a grant totaling \$867k). Jim designed the instrument, to be housed in our building, which will be a great asset for students and faculty working on a wide range of geological topics. Following this success, the Office of Research and many departments and programs across campus all combined to buy a

micro-Computer Tomography ( $\mu$ CT) instrument, also to be housed in our building, that will be used to look inside fossils and other museum specimens, as well as bone and other rock samples. Room 1 Geological Sciences will be the premier microscopic imaging facility in the region, and one of the best in the nation. Meanwhile we are using lab fees to convert room

109 into a computer classroom so that our majors can learn to use state of the art technology a wide range of courses. Both renovations should be complete by Fall 2017.

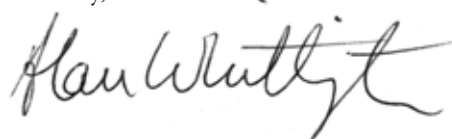
*The photo inset is of Alan Whittington attempting work-life balance near the summit of Mt. Etna, Sicily.*



Over the summer, Dean Mike O'Brien departed MU to become the Provost and Vice President for academic affairs at Texas A&M—San Antonio. Mike has been a great friend and supporter of the Department of Geological Sciences for more than 30 years. He was instrumental in providing support to faculty, students and numerous departmental endeavors (especially field camp). With his leadership, we were able to modify the tuition structure for Camp Branson, which allows us to successfully attract outstanding students from across America. Mike joined the University of Missouri in 1980 as an assistant professor of anthropology and director of the American Archaeology Division, then became director of the Museum of Anthropology, and joined the College of Arts and Science dean's office as associate dean for research. In 2006, he became dean of the College of Arts and Science. We wish Mike and Gloria all the best in San Antonio! The Interim Dean is Pat Okker, formerly chair of the English Department and then Senior Associate Provost, and a national search will be held to find a permanent Dean.

At the end of September, Marsha Huckabey celebrated her 30th year at Mizzou, and celebrated with pie in the department and a weekend at the Roots'n'Blues'n'BBQ festival. Marsha and Tammy's hard work and attention to detail is reflected in this expanded newsletter, which I hope you enjoy. We are all grateful to the alumni and friends who have provided the support to make the department's continued success possible. Please keep us informed of your activities, and "like" us on Facebook at "MU Geology" and "MU Geology Field Camp" to get more frequent updates on our activities.

Sincerely,



Alan G. Whittington  
Chair and E.B. Branson Professor



Alan Whittington with development board members Scott Raymond (center) and Buddy Schweig (right) at the alumni reunion in Denver.



## Faculty News

(In their own words)

**Martin Appold** spent the 2015-16 academic year on research leave. The break from teaching provided time both to wrap up and begin new research, and for extra travel to conferences and research facilities. Mississippi Valley-type (MVT) deposits remained an important focus of research. Doctoral student Joshua Field continued his study of fluid inclusions and the isotopic composition of trace occurrences of MVT mineralization in the U.S. mid-continent. Stuart Kenderes completed his master's degree study of fluorine concentrations in the ore fluids of the Illinois-Kentucky district through analysis of fluid inclusions. Master's student Sarah Smith continued a theoretical geochemical study of the Zn concentrations of ore fluids in the Illinois-Kentucky and Central Tennessee districts predicted from the solid solution Zn concentrations in ore stage calcite and galena. Master's student Riaz Khan began working on the Southwest Partnership for CO<sub>2</sub> Sequestration project, conducting reactive transport modeling to simulate the behavior of injected CO<sub>2</sub> in the Farnsworth, Texas hydrocarbon field. Undergraduate student Cale Diehl continued a project studying fluid inclusions in zinc silicate deposits in the Vazant, Brazil and Star, Zambia deposits. Martin completed his first year as co-editor of *Hydrogeology Journal*. Martin, Kevin Shelton, and Peter Nabelek co-organized and co-hosted the Pan American Current Research on Fluid Inclusions (PACROFI) conference and short course that were held on the University of Missouri campus May 23-26, and the ensuing field trip to southeast Missouri from May 26-28.

**Bob Bauer** is enjoying retirement, but he continues to work with the UM Campus Writing Program and also continues his research in Wyoming. He and Karen are enjoying traveling and visiting friends and relatives.

**Miriam Barquero-Molina** returned from military leave in time for Spring 2016. She once again taught Sedimentology and Stratigraphy as well as a study abroad class on the Geology of Northern Spain. In late May Miriam headed out to Wyoming to run our geology field camp. Upon her return in mid-July she managed to get some laundry done (just barely) and quickly head to Spain for the "abroad" portion of our Spain class.

**Noel Bartlow** is excited to be the newest addition to the Geological Sciences faculty. Noel is in the midst of getting her new lab set up and recently received a 3-year research grant funded by the National Science Foundation GeoPRISMS program. She has also recruited two masters students who started this fall: Ryan Yohler and Nick Benz. Ryan comes to Mizzou from Indiana University–Bloomington. He's leaping immediately into research, working on improving models of slow earthquakes and inter-plate locking in the Cascadia subduction zone offshore Oregon and Washington. Nick Benz comes to Mizzou from the University of Texas–Austin where he did geophysical research at the University of Texas Institute for Geophysics. Nick is considering multiple options for his master's research. Noel is also advising an undergraduate physics major, Amrit Bal, who is working on a research project investigating a novel method for removing seasonal noise from tectonic GPS data. Amrit plans to present her work at the 2016 American Geophysical Union meeting in December. Noel, her husband Grant, their daughter Caitlin, and their dog Jack have settled into Columbia quite well. Caitlin and Jack are especially enjoying the large backyard behind their new house.

**Ray Ethington** reports that he continues to massage conodont collections of former years, hoping that eventually he will understand them. Of course he said that last year and you may assume he is misleading himself. Evidence to the contrary is that this year Palaios published his paper on conodonts from Cambrian/Ordovician boundary beds in west central-Utah. He aspires to repeat this effort on other collections now that he has eliminated the cataracts he was looking through in recent years. And, Leslie's broken arm with carpal tunnel complications is completely healed at last. Life is good, but he really would like to be back in the desert and mountains of central Nevada chasing conodonts that got away.

**Tom Freeman** and Peggy continue to enjoy the occasional trip to Arkansas to visit family and friends, as well as frequent visits from sons Tom and Rob, their wives Dawn and Nancy, and four grandchildren. Tom continues to publish his manuals *Geoscience Laboratory 5th* edition and *Environmental Geology Laboratory 2nd* edition via John Wiley and Sons. Their eldest son, Tom, has assumed the business of publishing the pocket booklet *Geology Field Methods*. This year he and Peggy have been sorting through piles of old photos and slides and have uncovered lots of great outcrops, exciting travel adventures, and

fantastic students. Life in geology has been a blessing to the entire Freeman family.

**Paco Gomez** and his neotectonics research had a busy year. In the classroom, Paco taught his regular course offering of surficial geology (undergraduate), as well as a course on remote sensing for geoscientists. A major research emphasis is the National Science Foundation-funded project for the Afar rift in Ethiopia. Doctoral student Sean Polun continued his research on extensional tectonics in the Afar. Master's student David Horrell completed his thesis relating bedrock river erosion to faulting in the Afar region. Master's student Charlie Miles is studying kinematic, hydrological, and thermal properties of rock glaciers in Colorado. Master's student Kelly Hickcox is studying mass wasting and rock fall problems in western Colorado. Undergraduate student Clarke Delisle conducted field work during the summer as part of his study of late quaternary faulting in the Wind River Basin of Wyoming. Last, but not least, the research group is joined by two additional students: David Nymberg will be studying neotectonic fault interactions near the junction of the Garlock and Southern Death Valley Fault Zones (eastern California) as part of his master's research, and George Davis will be conducting research on Quaternary geology and neotectonics in Missouri and western Nevada. Additionally, Paco has also initiated applied research relating to rock fall hazards in Arches National Park.

**Glenn Himmelberg** reports that he and Marilyn are adjusting to his new retirement.

**John Huntley** had another fun and productive year with the paleobiology group here in the department. Kelly Hale successfully defended her master's thesis in April. Matt Jeffrey (co-advised with Kevin Shelton and Jim Schiffbauer serving as an unofficial third advisor) is making good progress on his master's thesis examining the litho-, bio-, and chemostratigraphy of the SPICE carbon isotope excursion preserved in late Cambrian carbonates of Missouri. We have submitted a paper demonstrating that the SPICE is time-transgressive, facies dependent, and could not have been the driver of biotic turnover at the Marjumiid-Pterocephaliid biomere boundary. Matt will be following up with a longer format analysis. It has been great fun working with local geology and addressing open research questions related to the work done in years past at MU by Professor Stitt. Matt will be presenting this work at the annual GSA meeting in Denver. Liane Linehan is also making good progress

toward completing her master's research. Her first chapter is dedicated to building a global database of the fossil record of parasites of marine animals in collaboration with Kenneth de Baets at the University of Erlangen and her second chapter will involve trematode parasitism of bivalves in the Lesina lagoon (Italy) as a modern analog for fossil lagoonal bivalves (in collaboration with Daniele Scarponi). Liane will be presenting her results on the global database at GSA in Denver. Mikaela Ruga (BS Westminster College) joined the group as a master's student. Mikaela will use various geochemical approaches in order to interpret changes in salinity, temperature, and productivity in Holocene estuarine environments of the Pearl River estuary (China). These samples were the first to demonstrate a link between the initiation of sea level rise and a dramatic increase in parasite prevalence and we would really like to better understand the environmental context of this ecological shift. John was honored to be selected as a Senior Visiting Fellow at the Institute of Advanced Studies at the University of Bologna this summer (with the generous support of the MU Research Council Faculty International Travel Award). He was able to further promote the efforts of their group to understand the links between global change and shifts in ecosystem function by addressing the Institute in the Sala Rossa of the Scuola Superiore di Studi Umanistici. This impressive room houses 16th Century frescoes that depict the 1530 coronation of the Holy Roman Emperor by Pope Clement VII in Bologna. Additionally, through the generous support of the Unklesbay Fund, John was able to see new geology from the Dolomites to Pompeii, visit Steno's tomb, and explore the evolution of western art during the Renaissance and its links to the origin of geology as a science. All of these activities will allow him to develop novel lessons in Historical Geology for next semester.

**Cheryl Kelley** had a good year, beginning with mentoring Haris Hopkins through her senior thesis during the summer and fall semester. Haris determined methane oxidation rates in the water columns of some of our local reservoirs, which she then compared to both reservoirs and natural lakes from the literature. Cheryl also presented her own research into methane substrate utilization within hypersaline environments at the AGU meeting in San Francisco in December. With the retirement of Mike Underwood, Cheryl took over teaching The World's Oceans class in the spring semester. During the same semester, she also taught Low-Temperature

Geochemistry. Both classes were enjoyable, although the The World's Oceans class was especially fun since she was able to draw on her own graduate experiences in Marine Sciences. In the fall semester she taught an old favorite, Global Water Cycle. Over this past summer, Cheryl was part of a faculty search committee for the MU School of Natural Resources to hire a new assistant professor in the area of water quality and resources. Very strong candidates, working in both lakes and streams, were interviewed. Throughout the process, Cheryl was reminded of the breadth and strength of her colleagues across the MU campus.

**M**ian Liu survived from teaching Structural Geology last fall, before the real structural geologist arrived. Otherwise life went on as usual and he continued to study earthquakes. Collaborating with Dr. Chen, a visiting scholar from China Earthquake Administration (CEA), they found significant gravity increases at four absolute gravimetry stations in southern Tibet before the 2015 Nepal earthquake (Mw 7.8), and suggested that the crust in a broad region of southern Tibet participated in strain accumulation that drives earthquakes in the Himalayan front faults. This study, published in *Geophysical Research Letters*, sparked interest and debate, so the team resurveyed these stations in the summer of 2016 and is in the process of writing another report. He and his colleagues in the U.S. and Europe published a number of papers last year on intracontinental earthquakes and the associated hazards. Mian's other field of research is lithospheric deformation. Working with Dr. Shen, another visitor from CEA, they used seismic data from a regional network to show that there was no evidence of the Asian lithosphere subducting under the northern Tibetan Plateau, as proposed by some earlier studies. He worked with Dr. Li, a visiting scientist from Chinese Academy of Science, on the geodynamics of delamination of mantle lithosphere. This study is published in *Journal of Geophysical Research*. The stream of young visiting scientists from China has been fueling the vibrant research at Mizzou. Mian is hosting two visitors at the moment: Dr. Boyan Liu from CEA, who works on earthquake physics, and Dr. Guimei Wan from the Chinese University of Petroleum, who works on basin formation. A new visitor from CEA is expected to join Mian's group this fall.

**K**en MacLeod reports that plans for IODP Expedition 369 are moving forward at a good pace. The expedition has added a drill site in the

Australian Bight (the indentation along the southern coast of Australia) to previously planned sites in the Mentelle Basin and on Naturaliste Plateau (tectonically intriguing features that lie southwest of Australia). There are now set dates and planned ports of call. The expedition will last 2 months departing Hobart Tasmania in late September 2017 and return to Fremantle Australia in late November 2017. Ken hopes to sail as the stratigraphic coordinator, and doctoral student Shannon Haynes has applied to sail as a sedimentologist. Cruise objectives include investigation of Late Cretaceous greenhouse climates, carbon cycling, and ocean circulation. Getting access to samples from an understudied region of the Cretaceous globe, Shannon would hope to build on work she has done on samples from Tanzania and existing deep sea core material. Shannon passed her qualifying exam this year and continues to work as the lab manager in the stable isotope lab. In her research, she is testing the relationship between circulation and a regional cooling events that occurred about 70 million years ago. She has taken several trips to the University of Florida to measure Nd isotopic ratios in fish debris, and during the most recent one, she reportedly set the lab record for generating the largest number of measurements in the shortest amount of time ever for the lab. She will be presenting a talk using some of those data at this year's GSA annual meeting in Denver. Page Quinton defended her doctoral degree last May, moved to upstate New York in June, taught at the Indiana University field camp in Montana in July, and started work as tenure track professor in the Geology Department at SUNY Potsdam in August. Page will also be giving a talk at the GSA meeting. On the subject of former students, while finalizing details related to the publication of her masters' research, Kelsey Hughes (Putman) caught us up on her recent activities. She is still in Tulsa and has recently moved from Orca Resources to her current position as a senior geologist at Staghorn Petroleum. Finally, masters student Kate Ferguson is progressing towards her degree keeping two projects active. She continues to work on trying to constrain temperature in the Late Cretaceous arctic from isotopic analyses of fossil fish remains, and she is also trying to refine interpretations of the ecology of individuals within an assemblage of very well preserved Late Cretaceous fossils from an exposure of the Owl Creek Formation in Mississippi.

**P**eter Nabelek is looking forward to being on research leave during the 2016-2017 academic

year. His two master's students, Eric Nowariak and Antonio Manjón-Cabeza Córdoba, obtained their degrees after doing field-based research in the Proterozoic/Archean Hartville Uplift of eastern Wyoming. His doctoral students, Yanying Chen and Ashraf Gafeer are coming up with exciting results in their dissertations. Elizabeth Gammel's radiogenic isotope and trace element analysis of granitoids in the White-Inyo Range eastern California is yielding new information about the Mesozoic magmatic evolution of the arc terrain.

**E**ric Sandvol and the seismology research group have continued working on the large amounts of data from central Turkey and China. In addition the seismology group was funded to deploy a large seismic array across the Greater Caucasus mountains including the countries of Azerbaijan, Armenia, Georgia, and Russia. This is a very large effort that will involve scientists from three U.S. Universities and a large number of scientists from all of the countries involved. Two scientists from Azerbaijan, Ruginya Kerimova and Yegana Muridova, will visit the Mizzou seismology group for three and a half weeks in August and September to prepare for this project. In addition we have a new graduate student, Mike Gunnels, who will work on this project with the Azeri scientists. We have dismantled our 71 seismic broadband seismic network in central Turkey as a part of the Continental Dynamics Central Anatolia (CDCAT) project with the help of undergraduate Joshua Russell. Undergraduates Nick Marti and Jordyn Cloud have worked over the last year to analyze the data. Jordyn is measuring uppermost mantle attenuation using data from the CDCAT network; Jordyn is going to Brown University for her graduate studies. Nick Marti looked at shear wave splitting from teleseismic SKS and SKKS waveform data; Nick is going to graduate school at the University of Tulsa. Wenfei Ku and Eric are continuing their work with the Air Force Research Laboratory and the National Nuclear Security Agency on the seismic attenuation in the Iranian and Tibetan plateau. This work is important to be able to better predict seismic amplitudes of the seismic phase Sn across Anatolian, Iranian and Tibetan plateaus. We have expanded our work from the crust to the uppermost mantle in order to understand propagation of shear waves within the lithospheric mantle. Wenfei will be finishing his doctoral thesis in the fall of 2016. Rayan Yassminh has continued her work on understanding the attenuation structure of the United States by looking at

localized site amplification terms across the central and eastern U.S. using USArray data. She has discovered that on both flanks of the Appalachians there is relatively large site amplification of high frequency seismic waves. This work has important implications for seismic hazard estimates in the central US. Rayan has also completed an initial model of Sn attenuation in the central US. She will present her finds at this year's Fall AGU meeting. JingJing Pan finished her Thesis on Sn attenuation across all of China. She was able to construct a very nice image of uppermost mantle shear wave attenuation beneath China. She is working with me to prepare her thesis for submission as a paper to Geophysical Journal International. Hongjun Hui is continuing his work on modelling of high frequency wave propagation through the Earth's crust and uppermost mantle. He has helped in the upgrade of our cluster and the installation of the latest version of the spectral element code SPECFEM3D. Hongjun also has plans to extend his work to include geodynamic modelling of slab roll back and break off beneath central Turkey. In addition to these projects Eric is working to establish a new project in the country of Myanmar which has been previously closed to foreign scientists. He visited Myanmar twice over the past year and hopes to conduct a major seismic experiment there in the next two years.

**J**ames D. Schiffbauer reports that this past year has been the toughest personally, but one of the best professionally. In March his dad passed away after a long battle with Parkinson's disease. As much as Jim normally pours himself into his science, getting back into it since then hasn't been an easy task. Now that he has had a moment to step back from it all, and thinks about all of the advice his dad had given him over the years—nearly all of it revolves around hard work and dedication. So, Jim says he owes it to him, his biggest supporter, to keep doing exactly that. On the other end of the spectrum, it has been a great year professionally. He was named the recipient of the 2016 Provost's Outstanding Junior Faculty Research and Creative Activity Award, and his National Science Foundation Instrumentation and Facilities proposal was fully funded (just shy of \$900,000). This latter bit means a shiny, new, highly specialized scanning electron microscope is on its way to the department, which he is sure will have enormous benefit in research output and outcomes, graduate student recruiting, and educational/training opportunities for our current students. We've been



keeping busy with research—our group has published five papers since the last newsletter, including doctoral student Tara Selly's first paper, which made the rounds in several science news outlets. Tara also had other exciting news—in her first year as a doctoral student, she was awarded the prestigious Stephen Jay Gould Research Award from the Paleontological Society. Jim's former master's student, Gretchen O'Neil, successfully defended her thesis, and has her first paper in press at *GSA Today*. She moved on to North Dakota State University to pursue a doctoral degree in paleoecology/sedimentology. Jim welcomed a new student to his group this fall. Stephanie Rosbach grew up in the Columbia area, but went to the University of New Haven (Connecticut) for her undergraduate education, where she was able to work with the Yale University Peabody Museum for her undergraduate research. Stephanie received one of the University's competitive graduate school fellowships to help supplement her master's work, and has hit the ground running with her research on taphonomy of the Mazon Creek fossils from a now-defunct mine locality—yes, we have some Tully Monsters! The entire group is traveling to GSA in Denver, and everyone is a contributing author on at least one abstract (we have a total of nine presentations this year, eight of which have student contributing authors or presenters). Jim will be speaking on their recent work on a widely-known, late Cambrian carbon isotope excursion that they were able to study in Missouri carbonates. At home, everything is going pretty well. Jim and his wife took their first 'vacation' in about a decade, partially supported by the Unklesbay Fund, to Las Vegas, Nevada. Of course he did some work while there, building new collaborations with UNLV scientists, but meeting Penn & Teller may have been the highlight of the trip. Jim's son Parker recently turned four, and has begun memorizing every detail of construction vehicles, from front-loaders to backhoes. His daughter Everleigh is now one, and has immediately jumped headlong into the 'terrible twos'. Stay-tuned to the next newsletter for images from the new electron microscopy lab!

**Kevin Shelton** is entering his 34th academic year at MU. He is spending his time working on several manuscripts and conducting fieldwork in the UK and in southern Missouri. Master's student Laura Perry completed her degree this summer with a thesis entitled "Gold in the northern Yellowknife greenstone belt, Canada and Pb-Zn-Cu in the MVT deposits of S.E. Missouri: Geochemical studies and numerical models." Tyler Adelstein is completing his

senior thesis on geochemical studies of the zinc-rich West Fork mine in southeast Missouri. This fall, Kevin is teaching Mineralogy and Stable Isotope Geochemistry (to a personal record enrollment of 12 graduate students plus 2 of our faculty). In spring 2017, after a 13-year hiatus, Kevin returns to the introductory geology auditorium rotation to teach Planet Earth. On the home front, Lois and Kevin celebrated their 36th wedding anniversary a bit early with a trip to Kauai in July.

**Mike Underwood** thoroughly enjoyed his first year of retirement from the University of Missouri. He and Gail split their time between Columbia and the mountains of northern New Mexico.

**Alan Whittington** taught a themes class on Natural Disasters, and co-taught Solar System Science with Angela Speck during the fall. Alan participated in the UM System's year-long Leadership Development Program, with events of the Fall semester providing a case study. In October, Alan attended the 10th Silicate Melts workshop, in the hills of Alsace, France, with doctoral students Alexander Sehlke and Arianna Soldati. Alex defended his doctoral degree in November, and started his dream postdoc at NASA Ames (next door to Google) in January. In the spring, Alan visited the island of La Réunion, in the Indian Ocean, to do fieldwork on Piton de la Fournaise volcano with Arianna. Alan then gave a keynote talk on thermal properties of magma at the 15th High Temperature Materials Chemistry conference in Orléans. In April, Aaron Morrison defended his master's thesis, and immediately began work on his doctoral degree. Over the summer, Aaron worked with visiting postdoc Mike Zanetti from the University of Western Ontario to study the rheology of melts produced by large impacts on the Moon. In May, Alan visited northern Ontario with doctoral student Jesse Merriman and undergraduate Derick Roy, sampling the lower crust in the Kapuskasing structural zone, alkali carbonatite complexes (including outcrops accessed by traversing beaver dams), and Archean komatiite lava flows. In June, Alan led the Teton-Yellowstone field trip from Field camp. In July, Alan visited Etna and the Aeolian islands with the 3rd IAVCEI workshop on volcano geology. Highlights included witnessing Strombolian eruptions at Stromboli, and swimming to an outcrop on Lipari. In August, Alan, Jesse and Jim Schiffbauer ran a one-day workshop on Geologic Time for middle and high-school teachers from Columbia and Jefferson City schools. Xander (12) and Hamish (9) taught Alan a lot about Minecraft.



Noel Bartlow, an assistant professor in the department of geological sciences, is interested in earthquakes that take a long time to occur. The focus of her research is slow slip events, or what are referred to as “slow earthquakes,” earthquakes that can last from a few days up to a year. But you probably wouldn’t notice these slow earthquakes because they do not produce seismic waves or cause buildings to shake; in fact, Bartlow says scientists did not realize slow slip events were occurring until the late 1990s.

Because slow slip events do not emit seismic waves, Bartlow says scientists measure the movements of tectonic plates at a geologic fault line using GPS monitors. Slow slip events are usually found in subduction zones, where one tectonic plate slides under another plate, and there are two subduction zones in America—Cascadia in the Pacific Northwest and the Alaska subduction zone. Bartlow says her research is focused on the Cascadia subduction zone as well as another one in New Zealand, where she maintains ongoing research collaborations with GNS Science New Zealand. Bartlow says slow slip events do not pose a direct danger to people or property like typical earthquakes, although she says slow slip events can trigger regular, damaging earthquakes. “In fact, the 2011 earthquake in Japan that caused the devastating tsunami that destroyed the nuclear power plant started as a slow slip event,” Bartlow says. “That taught us that sometimes slow slip events can accelerate and become a regular earthquake, and when that happens it can be a mega-thrust earthquake up to a magnitude 9.”

Bartlow was recently told her first proposal to the National Science Foundation has been accepted for funding. She is soliciting applications from master’s students and doctoral candidates to assist in the three-year project, which will help improve earthquake forecasting. Earthquake forecasting is currently based largely on historical data, but that data only goes back about 100 years, so earthquakes that recur every 500 or 1,000 years are sometimes not recognized. Bartlow says studying slow slip events might give scientists a window into things they might miss otherwise and improve earthquake forecasting.

Bartlow is originally from Washington, D.C. and earned her bachelor’s degree in physics at Carnegie Mellon University in Pittsburgh, Pennsylvania. She completed her doctorate at Stanford and spent the past two years as a Miles Postdoctoral Fellow at the Institute for Geophysics and Planetary Physics at the Scripps Institution of Oceanography at UC San Diego. Her husband, Grant, has a degree in computer science and works as a systems developer for Carfax; their daughter Caitlin will be two in March.

So what enticed Bartlow and her family to relocate from sunny California to central Missouri in the dead of winter?

“It was very expensive to live in California,” she says. “I was looking for a place where I could settle down and have a faculty job at a good university that would support me. We also wanted to find a place where we could afford a house in a community that also has good schools for my daughter. Columbia and the University of Missouri offer all of those things.”

Article written by Jordan Yount, College of Arts & Science.

## Schiffbauer Receives Award

Columbia, Mo (May 13, 2016) – Assistant Professor James Schiffbauer (<http://paleo.missouri.edu/people/schiffbauer.shtml>) of the Department of Geological Sciences has been named to receive the 2016 MU Provost's Outstanding Junior Faculty Research Award. The award recognizes faculty, who are in the early phases of their careers, for superior research and creative activity on the MU campus.

Dr. Schiffbauer is interested broadly in the evolution and ecology of our earliest animal ancestors, and the geobiological and environmental factors that influence soft-tissue fossil preservation. He studies pathways of exceptional preservation, largely focused at the Ediacaran–Cambrian transition during the dawn of animal life.

Jim received his Honors BA in Biology from West Virginia University (2000), dual MS degrees in Marine Biology and Coastal Ecosystems from Nova Southeastern University (2004), and a PhD in Geobiology from Virginia Tech (2009). Following a two-year post-doctoral position in the Virginia Tech Department of Geosciences, he spent a year as an Assistant Research Professor at the Virginia Tech Institute for Critical Technology and Applied Science Nanoscale Characterization and Fabrication Laboratory and an Adjunct Professor in the Virginia Tech Department of Geosciences, studying advanced microbeam analytical methods in geosciences. Jim joined the Mizzou Department of Geological Sciences in 2012.

Previous winners of the award include Prof. Eric Sandvol and Professor Emeritus Mike Underwood of the Department of Geological Sciences.

Dr. Schiffbauer will receive the award at a ceremony in November 2016.

Article written by Jordan Yount, College of Arts & Science.



An outcrop of the Bonne Terre/Davis formations in southeastern Missouri.



John Huntley loves Italian food, which is convenient because the assistant professor of paleobiology will spend the next month as a senior visiting fellow of the Institute for Advanced Studies at the University of Bologna, Italy.

One main area of Huntley's research focuses on the fossil record of interactions between organisms, particularly parasites and hosts. Huntley and a colleague will spend part of the summer examining core samples taken from the Po River plain in Italy to analyze traces made by parasitic flatworms (trematodes) on the shells of clams and other bivalves. Huntley is studying how those interactions change through sea-level cycles. He says an interesting finding from previous research projects in Italy and China is that the prevalence of these parasites increases dramatically during the first stage of sea-level rise. The question he asks is why?

"One of the things we found in China is [the prevalence] has nothing to do with changes in salinity and nothing to do with how abundant the preferred host is," Huntley says. "So it's probably not a single factor. What we're talking about is understanding the broad, ecological context of how this family of parasites responds to sea-level cycles and how it influences the ecosystem."

Huntley says researching how this parasite-prey system responded during previous sea-level cycles gives scientists a better understanding of what occurred naturally in deep time, which can then be used to investigate modern ecosystems. Huntley says the research could help scientists better understand the implications of warming temperatures and rising sea levels on current marine and freshwater ecosystems.

"It's really a wonderful example of research that is pure, exploratory research—not knowing where it's going to lead that could perhaps hone in on something with real applications for modern human problems," he says. "We're not going to solve the world's problems, but we have a real narrow slice where we can offer practical contributions to understanding anthropogenic climate change."

Huntley also is excited about the chance to dine on Italian cuisine. The last line on his website, describing his research interests in organisms from the marine, freshwater, and terrestrial realms ranging in age from Paleoproterozoic to Anthropocene, states, "His current favorites are modern bivalves (especially when pasta, olive oil, and wine are involved)."

Article written by Jordan Yount, College of Arts & Science.





Josh Field, along with Martin Appold and Stuart Kenderes conducted research work at the Argonne National Lab in October, 2015.

## Active Research Grants

### American Chemical Society

Jim Schiffbauer	\$100,000
Alan Whittington	\$110,000

### Lawrence Livermore National Lab

Eric Sandvol	\$14,000
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### National Science Foundation

Martin Appold	\$230,000
Noel Bartlow	\$243,000
Paco Gomez	\$290,000
Paco Gomez	\$300,000
Paco Gomez with UM Civil Engineering	\$350,000
Mian Liu	\$245,000
Ken Macleod	\$225,000
Ken Macleod	\$560,000
Peter Nabelek	\$226,000
Eric Sandvol	\$609,000
Eric Sandvol	\$323,000
Eric Sandvol	\$281,000
Jim Schiffbauer	\$867,000
Alan Whittington	\$262,000

### University of Arizona

Alan Whittington	\$13,000
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### UM Research Board

Jim Schiffbauer	\$60,000
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### UM Research Council

Kevin Shelton	\$8,900
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### U.S. Department of Defense

Eric Sandvol	\$429,000
Eric Sandvol	\$189,000

### U.S. Department of Energy

Martin Appold	\$272,000
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### U.S. National Park Service

Paco Gomez	\$39,800
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## NEWS



Ruqiyya Kerimova (center) and Yegana Muridova (right) from the Republican Seismic Center of Azerbaijan spent 25 days at the University of Missouri working with Eric Sandvol (left) and his students Mike Gunnels and Rayan Yassminh. They worked on developing a three dimensional image of the crust and uppermost mantle beneath most of Azerbaijan as well as a complete map of earthquake locations in that country. Their work will help us better understand the tectonics of the Greater Caucasus and characterize the seismic hazard in the region.

## Marsha's 30th Year!



September 29, 2016 marked the 30th anniversary of Marsha's employment in the department. Many faculty were on hand to award her a card with tickets to the Roots 'n' Blues Festival that was held in early October for their appreciation of her dedication to the department.

## Visiting Speakers

A rich and varied program of visiting speakers was funded by our Williamson Family Endowment Fund. Last year's Williamson Family Colloquia and other seminars included:

**Richard Alley, Pennsylvania State University**  
Crumbling at the edges: Ice sheets and sea level.

**William Casey, University California-Davis**  
NMR Spectroscopy on aqueous solutions to geochemical pressures.

**Kevin Chamberlain, University of Wyoming**  
Archean craton evolution and the Proterozoic assembly of Laurentia: a Wyoming perspective.

**Ted Daeschler, Academy of Natural Sciences of Drexel University**  
Great steps in the history of life: The origin of limbed vertebrates.

**Kenneth De Baets, Friedrich Alexander Universität Erlangen, Germany**  
The importance of fossils in understanding of the evolution of parasites and their vectors.

**Ahmed Ehbanna, University of Illinois of Urbana-Champaign**  
The different signatures of pulse like earthquakes propagating on thin faults.

**Josh Field, MU Geological Sciences**  
Geochemical controls on the formation of North American midcontinent Mississippi valley-type Zn-Pb deposits: Insights of trace occurrences of mineralization.

**Candace Galen, MU Biological Sciences**  
Species interactions in alpine ecosystems.

**Peter Hudleston, University of Minnesota**  
Recumbent folds and migrating hinges.

**Mike Ramsey, University of Pittsburgh**  
Thermal infrared properties of active lava flows: Using remote sensing, laboratory and field data to constrain cooling and flow propagation.

**Eugene "Buddy" Schweig, USGS, Denver**  
What a long, strange trip it has been: My observations after a career in industry, academics, and the USGS.

**Arianna Soldati, MU Geological Sciences**  
4D Rheological and morphological evolution of basaltic lava flows.



Dr. Ted Daeschler, Academy of Natural Sciences of Drexel University.

## CONFERENCE PACROFI XIII

The biennial Pan American Current Research on Fluid Inclusions (PACROFI) conferences and their European (ECROFI) and Asian (ACROFI) counterparts are among the leading venues in the world for presenting fluid and melt inclusion research. The Department of Geological Sciences had the privilege of continuing that tradition by hosting PACROFI XIII conference from May 24-26 (<http://muconf.missouri.edu/Pacrofi/>). The conference was preceded by a one-day short course on fluid inclusions taught by Robert Goldstein of the University of Kansas, and followed by a two-day field trip to southeast Missouri to see the St. Francois Mountains Precambrian igneous rocks, the Cambrian platform carbonate rocks, Mississippi Valley-type Pb-Zn-Cu ores in the Viburnum Trend Brushy Creek mine, and iron oxide ores in the Iron Mountain mine. A conference dinner was held at Les Bourgeois Restaurant in Rocheport. Martin Appold, Kevin Shelton, and Peter Nabelek co-organized the conference and related activities. The conference drew 72 registered participants representing Canada, Chile, China, India, Norway, and the United States. A total of 57 oral and poster presentations (including five keynote lectures) were given in the following topical categories: Recent Innovations in Technique and Application, Phase Relations, Sedimentary Basins and Diagenesis, Fluid and Melt Inclusions in Igneous and Metamorphic Systems, and Hydrothermal Ore Deposits. The conference was supported by Doe Run Mining Company, The Geochemical Society, McCrone Microscopes and Accessories, Olympus Corporation, and The Society of Economic Geologists.



Field trip to SE Missouri.



Group photo of conference attendees in front of the Geological Sciences Building May, 2016.



## FIELD CAMP FIELD COURSE

It was a great summer at the University of Missouri Branson Geology field camp. We received 40 students from nine different institutions: University of Missouri, Sam Houston State, University of Nebraska-Omaha, Northwest Missouri State, Muskingum University, Central Michigan University, Missouri State University, University of Idaho, and University of Pittsburgh.

We were pleased that 10 out of our 40 students qualified for scholarships from our alumni contributions to the camp's scholarship funds (see photo). If you have a chance, visit our field camp website (<http://fieldcamp.missouri.edu/>) which is the main venue through which potential students learn about our camp. You can also "like" us and follow on Facebook at <https://www.facebook.com/Camp.Branson>.

Our projects in field camp are diverse and highlight a broad range of geological field experiences, including sedimentology, stratigraphy and sedimentary environments, geologic mapping of folded and faulted sedimentary rocks, structural analysis of metamorphic rocks, surface and groundwater hydrogeology

and reflection and refraction geophysics. We were able to work with a group of exceptional field instructors with expertise in all of the disciplines that the students are exposed to at Camp Branson. Damon Bassett, an instructor at Missouri State University and a paleontology and sedimentology expert. Jon Mies, a structural geologist at the University of Tennessee at Chattanooga, worked with Miriam on the field mapping projects on Dallas and Derby Domes as well as our fifth and sixth week advanced structural geology projects near South Pass. Alan Whittington accompanied the students on a four-day field trip to Yellowstone and the Tetons National Parks. Ed Romanowicz and Dave Franzi



(SUNY-Plattsburgh) oversaw our surface and groundwater hydrology projects. Eric Sandvol took charge of all the geophysics projects.

In addition to our faculty, we managed to gather an incredible group of teaching assistants: Angie Van Boening (former MU graduate student, now finishing a doctoral degree at Texas A&M); Elizabeth Gammel and Stuart Kenderes (MU graduate students both working on their doctoral degrees); Joe Cochran (former MU undergrad and grad student, now finishing a doctoral degree at Virginia Tech); Levi Croke (former MSU undergraduate now finishing his master's degree at the University of Alabama); Michael Pelch (former MU undergrad and grad student, who just completed his doctoral degree at North Carolina State) and Jordyn

Cloud (graduated from MU this spring and is headed to Brown University for a doctoral degree). How many PhDs and future PhDs does it take to run camp Branson? Well, a whole lot of them. Rock science ain't easy. Our camp support staff were, as always, magnificent. Jill McKenzie, our cook, and Kaitee McKenzie, our cook helper, did a superb job of keeping us

all fed and happy for six whole weeks. Our permanent caretakers, the newest additions to Team Camp Branson, Lynne and Hotrod Smith, were absolutely excellent, had the place ready to go when we arrived, and kept it in top shape during the season. And have a list of projects to keep them busy during the rest of the year until we get back for the next class. Go figure.

Thanks to all the faculty, staff, alumni and friends whose contributions continue to help Camp Branson move forward.

Miriam Barquero-Molina, Field Camp Director



Field Camp Scholars (from left): Laura Speir (MS); Tyler Adelstein (MU); Trevor Basham (Muskingum University); Derick Roy (MU); Cory Williams (MU); Alexander Babb (University of Nebraska-Omaha); Alex Cavalco (MU); Adam Price (University of Idaho).

**William B. Allen Scholar**

Laura Speir

**Donald S. Garvin Scholars**

Trevor Basham  
Natalie Angel  
Alex Cavalco  
Derick Roy  
David Vaughn  
Cory Williams

**Clayton H. Johnson Memorial Scholars**

Tyler Adelstein  
Alexander Babb

**George W. Viele Memorial Scholar**

Adam Price



Researchers who study evidence of predatory behavior in the fossil record generally look for drill holes, repair scars, bite marks, and other signs of predation in fossilized skeletons. But a team of researchers at the University of Missouri has found fossil “snapshots” of predators caught in the act of feeding on their prey. Assistant Professor of Geological Sciences Jim Schiffbauer says predation is a significant factor in evolution, and this discovery represents one of the earliest examples of sophisticated predatory behavior.

The discovery started with a field trip to southeast Missouri. Kevin Shelton, a professor of geology, has been visiting the Davis Formation on the north side of Highway 8 in St. Francois County for the past 30 years. His specialty is metallic ore deposits, and Shelton says this formation is part of a sequence that hosts the major lead and zinc deposits in southeast Missouri. He invited Schiffbauer, Assistant Professor of Geological Sciences John Huntley, and masters’ student Tara Selly to join him on an outing to the formation. Shelton took the team to his favorite site of the Davis Formation. “I said, ‘Here’s one of the coolest outcrops I’ve seen before,’ and John saw one rock with lots of burrows in it and said, ‘Do you know what you have?’”

What they found was a very large number of fossilized trilobite impressions that intersected with the burrows of worm-like (vermiform) organisms. Trilobites are early marine arthropods that scuttled along the bottom of Cambrian oceans some 500 million years ago. Schiffbauer says scientists generally do not find numerous associations between trilobite and vermiform burrows from a given location—typically up to 10 to 20—but they found hundreds of interactions in the rocks in southeast Missouri. Selly was tasked with documenting all of the trilobite–vermiform burrow interactions in the 82 slabs the team brought back to Columbia. What she found was that the trilobite traces intersected the worm burrows more often than would be expected by random chance. The fossils also show evidence that suggests the trilobites were selective in hunting their prey, preferring smaller worms, and that trilobites attacked their prey at low angles more frequently than expected, improving their chances of grabbing onto and handling their prey.

Huntley says the findings give scientists a unique window into ecological interactions that are usually not preserved. “We do have trilobites preserved in these rocks, but mainly just little fragments that don’t reveal anything about behavior,” Huntley says. “In this case we have a different view—this is the behavior of the organism preserved as traces in the sediment.”

Huntley says the fact the team found more low-angle attacks than would occur by random chance indicates a certain degree of neural sophistication. “These are just little trilobites, but it suggests there was a fair amount of sophistication in their approach,” Huntley says.

Article written by Jordan Yount, College of Arts & Science.

## Undergraduate Research Program

Several years ago we began a departmental Undergraduate Research Program. The program is funded from four Opportunities for Excellence in Geology Endowments (the John and Betty Marshall, Gene and Thelma Schmidt, Walter D. Keller, and Norman E. Smith funds). Last year we funded undergraduate projects at ~\$3,000 each that led to Senior Theses. This year we have several students pursuing Senior Theses.

The intent of the program is to provide funds to enable undergraduates to conduct meaningful field- and laboratory-based research as part of their MU education. There are a number of benefits to such a program:

- (1) It encourages and rewards research starting early in our students' careers.
- (2) It is a great recruiting tool to attract students to our program.
- (3) Our students will be more competitive and better prepared for graduate school and the work force.
- (4) The program increases our department's visibility on campus and beyond.
- (5) Integrating meaningful research into our undergraduate curriculum allows us to create a unique role relative to other state-funded universities in Missouri.

We are extremely grateful to the donors to the Opportunities for Excellence in Geology Endowments who have provided research opportunities for these students.



Austin Savage presents his senior thesis research to the department in May, 2016.



Derick Roy crossing a beaver dam while conducting fieldwork in northern Ontario.



## STUDY ABROAD IN GEOLOGY: GEOLOGY OF NORTHERN SPAIN

By **Miriam Barquero-Molina**

The Study Abroad in Spain class was run in collaboration with the Geology Program at the University of Tennessee at Chattanooga, and two of their faculty members, Jonathan Mies and Ann Holmes and their students joined us for many of the lectures during the regular semester, which we live-streamed into our respective classrooms.

During the first half of the semester the class mainly consisted of instructor-led lectures on the geologic background of northern Spain, which included topics like the Variscan Orogeny, oroclinal bending and the Cantabrian Orocline, Alpine deformation in NW Iberia, the Pyrenean Orogeny, overview of sedimentary deposition in tectonic basins, and Cretaceous Carbonates and syn-sedimentary deformation in the Bay of Biscay, just to name a few. During the second half of the semester the class focused on student class presentations, which were related to the geology we would visit on the ground during our trip to northern Spain later in the summer, and would also tie-in with student's field presentations that would take place in Spain. Student class presentations were really diverse, and made for a great learning experience for the whole class.

Topics included: high-grade deformation in Cap de Creus; Holocene volcanism; ultramafic bodies of the Pyrenees; glacial geomorphology; Variscan granitic plutonism; major faults and folds; glacial and karst geomorphology, mass wasting; snow avalanches; large vertebrate paleontology; human paleoanthropology; fossil fuel resources; renewable energies; and seismicity in the Pyrenees.

Faculty and students from the two programs, (37 total participants, 23 from MU, 14 from UTC), rendezvoused at Charlotte International Airport to board a plane headed for Barcelona on July 18. We

arrived safely in Spain on a bright sunny morning on July 19, boarded a swanky coach bus that would be our home for the next 2.5 weeks, and headed off into the mountains.

We spent the first half of our trip in the Spanish side of the Pyrenees. We started our geologic sojourn with high-grade metamorphic rocks and mid-crustal ductile deformation structures at Cap de Creus. After a quick day-trip to France to look at lithospheric mantle rocks, we then traveled west through the Southern Pyrenean Zone, a south-verging fold-and thrust belt, where we saw classic foreland fold-and thrust belt deformation structures, as well as extensional Holocene volcanism and recent glacial and fluvial geomorphology. We had the chance to hike to the third highest peak in the Pyrenees, Monte

Perdido, 11,007 ft, highest limestone massif in Europe. Eocene limestones have been brought up to such lofty heights on the hanging wall of the Monte Perdido Thrust, which samples some of the highest structural levels within the Southern Pyrenean fold and thrust belt.



Following a day of learning about human paleoanthropology at the UNESCO World Heritage site of Atapuerca, and another morning visiting Cretaceous carbonates deposited during the opening of the Bay of Biscay, we headed to the Variscan-aged Cantabrian Cordillera, the mountains that separate the rugged northern province of Asturias

from the central Spanish plains. Extremely complicated structural geology (this is what happens when you slice-up and repeatedly thrust identical looking Carboniferous limestones over and over again, and then you oroclinally bend them), incredibly rugged glacio-karstic geomorphology, and lots and lots of human history in this old land.

The trip was fantastic, we saw amazing geology, and we all learned a lot. Entirely too quickly our two and a half weeks went by, and we found ourselves, jet-lagged and bleary-eyed, back on this side of the pond, gearing up for the start of a new academic year.



David Horrell (left) and Stuart Kenderes (right) on the summit of Monte Perdido, 3,355m or 11,007 feet.

A bit of the scenery while on an excursion of faculty and students on the Spain study abroad trip.



Elizabeth Gammel atop the Mirador de Ordiales with the mar de nubes (sea of clouds) behind her over the northern coast of Spain.



## STUDY ABROAD PROGRAM

## SPAIN



Students and faculty at the top of Pineta Valley with the Marbore Cylinder in the background. Those pictured left to right include Dan Gregory, Nicole Reidel, Anna Patterson, Jordyn Cloud, David Horrell, Clark Thomas, Tyler Hinshaw, and Jonathan Mies (University of Tennessee-Chatanooga), with Kurt Oberreither in the back (far right).

Paleoanthropology at the UNESCO World Heritage site of Atapuerca.



Miriam Barquero-Molina and teaching assistant, Elizabeth Gammel, preparing the students for the beginning of their geology of Spain adventure.

## PHOTO GALLERY

### FIELD TRIPS



Sean Polun and the Structural Geology class at the House Springs road cut, outside St. Louis.

Sarah Smith at the Elmwood zinc mine in Central Tennessee MVT district in November, 2015. The field trip was led by Martin Appold.



AAPG Labor Day field trip to Arkansas. Attendees include (from left to right): Alexis Dickinson, Stuart Kenderes, Nick Gilbert, Martin Appold, Kelly Hickcox, Charles Miles and Wenfei Ku.



## PHOTO GALLERY

### FIELD CAMP



Group photo on the annual field trip to the Tetons for field camp students.

Field camp students after completion of the Paleozoic Death March.



Just another day at field camp....with our super heroes! Picturef left to right: Levi Crooke, Elizabeth Gammel and Jill McKenzie.

## PHOTO GALLERY

### OUTREACH



Yanying Chen and Jesse Merriman showing rocks and minerals to elementary school students at Science Sleuth in April, 2016.

Alex Sehlke making corn starch lava flows at the Columbia Public Schools STEM Expo, Rock Bridge High School in November, 2015.



New faculty Noel Bartlow's presentation at the St. Louis Science Center. Her presentation, "The How, When, Where and Why of Megathrust Earthquakes and Tsunamis" was part of the "Rock, Fossil, Quake" event.

## PHOTO GALLERY

### ALUMNI REUNION



Alumni Ace Caneer and current doctoral student, Tara Selly, visit while attending the alumni reunion reception held in conjunction with the annual Geological Society of America meeting in Denver, Colorado in September, 2016.

Josh Wallace, who recently graduated from the department, was the recipient of a door prize given at the alumni reunion reception.

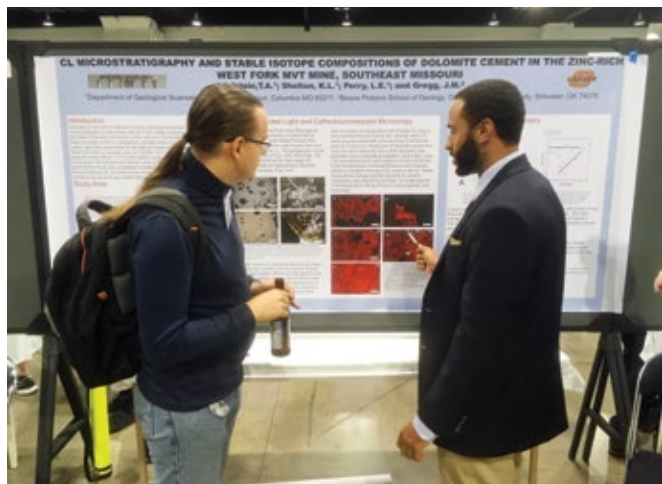


Miriam Barquero-Molina visits with former graduate students in the department (from left to right): Joe Hill, Aaron Johnson and Damon Bassett, at the alumni reunion reception.



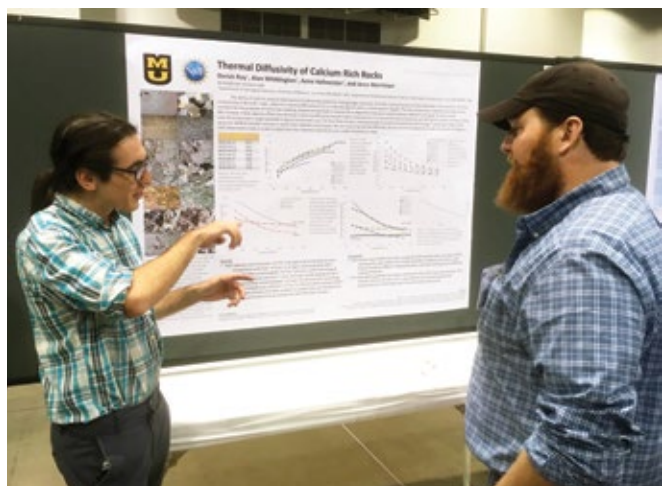
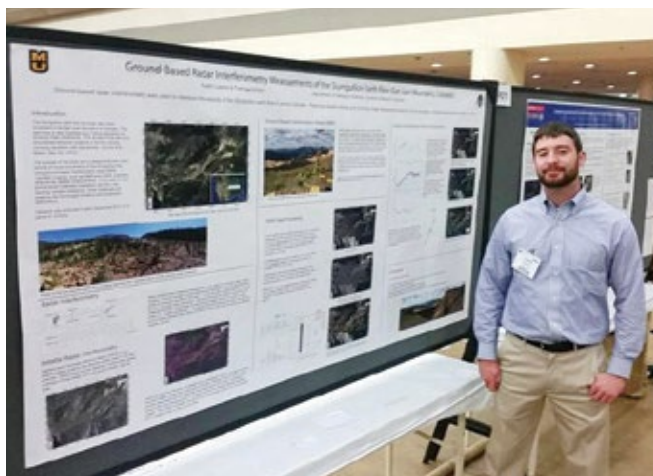
## PHOTO GALLERY

### UNDERGRADUATE PRESENTATIONS



Tyler Adelstein presenting his undergraduate research work at the Geological Society of America annual meeting held in Denver, Colorado in September, 2016. Kevin Shelton is his advisor.

Austin Luecke presents his senior thesis research work at the Geological Society of America annual meeting in Baltimore in October, 2015. Paco Gomez is his advisor.



Derick Roy, undergraduate major in the department, presents his research work at the Geological Society of America annual meeting in Denver, Colorado in September, 2016. His advisor is Alan Whittington.



## STUDENTS

### LA REUNION

Doctoral candidate Arianna Soldati spent the 2016 Spring semester abroad as part of her dissertation research. Thanks to a National Geographic Young Explorer Grant and a Chateaubriand Fellowship of the Office for Science and Technology of the Embassy of France in the United States, she was able to collaborate with French researchers on the link between terrain morphology and lava flow rheology of Ocean Island Basalts.

She first traveled to La Réunion, a French overseas territory in the Indian Ocean, to study its volcano, Piton de la Fournaise. Piton de la Fournaise is one of the most active volcanoes of the world, second only to Kilauea (HI). During the three months she spent on the island, Arianna partnered with the local Volcanological Observatory to learn about monitoring techniques. Her fieldwork, for which her advisor, Alan Whittington, joined her, focused on the 2007 and 2010 flows. They conducted extensive mapping and sampling of both flows. Arianna spent the following 2 months in Clermont-Ferrand, mainland France, where she learned new textural analyses techniques. Now that she is back at MU she has developed a new experimental protocol to measure the viscosity of Piton de la Fournaise lavas and is gathering plenty of data for the last section of her dissertation.



Arianna Soldati and Alan Whittington measuring the slope of the 2010 flow.



A view of Piton de La Fournaise, with the 2010 flow clearly visible on the left side of the cone.

### Geology Graduate Student Wins UM 3MT®



Arianna Soldati receiving the MU 3MT® first place prize from student event organizer Ronnie La Combe.

Last year the UM System Graduate Student Leadership Development Program brought the Three Minutes Thesis (3MT®) to Mizzou for the first time ever. The 3MT® is an international research communication competition, designed to help students improve public speaking skills. In collaboration with the UM Office of Graduate Studies, over 30 doctoral candidates from all disciplines were offered both group and individual training as well as practice sessions with Dr. Robin Walker and Dr. Milbre Burch.

Three Geological Sciences doctoral candidates represented the department at the competition: Page Quinton, Arianna Soldati and Yanying Chen. Arianna won the Mizzou Finals in October, with her presentation titled “How to Stop a Lava Flow”. She described to the audience how her research on the role of topography in controlling lava flow patterns can help protect coffee fields in Guatemala. Arianna then had the opportunity to represent Mizzou at the Regional Finals in Charlotte, NC in February. The competition was tough, and she did not win the Regionals, but she was excited to spread the results of her research a bit further and had the chance to meet with some of the most brilliant young researchers of the South Eastern United States.

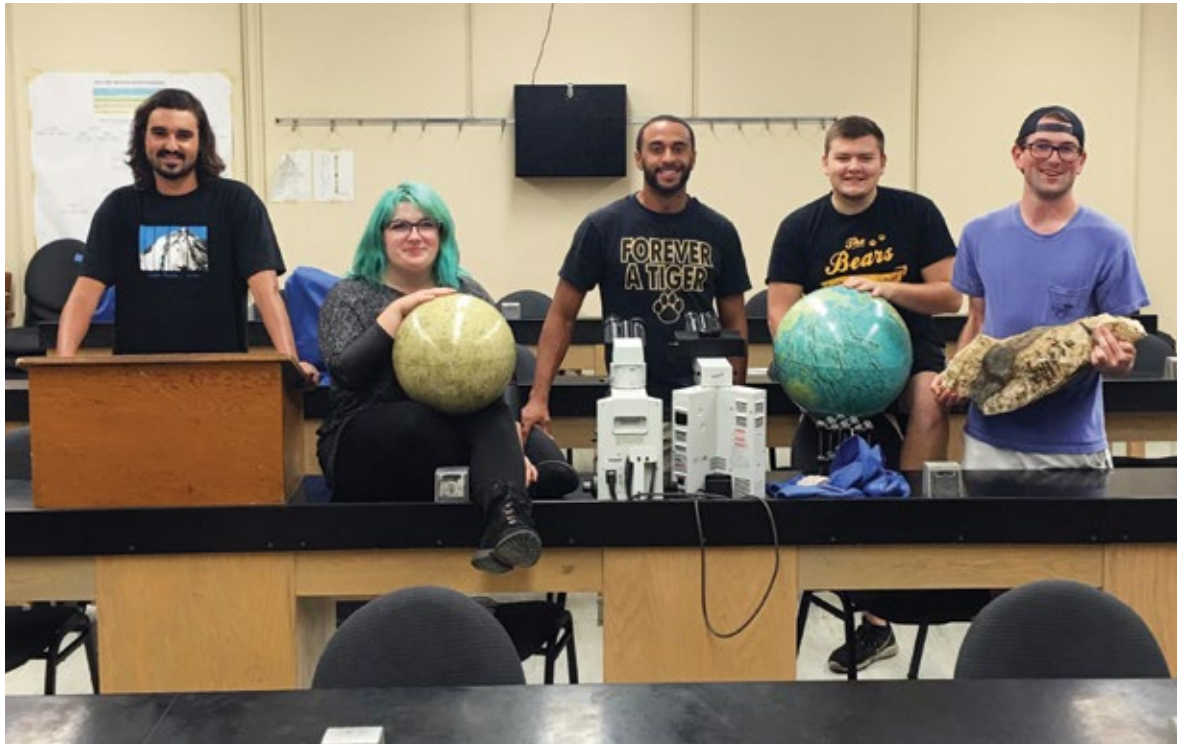
## STUDENTS

### GEOLOGY CLUB

The purpose of the Geology Club at the University of Missouri is to allow undergraduate and graduate students of all backgrounds an opportunity to expand their knowledge of the geological sciences in and out-of-classroom settings. This organization not only strives to further the knowledge and interest of geology for its members, but also that of the community. The club strives for experiences in additional field excursions, volunteer work, community outreach, and socialization.

The geology club has many exciting events planned for 2016-2017. We began the year with a workshop on citation management software where research librarians taught club members to use the programs Zotero and Mendeley. We have hiking trips planned for Rock Bridge Park, and the Pinnacles. Two of our members will be attending the annual meeting of the Geological Society of America in Denver. An event that requires a great deal of planning is Youth night. The event features 150+ grade school children being taught the principles of geology from club members. Many of the kids use this opportunity to earn their geology merit badge, and the members learn presentation skills and provide community outreach. We are working on developing a highly functional geology club t-shirt for this year. To stay informed about club activities like our facebook page: <https://www.facebook.com/mizzougeologyclub>.

Tyler Adelstein, Club President



The 2016-17 geology club eboard. From left to right: Zach Verrett (secretary), Alexis Dickinson (Social Media Chair), Tyler Adelstein (President), Ryan Kraft (Vice-President), and Will Kleeman (Treasurer).



## STUDENTS

### STUDENT CHAPTER OF AEG-AAPG

The American Association of Petroleum Geologists (AAPG)/Association of Engineering and Environmental Geologists (AEG) student chapter at Mizzou is in its seventh year. There are approximately 30 active members, both graduate and undergraduate. Paco Gomez remains our stalwart advisor. The purpose of our association is to provide opportunities for the professional development and advancement of students within the geological sciences, particularly those interested in the petroleum and energy industries.

Many of our members have had travel opportunities in the past year. There is a small but steady attendance at the monthly St. Louis AEG section meetings. We attended the 2015 Rocky Mountain Rendezvous and many in the department are looking forward to the GSA in late September, held in Denver. Several of our members went to the Southern Ozark Plateau region of Arkansas over the long Labor Day weekend, led by faculty member Martin Appold. They visited Crater of Diamonds State Park, several zinc mines, and a bauxite mine, as well as enjoyed the sights in the town of Hot Springs.

Within the department, meetings are held monthly. Several members have taken advantage of a new fund created during the 2015-16 school year to offset costs for HAZWOPER training. Later this fall, we will welcome Greg Hempen, who will be speaking on careers in the Geosciences. In behind-the-scenes news, officer elections were held in mid-April. Thanks to our previous officers and welcome to our new ones.

At the first meeting of the 2016-17 school year, we announced our new non-profit status and were joined by five new members. Officers plan to rework the chapter constitution during the fall semester and discuss the creation of a new officer: Chapter Historian. Our major fundraising opportunity, concession earnings at Mizzou football games, was extended for another year. Come see us for brisket nachos! We look forward to volunteering in collaboration with MUGGS and the Geology Club. Funds will be used for travel costs and a small new undergraduate scholarship.

Kelly Hickcox, Club President



From left: Wenfei Ku, Stuart Kenderes and Charlie Miles outside the entrance to the Beulah Zinc mine.



## MU GEOLOGY GRADUATE SOCIETY

The MU Geology Graduate Society (MUGGS) is the official graduate student organization for the department, with a focus on students interested in pursuing careers in academia upon completion of their graduate work at Mizzou. Having an official graduate student organization makes our graduate students eligible to apply for travel funds from various sources across the campus. Last year, several students received travel awards to attend national and international conferences, including GSA in Baltimore and AGU in San Francisco. MUGGS members also participated in a number of fundraising opportunities, and we are now planning to use those funds to directly fund student's conference travel.

During the fall semester we published the first annual MUGGS Geologic Calendar, which was compiled by Jesse Merriman and featured photos taken by Geology graduate students. In the spring, MUGGS students held the first annual Student Research Forum (SRF), which highlighted current graduate student's research. We have already started programming the second improved edition of this initiative!

This year we are looking forward to hosting the Mineralogical Society of America (MSA) Distinguished Lecturer John Cottle from the University of California, Santa Barbara on February 17, 2017.

Arianna Soldati, Club President



Group photo of the members of the MUGGS organization on the Francis Quadrangle.

**STUDENTS**  
**UNDERGRADUATE**

## Degrees

### Bachelor of Arts

Austin Thomas Luecke  
Briana Kristin Stone

### Bachelor of Science

Jordyn Lael Cloud (Magna Cum Laude )  
Kelly Bryan Hickcox (with honors)  
Dylan Paul Lambur (with honors)  
Nicklos Benz Marti (with honors)  
James Collin Smith (with honors)  
Cory Eugene Williams (with honors)  
Ura Robert Asher  
Kevin Patrick Costello  
Brendan Burks Donley  
Taylar Justine Hogan  
Haris Rachelle Hopkins  
Madeline Jayne Kiefel  
Paul Steven Marek  
Avery Anne Peneston  
Nicole Christine Riedel  
Austin Michael Savage  
Eric Michael Schneider  
Morgan Stockman  
Clark Nathan Thomas

## Senior Theses

### Jordyn Cloud

*Seismic attenuation and velocity structure of central Anatolia.*

**Advisor: Eric Sandvol**

### Kelly Hickcox

*Rates of Surficial and Tectonic Processes in the Afar Rift (Ethiopia) Based on Rebound Test Hammer Measurements.*

**Advisor: Paco Gomez**

### Haris Hopkins

*Methane oxidation in four man-made lakes in the Columbia, Missouri area.*

**Advisor: Cheryl Kelley**

### Austin Luecke

*Ground-Base Radar Interferometry Measurements of the Slumgullion Earth Flow (San Juan Mountains, Colorado).*

**Advisor: Paco Gomez**

### Austin Savage

*Multi-Temporal Assessment of Rock Glacier Mass Transport in the Spanish Peaks Region, Colorado.*

**Advisor: Paco Gomez**

### Morgan Stockman

*Neotectonic and Seismicity Assessment of the 1961 Kara Kore Earthquake in the Marginal Grabens of the Afar Rift (Ethiopia).*

**Advisor: Paco Gomez**

## Awards

### Estwing Hammer Award

Cory Williams

### Geology Development Board

#### Outstanding Undergraduate Award

Derick Roy

### McNair Scholar

Tyler Adelstein

## Scholarships

### James Mitchell Scholars

Nicholas Gilbert                      Brendan Talbert  
Austin Ray

### Mrs. Pat Geology Scholars

Taylor Hunt

### Raymond E. Peck Undergrad Scholar

Edward Kleeman

### Edmond & Mary Raymond Scholar

Tyler Adelstein

### Pearl T. Sando Scholars

Samuel Finnegan                      Derick Roy

### Gene Schmidt Scholar

Emalyn Glastetter

### Fred Strothmann Scholars

Clarke Delisle                      Daniel Gregory  
Emalyn Glastetter                      Andrew Guerrein

**STUDENTS**  
AWARDS

Cory Williams receives the Estwing Hammer Award from Alan Whittington, Chair.

Paige Quinton receives the Outstanding Graduate Student Award from Alan Whittington, Chair.



Sean Polun receives the James H. Stitt Graduate Teaching Award from Alan Whittington, Chair.

## Degrees

### Master of Science

#### **Katrina Burch**

*Lg attenuation in Central Anatolia.*

Advisor: Eric Sandvol

#### **Ramazan Ertugrul**

*Application of numerical 2D basin modeling of Farnsworth Unit, Ochiltree, TX.*

Advisor: Martin Appold

#### **David Horrell**

*Constraining the timing of graben initiation in the central Afar using fluvial knickpoint erosion and terrestrial cosmogenic nuclides.*

Advisor: Paco Gomez

#### **Antonio Manjon-CabezaCordoba**

*Geochemistry, petrogenesis and tectonic setting of igneous rocks of the Hartville uplift, Wyoming.*

Advisor: Peter Nabelek

#### **Aaron Morrison**

*Rheology of crystallization basalts from Nyiragongo and Nyamuragira volcanoes, D.R.C.*

Advisor: Alan Whittington

#### **Eric Nowariak**

*Paleoproterozoic metamorphic and structural evolution of the Hartville uplift, Wyoming.*

Advisor: Peter Nabelek

#### **Gretchen O'Neil**

*The latest ediacaran wormworld fauna: Comparative taphonomy, morphology, and body size dynamics of the tubular faunas from Gaojiashan Lagerstätte, Shaanxi, China and the Deep Spring Formation, Nevada.*

Advisor: Jim Schiffbauer

#### **Jingjing Pan**

*Uppermost mantle shear wave attenuation in China.*

Advisor: Eric Sandvol

#### **Laura Perry**

*Gold in the northern Yellowknife Greenstone Belt, Canada and Pb-Zn-Cu in the MVT deposits of southeast Missouri: Geochemical studies and numerical models.*

Advisor: Kevin Shelton

## Doctor of Philosophy

#### **Ajit Joshi**

*Numerical modeling of porosity waves as a mechanism for a rapid fluid transport in elastic porous media.*

Advisor: Martin Appold

#### **Page Quinton**

*Constraints on the late Ordovician climate and carbon cycle.*

Advisor: Kenneth Macleod

#### **Alexander Sehlke**

*Rheological evolution of planetary basalts during cooling and crystallization.*

Advisor: Alan Whittington



Charlie Miles and Jared Smoot operating a radar system at Balanced Rock, Arches National Park.



## Scholarships

### Boyd Scholar

Rayan Yassminh

### Burst Grad Fellow

Sarah Smith

### Davies Memorial Scholar

Katherine Ferguson

### Ethington Geology Scholar

Liane Linehan

### Freeman Geology Scholar

Matthew Jeffrey

### Frey Memorial Scholar

Jesse Broce

### Geology Student Support Fund Scholars

Nicholas Benz

Mikaela Ruga

### Himmelberg Geology Scholar

Elizabeth Gammel

### Johns Geology Scholar

Shannon Haynes

### Hal and Ruth Johnson Scholar

Kelly Hickcox

### Walter D. Keller Scholars

David Nymberg

Arianna Soldati

### Craig Russell Knotts Scholar

Michael Gunnels

### Knox Geology Scholar

Kelly Hickcox

### M.G. Mehl Geology Scholar

Jesse Broce

### Miles Geology Scholar

Sean Polun

### Office of Graduate Studies Fellowship

Stephanie Rosbach

### Peck Graduate Fellowship

Charles Miles

### Rexroad Geology Scholar

Liane Linehan

### James H. Stitt Geology Scholar

Mikaela Ruga

### W.A. Tarr Scholar

Elizabeth Gammel

### M. Ray Thomasson Scholar

Sean Polun

### Scott H. Raymond Outstanding Achievement Scholar

Rayan Yassminh

### Tlapek Geology Scholar

Sarah Smith

### Viele Geology Scholar

Joshua Field

## Grants and Awards

### William B. Howe Fellowship

Tara Selly

### Houston Geological Society W. L. Calvert Memorial Scholarship Award

Joshua Field

### Huggins Graduate Fellowship

Arianna Soldati

### Outstanding Graduate Student Award

Page Quinton

### Paleontological Society, Stephen Jay Gould Research Award

Tara Selly

### James H. Stitt Graduate Teaching Award

Sean Polun

## Student Journal Publications

**Ahmed, B.**, Appold, M.S., Fan, T., McPherson, B.J.O.L., Grigg, R.B., White, M.D., 2016. Chemical effects of CO<sub>2</sub> sequestration in the Upper Morrow Sandstone in the Farnsworth, Texas hydrocarbon unit: *Environmental Geosciences Journal*, v. 23, p. 81-93.

**Bao, X.**, Sandvol, E., Chen, Y.J., Ni, J., Hearn, T., Shen, Y., 2015. Azimuthal anisotropy of Lg attenuation in eastern Tibetan Plateau: *Journal of Geophysical Research B: Solid Earth*, 117 (10), art. no. B10309.

**Brown, M.**, and Liu, M., 2016. Injection-Induced Seismicity in Carbon and Emery Counties, central Utah: *Geofluids*, doi: 10.1111/gfl.12184.

**Cavender, B.D.**, Shelton, K.L., Schiffbauer, J.D., 2016. An atypical orebody in the Brushy Creek mine, Viburnum Trend MVT district, Missouri, USA: Early Cu-(Ni-Co)-Zn-rich ores at the Lamotte Sandstone/Bonnetterre Dolomite contact: *Economic Geology*, v. 111, p. 259-269.

**Gammel, E.M.**, and Nabelek, P.I., 2016. Fluid inclusion examination of the transition from magmatic to hydrothermal conditions in pegmatites from San Diego County, California: *American Mineralogist*, 101, 1906-1915.

**Hughes, K.P.**, MacLeod, K.G., **Haynes, S.J.**, **Quinton, P.C.**, Martin, E.E., Ethington, R., 2015. A paired neodymium and oxygen isotopic perspective on paleoceanographic changes across the Dubuque/Maquoketa contact in the Late Ordovician Laurentian Seaway: *Stratigraphy*, v. 12, p. 275-285.

**Joshi, A.**, Appold, M. S., 2016. Potential of porosity waves for methane transport in the Eugene Island field of the Gulf of Mexico basin: *Marine and Petroleum Geology*, v. 75, p. 1-13.

Schiffbauer, J.D., Huntley, J.W., **O'Neil, G.R.**, 2016. Darroch, S.A.F., Laflamme, M., and Cai, Y. The Latest Ediacaran Wormworld Fauna: Setting the Ecological Stage for the Cambrian Explosion. *GSA Today*.

**Quinton, P.C.**, Leslie, S.A., Herrmann, A.D., and MacLeod, K.G., 2016. Effects of extraction protocols on the oxygen isotope composition of conodont elements: *Chemical Geology*, v. 431, p. 36-43, doi:10.1016/j.chemgeo.2016.03.023.

**Quinton, P.C.**, Herrmann, A.D., Leslie, S.A., and MacLeod, K.G., 2016. Spatial gradients in carbon cycling across the southern margin of Laurentia during the Middle to early Late Ordovician, Palaeogeography, Palaeoclimatology, Palaeoecology, doi: 10.1016/j.palaeo.2015.08.020.

**Quinton, P.C.**, Percival, I.G., Zhen, Y.-Y., and MacLeod, K.G., 2015. Factors influencing conodont apatite  $\delta^{18}\text{O}$  variability in the Ordovician: a case study from New South Wales, Australia, *Stratigraphy*, v. 12, p. 265-274.

**Robert, G.**, Knipping, J., Scherbarth, S., **Robertson, T.**, Stechern, A., Behrens, H., and Whittington, A., 2015. Heat capacity and viscosity of basaltic melts with H<sub>2</sub>O $\pm$ F $\pm$ CO<sub>2</sub>: *Chemical Geology*, 418: 51-65, doi: 10.1016/j.chemgeo.2014.07.015.

**Schlke, A.**, and Whittington, A.G., 2016. The viscosity of planetary tholeiitic melts: A configurational entropy model: *Geochimica et Cosmochimica Acta*, 191:277-299, doi:10.1016/j.gca.2016.07.027.

**Schlke, A.**, and Whittington, A.G., 2015. Rheology of lava flows on Mercury: *Journal of Geophysical Research: Planets*, 120: 1924-1955, doi: 10.1002/2015JE004792.

**Selly, T.**, Huntley, J.W., Shelton, K.L., and Schiffbauer, J.D., 2016. Ichnofossil record of selective predation by Cambrian trilobites. *Palaeogeography, Palaeoclimatology, Palaeoecology* 444: 28-38.

**Soldati, A.**, **Schlke, A.**, Chigna, G., and Whittington, A.G., 2016. Field and experimental constraints on the rheology of arc basaltic lavas: the January 2014 Eruption of Pacaya (Guatemala): *Bulletin of Volcanology*, 78:43, doi: 10.1007/s00445-016-1031-6.

**Spurgeon, J.J.**, Paukert, C.P., Healy, B.D., Kelley, C.A. and Whiting, D.P., 2015. Can translocated native fishes retain their trophic niche when confronted with a resident invasive? *Ecology of Freshwater Fish*, v. 24, p. 456-466.

## Oral Presentations

**Broce, J.S.**, Schneider, E.M., and Schiffbauer, J.D., 2016. Experimental conditions conducive to fossil pyritization and patterns of occurrence: Geological Society of America Abstracts with Programs.

**Field, J.D.**, Appold, M., Coveney, Jr., R.M., 2015. Geochemical and isotopic differences between trace occurrences and ore deposits of Mississippi Valley-type mineralization in the U.S. midcontinent: Geological Society of America.

**Field, J.D.**, Appold, M.S., Coveney, Jr., R.M., 2016. Insights into MVT ore genesis from fluid inclusions in trace occurrences of MVT mineralization: Pan-American Current Research on Fluid Inclusions, May 24-26, Columbia, Mo.

**Gammel, E.M.**, Nabelek, P., 2016. Li, B, F, and Cl controls on transition from magmatic to hydrothermal crystallization in low pressure pegmatite dikes: Pan-American Current Research on Fluid Inclusions XIII.

**Haynes, S.J.**, Martin, E.E., and MacLeod, K.G., 2016. Pacific Ocean circulation during the Late Cretaceous: Geological Society of America, Abstracts with Programs, vol. 48(7).

**Kenderes, S.M.**, Appold, M. S., 2016. Fluorine concentrations of ore fluids in the Illinois-Kentucky district: evidence from SEM-EDS analyses of fluid inclusion decrepitates: North-Central Section Geological Society of America.

**Kenderes, S.M.**, Appold, M. S., 2016. Measuring fluorine concentrations of ore fluids in the Illinois-Kentucky district: An SEM-EDS analysis of fluid inclusion decrepitates: Pan-American Current Research on Fluid Inclusions, May 24-26, Columbia, Mo.

**Manjón-Cabeza Córdoba, A.**, Nabelek, P.I., Nowariak, E.S., 2016. Geochemistry, petrogenesis and tectonic setting of igneous rocks of the Hartville Uplift, eastern Wyoming: Geological Society of America, Abstracts with Programs, 48, no. 6.

**Nowariak, E.S.**, **Manjón-Cabeza Córdoba, A.**, and Nabelek, P., 2016: Neoproterozoic to Paleoproterozoic metamorphic and structural evolution of the Hartville

Uplift, southeastern Wyoming: Geological Society of America, Abstracts with Programs., 48, no. 6.

**O'Neil, G.R.**, Schiffbauer, J.D., Huntley, J.W., and Cai, Y., 2016. The importance of biotic interactions in shaping Ediacaran benthic communities: A comparative case study of the Gaojiashan and Mistaken Point biotas: Geological Society of America, Abstracts with Programs.

**O'Neil, G.R.**, and Schiffbauer, J.D., 2016. Comparative taphonomy and morphology of tubular faunas from the Deep Spring Formation, Nevada, and the Gaojiashan Lagerstätte, Shaanxi, China: North-Central Section Geological Society of America.

**Quinton, P.C.**, Miller, J.F., Ethington, R.L., and MacLeod, K.G., 2016. Early Ordovician climate fluctuations inferred from conodont oxygen isotopes, Geological Society of America, Abstracts with Programs, vol. 48(7).

**Selly, T.**, **Hale, K.E.**, **Clapp, D.A.**, Schiffbauer, J.D., and Huntley, J.W., 2016. Environmental gradients in a tidal carbonate lagoon (Pigeon Creek, San Salvador Island, Bahamas) and their relationship to molluscan diversity, body size, and predator-prey interactions. Geological Society of America, Abstracts with Programs.

**Selly, T.**, **Rosbach, S.A.**, Schiffbauer, J.D., and Wittmer, J.M., 2016. Comparing preservation of different histologies: Mazon Creek-type fossils of the Sun Spot Mine, Illinois, USA: Geological Society of America Abstracts with Programs.

**Selly, T.**, Schiffbauer, J.D., and Huntley, J.W., 2016. Drilling predation and taphonomy of gastropods along environmental gradients, San Salvador, Bahamas. North-Central Section Geological Society of America.

**Smith, S.E.**, Appold, M. S., 2015. Prediction of MVT ore fluid metal concentrations from solid solution metal concentrations in ore-stage calcite: Geological Society of America.

**Smith, S.E.**, Appold, M. S., 2016. Constraints from fluid inclusions on MVT ore fluid metal concentrations predicted from solid solution metal concentrations in ore-stage calcite: Pan-American Current

**STUDENT  
PRESENTATIONS**

Research on Fluid Inclusions, May 24-26. Columbia, Mo.

## Poster Presentations

**Adelstein, T.**, and Shelton, K.L., 2016. Zinc-rich ores of West Fork mine: Multiple-fluid involvement in the southeast Missouri mining district: University of Missouri Undergraduate Research Forum.

**Adelstein, T.A.**, Shelton, K.L., **Perry, L.**, and Gregg, J.M., 2016. CL microstratigraphy and stable isotope compositions of dolomite cement in the zinc-rich West Fork MVT mine, southeast Missouri: Geological Society of America.

**Chen, Y.** and Nabelek, P.I., 2015. Numerical modeling of forceful pluton emplacement and associated deformation at different crustal levels - instantaneous, continuous or episodic intrusion?: American Geophysical Union, T43B-3003.

**Field, J.D.**, Appold, M.S., Coveney, Jr., R.M., 2016. Insights into Mississippi Valley-type ore formation from analysis of trace occurrences of mineralization in the U.S. mid-continent: Gordon Research Conference on the Geochemistry of Mineral Deposits, Les Diablerets, Switzerland.

**Gammel, E.**, Nabelek, P.I., Phillips, E., Scott, S., Sims, K., 2015. Source variation for Mesozoic granitoid plutons in the White-Inyo Range, California, and implications for changes in the lithospheric structure. American Geophysical Union, T31F-2908.

**Hui, H.**, and Sandvol, E., 2015. Source depth and Azimuth dependent synthetic Lg attenuation: Seismological Society of America Meeting in Reno, NV.

**Jeffrey, J.M.**, Huntley, J.W., Schiffbauer, J.D., Fike, D.A., and Shelton, K.L., 2016. Stratigraphic variation of the SPICE event in upper Cambrian carbonates of southern Missouri: Geological Society of America.

**Joshi, A.**, Appold, M. S., 2015. Pressure wave propagation along the décollement of the Nankai accretionary wedge: implications for aseismic slip events: American Geophysical Union.

**Ku, W.**, Kaviani, A., **Bao, X.**, Christopher, J., Sandvol, E., 2015. Sn Attenuation in the Middle East: American Geophysical Union.

**Linehan, L.C.**, J.W. Huntley, 2016. Parasitism in marine ecosystems through geologic time: Geological Society of America, Abstracts with Programs, vol. 48, no. 7.

**Morrison, A.**, **Sehlke, A.**, and Whittington, A., 2015. Rheology of Crystallizing Basalts from Mt. Nyiragongo and Mt. Nyamuragira, D.R.C: American Geophysical Union.

**Sehlke, A.**, and Whittington, A., 2015. Rheology of lunar lavas: an experimental study on crystal-liquid suspensions: Silicate Melts Workshop, La Petite Pierre, France.

**Sehlke, A.**, and Whittington, A., 2015. The viscosity of planetary tholeiitic melts: Configurational entropy model. Silicate Melts Workshop, La Petite Pierre, France.

**Sehlke, A.**, and Whittington, A., 2015. Rheology of lunar lavas: an experimental study on crystal-liquid suspensions. American Geophysical Union.

**Soldati, A.**, **Sehlke, A.S.**, Chigna, G., and Whittington, A.G., 2015. Field and experimental constraints on the rheology of arc basaltic lavas: the January 2014 Eruption of Pacaya (Guatemala): Silicate Melts Workshop, La Petite Pierre, France.

**Soldati, A.**, and Whittington, A., 2015. Rheology and Morphology of a Trachybasaltic Lava Flow: a Case Study from the Cima Volcanic Field (CA): American Geophysical Union.

**Soldati, A.**, and Whittington, A., 2015. Rheology and Morphology of a Trachybasaltic Lava Flow: a Case Study from the Cima Volcanic Field (CA): Silicate Melts Workshop, La Petite Pierre, France.

**Yassminh, R.**, and Sandvol, E., 2015. Site Response in the Central and Eastern United States: American Geophysics Union.



## DEVELOPMENT ACTIVITIES

### ACTIVITIES



Scott Raymond (left) and Mike O'Brien (right) at the spring, 2016 board meeting.



Faculty, staff, students and invited guests enjoy the Thanksgiving feast in November, 2015.

## Investments in the Future

The Department of Geological Sciences gratefully acknowledges the financial support of alumni and friends who promote the recognition, welfare and progress of the Department of Geological Sciences and the University of Missouri. The University of Missouri's Jefferson Club recognizes donors whose cumulative cash gifts or pledges to MU, including corporate matching contributions, total a minimum of \$25,000 or whose deferred gifts total \$50,000 or more.



A beautiful picture of the Columns on the Francis Quadrangle, Columbia, Mo.

### Jefferson Club Members

#### Ambassadors

Mrs. Norman F. Jeffries  
Mr. and Mrs. Robert Weiser  
Mr. and Mrs. Ed Williamson

#### Very Distinguished Fellows

Drs. Alice M. and John F. Blount  
Dr. and Mrs. Tom Freeman Jr.  
Mr. B. Ray Holifield  
Dr. Herman Ponder  
Mrs. John W. Tlappek

#### Distinguished Fellows

Dr. and Mrs. Richard Bishop  
Mr. and Mrs. Richard G. Boyd  
Mr. and Mrs. Stephen T. Phillips  
Mr. Scott H. Raymond  
Mrs. Walter G. Staley Jr.

#### Fellows

Mr. and Mrs. Jack F. Schindler  
Mr. Timothy R. McHargue

#### Fellows

Mr. and Mrs. Jack D. Burgess  
Mr. Timothy R. McHargue  
Mr. and Mrs. Gary C. Mitchell  
Mr. Jack F. Schindler

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Ms. Susan J. Hebberger  
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Mr. and Mrs. Larry M. Knox  
Ms. Jane Espy Meyer  
Mr. and Mrs. Robert C. Miles  
Mr. Gene W. Schmidt  
Mr. and Mrs. Robert K. Sylvester  
Dr. M. Ray Thomasson and Ms. Merrill Shields  
Mr. Tom Ware

## DEVELOPMENT ACTIVITIES CONTRIBUTIONS

### 2015-16 Contributors (through Aug. 31, 2016)

John & Alice Blount  
Jack Burgess  
Reniero Araoz  
Merrilee Barta  
Bob Bauer  
Elaine Burgess  
Robert Burgess  
William "Ace" Caneer  
Wayne Canis  
Randel Cox  
Anna Cruse  
Tony & Snez Dincau  
Michael Dryer  
Dennis Duewel  
John & Lynn Elliott  
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Jesse & Alma Marshall  
Joan McDougal  
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Danielle Robinson  
Jami Roux

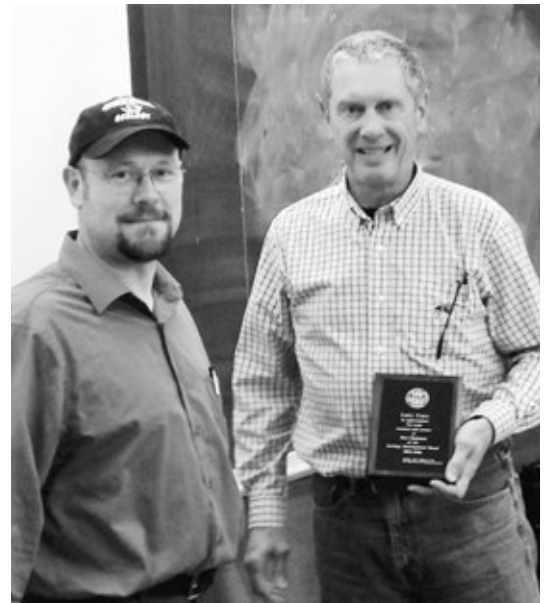
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Robert Ruffner  
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Lawrence Tedesco  
Sharon & Charles Twenter  
Alan Whittington  
James & Marilyn Williams  
Ed Williamson

### Corporations and Matching Contributions:

BP Fabric of America  
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Newfield Exploration  
Pangeaa Exploration



Alan Whittington presenting a plaque to Mike Quearry in appreciation for his service as President of our Geology Development Board for the past two years.



Alan Whittington presenting a plaque to Larry Knox in appreciation for his service as Vice-President of our Geology Development Board for the past two years.



## ENDOWMENTS

**Endowed Scholarship Funds**

William Burrows Allen Field Camp Scholarship  
 Mr. and Mrs. Richard G. Boyd Endowment Fund  
 John F. Burst Graduate Fellowship in  
 Industrial Minerals  
 David K. "Dai" Davies Memorial Scholarship Fund  
 Raymond Ethington Geology Student Scholarship Fund  
 Tom Freeman Geology Student Scholarship Fund  
 Richard P. Frey Memorial Paleontology Fund  
 Donald S. Garvin Geology Field Camp Scholarship  
 Geology Student Scholarship Fund  
 Leonard D. Harris Scholarship  
 Glen Himmelberg Geology Student Scholarship Fund  
 Wallace B. Howe Fellowship in Geology  
 William Johns Geology Student Scholarship Fund  
 Clayton H. Johnson Memorial Scholarship Fund  
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 Walter D. Keller Scholarship Fund  
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 Maurice G. Mehl Memorial Scholarship in Field  
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 James H. Stitt Memorial Scholarship Fund  
 Fred Strothmann Perpetual Geology Scholarship  
 W.A. Tarr Scholarship  
 Dr. M. Ray Thomasson Graduate Fellowship Fund  
 John W. Tlapek Geology Student Scholarship Fund  
 George Viele Geology Student Scholarship Fund  
 George W. Viele Memorial Geology Field Camp  
 Scholarship Fund

**Unrestricted Endowment Funds**

Lily Marie Carter Endowed Geology Fund  
 Geology Endowment Fund  
 Walter D. Keller Opportunities for Excellence  
 Endowment in the Geological Sciences  
 John & Betty Marshall Opportunities for  
 Excellence Endowment in Geology  
 Gene and Thelma Schmidt Geology Endowment  
 Norman E. Smith Opportunities for Excellence in  
 the Department of Geological Sciences  
 Walter and Katherine Staley Fund in Geological  
 Sciences  
 John M. Ware Memorial Geology Endowment  
 Williamson Family Geology Endowment

**DEVELOPMENT ACTIVITIES**  
**ENDOWMENTS**

**Other Endowed Funds**

Camp Branson Endowment

Camp Branson Improvement Fund

Geology Faculty Enhancement Fund

Geology Faculty Retention Award

Janet E. and Gary C. Mitchell Family Camp Branson Fund

A.G. Unklesbay Travel Award

Robert J. Waldram Camp Branson Endowment

**Bequests**

Blount Opportunities for Excellence in the Department of Geological Sciences

Cache Creek Exploration Co. Scholarship Fund

Norman and Shirley Jeffries Graduate Fellowship

Carl R. Swartzlow Memorial Geological Sciences Endowment Fund

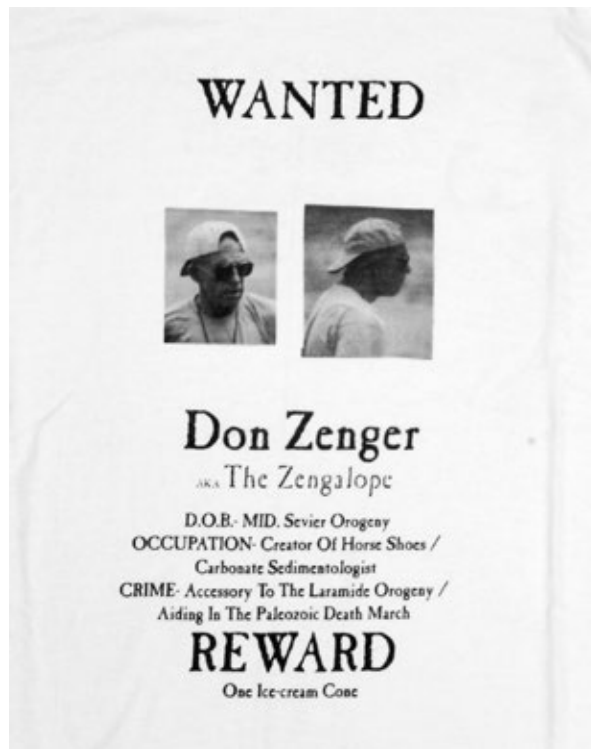
Robert and Sue Weiser Bequest

Ed and Connie Williamson Bequest

**Charitable Remainder Trusts**

John and Betty Marshall Opportunities for Excellence in the Geological Sciences

Jack and Mildred Schindler Geological Sciences Endowment Fund



One of the student-designed field camp t-shirts honoring some of Don Zenger's beloved qualities. He organized the annual horseshoe tournament, led students on one of the camp's first major climbs in the field (The Paleozoic Death March), and all bets were for ice-cream cones (in honor of his sweet tooth).

## Geology Faculty Enhancement and Retention Funds

We are fortunate to have loyal alumni and friends who have supported many aspects of the academic mission of our department (e.g. student academic scholarships and Camp Branson). Our department is stronger than ever.

Our students' lives have also been shaped by caring faculty mentors in the classroom, the laboratory, and in the field. To continue this legacy, we ask you to help us recognize and maintain the high quality of the faculty of our department.

Toward this end, two new funds have been established through lead gifts from members of our Geology Development Board: (1) the Geology Faculty Enhancement Endowment and (2) the Geology Faculty Retention Awards Fund. It is possible to donate to either the principal or distribution side of these endowments. An advantage of a gift to the distribution is that your gift is available for immediate use.

We hope that alumni and friends will recognize the value of supporting our faculty and contribute to these funds.

### Raymond Faculty Enhancement Award

Ken MacLeod

### Ed and Connie Williamson Faculty Retention Award

Eric Sandvol

Jim Schiffbauer

### Faculty Scholars

Martin Appold

Paco Gomez

John Huntley

Cheryl Kelley

Mian Liu

Peter Nabelek

Kevin Shelton



Eric Sandvol and former graduate student Chris Brocka setting off a Betsy gun seismic source for a reflection line next to Dry Lake in Lander, Wyoming. This work was a part of the field camp students advanced geophysics project.



## Geology Development Board Membership, 2016

**Michael Quearry, Chair**

Chevron (retired)  
Houston

**Larry Knox, Vice Chair**

BHP Billiton (retired)  
Houston

**Carey Bridges**

Department of Natural Resources  
Jefferson City, Mo.

**Mary S. Clark**

Department of Natural Resources (retired)  
Jefferson City, Mo.

**Anna Cruse**

Spectrum Tracer Services  
Tulsa, Okla.

**Jim Frank**

Chevron (retired)  
Houston

**David Fulton**

Consulting geologist  
Madison, Va.

**Martha George**

Schlumberger/WesternGeco (retired)  
Nashville, IL

**Harold E. Johnson III**

University of Missouri

**Matthew M. Laughland**

Pioneer Natural Resources  
Irving, Texas

**Alma Marshall**

Retired  
St. Charles, MO

**Jess Marshall**

Retired  
St. Charles, MO

**Timothy R. McHargue**

Chevron (retired)  
San Ramon, Calif.

**Gary Mitchell**

Consulting geologist  
Highlands Ranch, Colo.

**John M. Opich** (recently deceased)

Chevron Energy Tech Co. (retired)  
Houston

**Sean Polun**

University of Missouri

**Scott Raymond**

Marathon Oil Co. (retired)  
Littleton, Colo.

**Gene Schmidt**

Consulting Geologist  
Tulsa, Okla.

**Buddy Schweig**

USGS  
Denver, Colo.

**Arianna Soldati**

University of Missouri

**David J. Steyaert**

Impact Energy Resources  
Denver

**Ed Williamson**

BP Amoco (retired)  
Houston

## Greetings from our Geology Development Board Chair ...

I am looking forward to my second two year term as chair of the development board. This job is rewarding because of the enthusiasm I see in each of the members of the Development Board. Every person has a desire to help keep the geology department at the top of its peer group and, therefore is willing to pitch in to help when needed. Of course, working with Alan Whittington, the faculty, and staff further makes the job a rewarding one.

As I have written in past years to the faculty, the board will continue to be of service to you. That is our mission, to be of service to the department of geological sciences and that is YOU! Please let us know how we are doing! Please feel free contact me or any board member should the need arise.

The board welcomed Jim Frank as a new addition and said goodbye to Mark Petersen. I thank Mark for his service and already see Jim as a strong addition to the board. If any of you who take time to read this message want to become a member of the board please contact the geology department. We are always looking for hard workers. Fellow board members, I encourage you to attend all the board meetings. I hope each of us feels like a contributing member of an active organization. Please contact me and/or other board members with any ideas or concerns you may have regarding the operation of the board.

As many of you are aware Mizzou is in the midst of difficult times. Budget cuts in each college loom as the state continues to be miserly and enrollment declines. Other factors such as racial tensions that occurred earlier are hopefully being mitigated. Nevertheless, the geology department remains strong and intact. A new state-of-the-art SEM will soon be housed in the geology building and another room is being transformed into a computer lab bristling with workstations! Field camp was full again with students from around the country. As an alumnus, I encourage you to keep the geology department strong by continuing your monetary support. Our geology degrees prepared each of us for the future so let us continue to help provide that same opportunity to the geology students attending Mizzou today and in the future. If you have been away for many years, I encourage you to visit and walk the halls of the geology building and then the campus. They are as beautiful as ever!

May God bless you and your family this fall and throughout the New Year!

Best regards,

*Mike Quearry*

Mike Quearry  
Chair



## Alumni News

**Neil Babb (FC '04)** writes, "Still in the Arizona desert working and living." Neil is a geologist and field technician for Hydro Geo Chem Inc. in Scottsdale, Arizona.

**Dewey Baker (FC '58, BA '60, MA '62)** reports that he is an active member of the Charlotte Gem and Mineral Club as well as enjoying his grandchildren.

**Rachel Barker (FC '07, BS '08, MS '12)** is working as a geologist II at Newfield Exploration in Sand Springs, Okla.

**James Barkdull (FC '53, MA '57)** writes, "I retired after 55 years in the oil patch in the USA and around the world."

**Bill Berthold (FC '84, BS '85)** resides in St. Louis where he is the president of Frontenac Engineering.

**Shane Bird (FC '79, BS '77)** writes, "After 16 years with Devon Energy and 35 years in the oil industry Patty and I have decided to move on to the next phase of our life and retire."

**Joseph Born, Jr. (Grad Student '68-'70)** reports that he is enjoying time with his family and working on hobbies. He writes, "Since the price of oil has dropped so precipitously, drilling exploration consulting opportunities have also decreased."

**William "Bill" Bridges (FC '55, BA '56, MA '58)** resides in Dallas. He writes, "Eighty-Eight and holding."

**Cindy Carroll (MA '83)** resides in Jefferson City, Mo., and recently retired from the Missouri Department of Economic Development.

**Fred Davis (BS '05)** writes that he has just finished his first year as an Assistant Professor at the University of Minnesota Duluth where he is currently working on building an experimental petrology lab.

**George H. Davis (FC '86, MS '89)** reports another fine year at the Missouri Department of Transportation. George writes, "The graduates MU produces should make us all pleased because MU Geology is still teaching it right."

**Drew Diefendorf (MA '73)** reports that he is enjoying retirement more than ever. Drew writes, "I am busy designing and building a sediment core splitter for my son's biogeochem lab at the University of Cincinnati. I am deeply involved in family genealogy and doing gardening when the heat permits. I had a wonderful visit with Tola Moffett in February where we rehashed all of the pranks performed by our fellow grad students including Glaud Glasson."

**Toby Dogwiler (PhD '02)** reports that he recently moved and is the head of Geography, Geology and Planning at Missouri State University. Toby says he is happy to be back in Missouri!

**Farouk El-Baz (PhD '64)** reports he recently became a member of the Science and Technology Council of President El-Sisi of Egypt. This council advises on higher education and scientific research in Egypt.

**Jerome Eyer (FC '59, BA '60, MA '61)** writes, "If you like carbonates, come see the Biltmore House. Salem limestone from southern Indiana is a great place to see limestone features. I will show you!" Jerry resides in Asheville, North Carolina.

**Katee Pecsok Ewert (FC '07, BS '08)** writes, "Josh and I welcomed our second son, Federick Logan, in August."

**Juli Waring Fahy (MS '70)** is retired and resides in Evergreen, Colorado. She reports that she is still doing volunteer work at the USGS in Denver. "Hi to all the early 70's people!"

**James R. Frank (FC '75, BS '76, MA '79)** writes, "I retired from Chevron last December after 37 years. We're still living in Houston for the time being and I'm happy to be a member of Mizzou's geology development board. I am also excited that my son Jack will be the third generation of Franks to attend Mizzou - he will be a freshman this fall."

**Robert Foster (FC '60, MA '62, PhD '66)** reports he is still working on gold prospects in central Nevada.

**Richard Gentile (FC '56, BA '56, MA '58)** reports that he is teaching a weekend course on rocks and fossils of the greater Kansas City area. He also sponsored a dig to the Badlands, South Dakota to collect vertebrate fossils. He writes, "No grass grows under my feet."



**ALUMNI**  
**NEWS**

**Edward Goodrich (FC '51, MA '52)** resides in Bakersfield, Calif.

**Dick Hagni (PhD '62)** recently presented his research at the PACROFI meeting held at the University of Missouri, Columbia in May, 2016.

**Stanley Harris (Visiting Faculty 1947-50)** writes, "I am 98 years old, looking forward to 100! My short stay at MU gave me an excellent start in teaching."

**Dana (Downs) Heimes (MS '86)** writes, "Yikes! 30 years since graduating from Mizzou! Say it aint so! I will always proudly wear my Mizzou colors even if my husband is a cornhusker!"

**Troy Holcombe (MA '63)** reports that the U.S. Board on Geographic Names approved his application for 136 names of sea floor features in the NW Gulf of Mexico. He writes, "These features were discovered thanks to new and better bathymetry of the NW Gulf."

**Edith (Roper) Horrell (FC '78, MA '79)** writes that she and Tom were excited to visit campus in May to see their son, David, graduate with his master's degree in geology. She writes, "I guess all those stops at outcrops on family vacations made an impression on him! The Mills and Yunker families are still some of our closest friends all these years after graduate school. Stories of field camp always come up as well as memories of our time at Mizzou from 1977-79."

**Robert Jaques (MS '93)** reports he has had some health problems but hopes to return to work soon. Robert writes, "Tell everyone that remembers me hello from the sunshine state!"

**Aaron Johnson (FC '97, PhD '03)** resides in Pine, Colorado. He writes he has been appointed executive director of the American Institute of Professional Geologists.

**Art Kasey (Grad Student '65-'71)** reports he has retired and is now active on eight volunteer boards. He writes, "Thanks to Dr. Keller and Dr. Clay Johnson, I have enjoyed over 44 years of teaching."

**David King Jr. (PhD '80)** writes, "I am starting my 36th year here at Auburn. I am still working on Mesozoic Stratigraphy of Southeastern U.S. and in Belize." David reports that he and Hal Levin are the

co-authors of the 11th edition of the textbook, *The Earth Through Time*, which came out earlier this year.

**Stewart Klein (FC '50)** resides in Washington Depot, Connecticut.

**Harold Levin (FC '50, BA '51, MA '52)** reports he has now been retired from Washington University for 13 years. He writes, "I think often of the splendid geologic education I received from the MU department of geological sciences back in the early 50's."

**Lowell Lischer (FC '71, BS '72, MA '74)** currently resides in San Antonio but hopes to move to Columbia by the end of 2016.

**Amanda Lough (FC '07, BS '07)** reports she has accepted an assistant professor position at Drexel University in Philadelphia. She writes, "Majors are required to take field camp so I will definitely be promoting Camp Branson."

**Earle McBride (MA '56)** is still having fun teaching non-credit courses on general geology to the retired population in Austin, Texas. He writes, "Retired folks are smarter than college undergrads!"

**Ken McGee (FC '69, BS '70, MA '73)** reports that he is enjoying retirement and having time to travel. Ken retired from the USGS and resides in Vancouver.

**Mary Reilly-McNellan (FC '76)** reports that she retired after 30 years as an education specialist, and lastly as the preservation manager of Boulder's historic pioneer cemetery.

**Arthur Merkle (PhD '67)** reports that he has had an interesting year. Art writes, "I am having fun doing interesting things, just ask me! It's nice to be 83 and getting older. I am not stopping yet!!"

**John Miller (MA '68)** reports that he has published his 4th book, *He Hears the Rocks*, available thru Amazon. John and Mary recently completed a Smithsonian journeys tour to Patagonia.

**Mark Milward (FC '77, BS '78)** writes, "I am finalizing the final years of my career with government

work. I am managing the efforts for St. Louis County on the burning Bridgeton Landfill and the adjacent radiologically-impacted West Lake Landfill.”

**Gary Mitchell (FC '67, BS '70, MA '71)** resides in Denver where he continues his work on military history. He writes, “Call or come by if you are in the Denver area. Everybody take care as life can be shorter than expected.”

**Tola Moffett (FC '67, MA '73)** continues to consult part-time primarily on large ICE-containing ground-water plume. Tola recently had a great visit with Andy and Jinx Diefendorf recalling stories from their graduate school days at MU. Tola recently visited England, Scotland, Paris and Normandy while spending a month-long visit with his daughter while she is in England for four years.

**Thomas Moore (MA '81)** reports he is keeping busy teaching at Indiana University of Pennsylvania. He spent this summer building a non-major “Energy Geology” course that will run this fall.

**Russ Murphy (BS '86)** is a project advisor at Anadarko Petroleum. He writes, I thankfully survived the recent corporate downing, the fifth one of his 30 year career. Best wishes to Wes McCall, John Rockhold, Andy Macias and Kevin Shelton!”

**H.L. “Hank” Ott (BA' 53, MA '57)** reports that he recently moved to a new location in the Denver area. He writes that it’s hard believe he has been retired for 24 years.

**John Repetski (FC '69, MA '73, PhD '75)** writes that he is gradually becoming among the longest tenured in the eastern geology and paleoclimate team here in Reston. John writes, “It’s still challenging, so no reason to retire - yet. Besides, Professor Ethington and I still have some projects to finish, including some rear-guard defensive stratigraphy of the Oklahoma Ordovician.”

**Jerry Rhymer (FC '93)** writes, “A big hello to field camp alumni from 1993.” Jerry is employed as an environmental health engineer for Google. His oldest son graduated last year, and his two daughters are still keeping him busy with soccer and dance.

**Lisa L’Holte Schildt (FC '73, BS '80)** reports she is making a career change and is studying to be a paralegal. She writes that her daughter is studying molecu-

lar ecosystem sciences in Gottingen, Germany.

**Aliyah Schneider (FC '14)** reports that she is employed by Patagonia in Vancouver, Canada.

**Jack Sharp (Former faculty '74-'82)** writes, “I am back at the University of Texas after a year at the National Science Foundation. I am on phased retirement - 50% for three years.”

**Cecil Slaughter (FC '76, BS '76)** writes that he and Sara are still on the East Coast. He is employed as a hydrologist at the Office of Surface Mining Reclamation and Enforcement in Washington, D.C.

**Aaron Tillman (FC '92)** reports he is in his 20th year as a teacher at Marshfield Public Schools in Missouri. Aaron teaches 8th grade Earth Science and also coaches football.

**Lawrence Trudell (BS '56)** resides in Glenwood Springs, Colo. He recently received a heart pacemaker and reports he has more energy than ever. He writes, “Enjoying Life!”

**Robert “Bud” Weiser (FC '57, BA '58, MA '60)** writes, “All is going well on the lake front near Mooresville, North Carolina. Sue, who I met at MU our sophomore years and I were married 58 years on September 5. We have five sons, two daughters, and three grandsons.”

**James Wilmeshier (FC '85, BS '86)** writes, “I am still having a great time in Colorado.”

**James Williams (FC '50, BA '50, MA '52)** reports that he enjoys reading the geological sciences newsletter. Jim is a former state geologist and is currently a member of the Missouri Geologist Consortium.

**Ed Williamson (MA '73)** writes, “Connie (former geology librarian) and I are now full-time grandparents, which is much more fun than the oil business was.” He visits Columbia twice a year and encourages all alumni to contribute to the department when they can.

**Adam Wygant (FC '92)** resides in Jackson, Michigan where he is a geologist/manager for the Michigan DEQ Office of Oil, Gas and Minerals.

**ALUMNI**  
IN MEMORIAM

**Harold Andrews (MA '66)** passed away on February 22, 2015. Harold retired as a professor of geology at Wellesley College in 2006, after 36 years of teaching. He earned his doctoral degree from Harvard in 1971, and went on to become the chair of the geology department and director of the science center at Wellesley.

**Henry "Hank" Whitney Allen (BS '48, FC '49, MA'49)** passed away on January 24, 2016 in Gunnison, Utah, after a short illness. In 1942 he enlisted in the U.S. Army, where he served as a navigator on the B-24 Liberator Bombers "Miss Minnie" and "Miss Minnie II". He was discharged in December, 1945 attaining the rank of captain, being awarded the Air Medal.

**Jack Burgess (MA '55)** was one of the early pioneers in applying microscopic analysis of organic matter to assess thermal maturity. Jack passed away on April 6, 2016 in Dallas.

**George F. Carini (FC '57, PhD '64)** passed away unexpectedly on October 9, 2015 at his home in Carnegie, Pennsylvania. George opened Ceramic Consultants and Clay Harden Company and continued to own and operate them until his retirement in 1996. He was also a proud veteran who served with the U.S. Marine Corps as a sergeant in Korea from 1950 to 1953.

**Jack Foster (FC '48)** passed away on March 31, 2015.

**Carl "Fred" Lohrengel (MA '64)** passed away unexpectedly on December 17, 2015. He was scheduled to teach during the spring at Southern Utah University at the age of 76, where he loved to teach. He had retired five times according to his family.

**Dewey McLean (BA '57, FC '57)** passed away on September 2, 2016 at his home in Blacksburg, Virginia. Dewey served on the faculty of Virginia Tech for 25 years in the geology department where he received numerous teaching excellence awards.

**John Opich (FC '75, BS '76)** passed away on October 25, 2016. John met his wife, Rebecca, while attending Mizzou. They married in 1980 and after moving to Houston, John began a 40-year career as a geoscientist culminating as a senior geophysicist with Chevron. John served on the Geology Development Board.

**Floyd Twenter (FC '53, MA '56)**, passed away on April 18, 2016, just two weeks after his 88th birthday. Floyd served in the U.S. Army during World War II. He worked for the U.S. Geological Survey traipsing around the Grand Canyon and Verde Valley talking about rocks and being an ambassador to the Grand Canyon.



Basilica of Our Lady of Covadonga, adjacent to the Picos de Europa National Park in Asturias, Spain. One of the many beautiful pictures taken from the Spain Study Abroad trip.

### Remembering Don Zenger (1932-2016)

Donald H. Zenger, one of the most beloved and respected professors to ever teach at the Branson Geology Field Camp, passed away this past January at the age of 83. He taught at Camp Branson for 29 years, from 1975 through 2003, and was always the most popular professor in camp for his outstanding teaching, concern for students, and his wonderful personality. Don was the ultimate field teacher – able to help struggling students with care and compassion, but also challenge better students to a deeper understanding of field problems. He was typically the camp’s resident sedimentologist, but for many years he was in the field for all of the course projects. As a result, Don taught and mentored many of the new faculty who came to camp to teach specific projects

Students during the first week of camp were commonly mystified by Don. His calm gentle nature and self-effacing humor made him easy to approach and learn from, but at two to three times their age he could out-hike almost everyone in camp (eventually earning him the nickname “Zengalope”). By the third or fourth week of camp, Don was legendary among the students. He inspired camp T-shirts and features during end-of-camp slide shows. His infamous sweet tooth inspired a framed certificate in the dining hall guaranteeing him three desserts at any evening meal. Shortly before retiring from his camp teaching job, Don and his wife, Ann, leased a cabin about a mile up the canyon from camp where they would spend the summers (and occasionally visit camp to take advantage of the dessert guarantee).

Don is also fondly missed by his home geology department at Pomona College in Claremont, California, where he taught from 1962 to 1999. He taught courses ranging from Earth History and Sedimentology to Paleontology and Oceanography, and also chaired the department for eight years. He was widely known for his research on dolomites, and had the distinction of having a Silurian foraminifera (*Zengeri*) named after him. Don contributed to the Pomona athletic program by coaching the school’s men’s and women’s varsity soccer teams and women’s softball teams for many years. In 2007, he was inducted into the Pomona-Pitzer Athletic Hall of Fame.

Don is survived by his wife, Ann, of 58 years, and by their two children, David and Susan.



Don Zenger helping a student take measurements in the field on South Pass. Among his vast sports interests and coaching, Don was always an ardent LA Dodgers fan.



Don Zenger helping students locate themselves in the field.



