



University of Kentucky
College of Arts & Sciences

Department of Earth & Environmental Sciences
University of Kentucky
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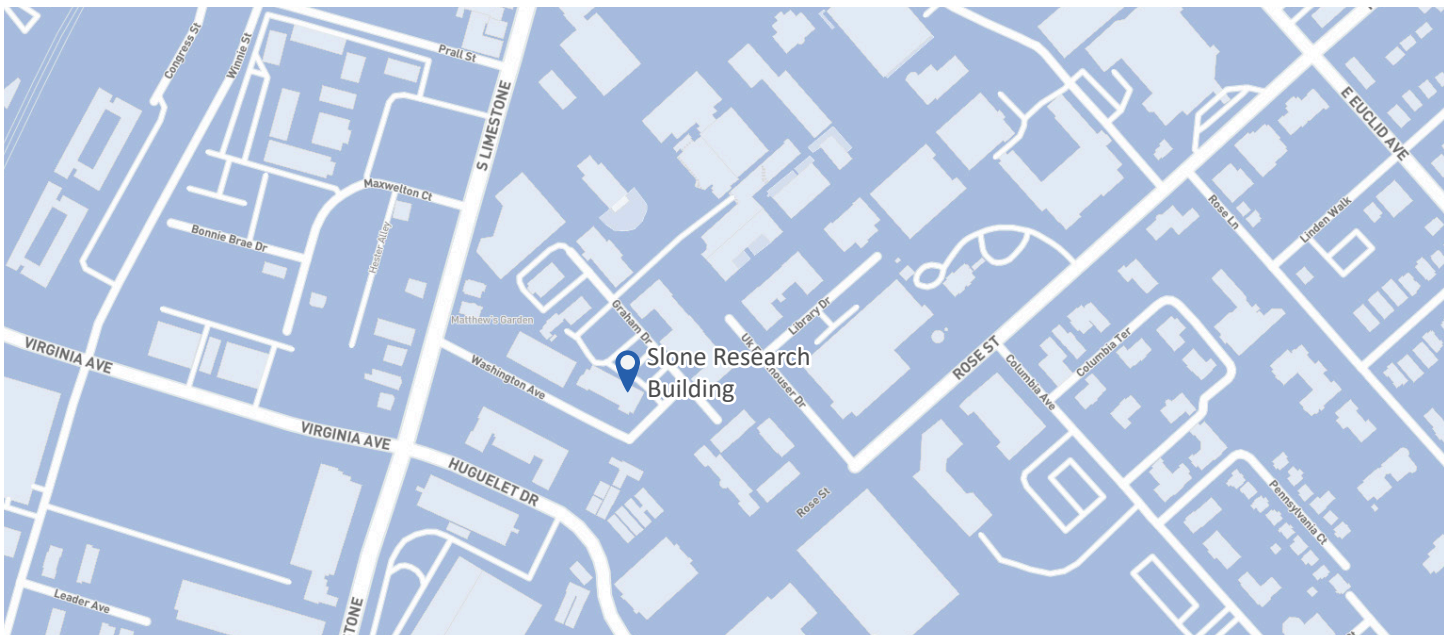
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Upcoming Events

Rast-Holbrook Seminar

Beginning August 30th, every Thursday from 3:30–5:00pm in 303 Slone Research Building. Full seminar schedule and details can be found at ees.as.uky.edu/seminar-schedule.





Earth & Environmental Sciences

2018 - 2019 DEPARTMENT NEWSLETTER





Earth & Environmental Sciences

2018-19 DEPARTMENT NEWSLETTER

Regular Faculty

Andrea Erhardt, Assistant Professor
Frank Ettensohn, Professor
Rebecca Freeman, Assistant Professor
Alan Fryar, Professor
Michael McGlue, Associate Professor
David Moecher, Professor
Keely O'Farrell, Assistant Professor
Dhananjay Ravat, Professor
Ryan Thigpen, Assistant Professor
Kevin Yeager, Associate Professor
Ed Woolery, Professor

Research Faculty

Bill Haneberg
Jim Hower

Senior Lecturer

Dr. Kent Ratajeski

Emeritus Faculty

William Blackburn
Bruce Moore
Kieran O'Hara
Sue Rimmer
Lyle Sendlein
Ron Street
William Thomas

Post-Doctoral Research Associates

Vanessa Fichtner
Yasir Soobiah
David Willis

Instructor

Summer Brown

Staff

Adrienne Gilley, Dept. Manager
Pete Idstein, Academic Lab Coordinator
Jordon Munizzi, Research Facility Manager

Adjunct Faculty

Rick Bowersox, KGS
Cortland Eble, KGS
Steve Greb, KGS
John Hickman, KGS
Marty Parris, KGS
Tom Robl, CAER
Zhenming Wang, KGS
Junfeng Zhu, KGS

Cover Photo:

Fall 2018 EES 230 Weekend Trip to Stone
Mtn, NC and Mt. Rogers, VA, led by Instructor
Summer Brown.

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Stay Connected...

You can keep track of department events, the Rast-Holbrook seminar schedule, our contact information, and alumni events via the department web page: ees.as.uky.edu

And Keep in Touch

Please let us know if your address or contact information changes. Send a note to, email, or call Adrienne Gilley, the EES Department Manager.



Adrienne Gilley

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Out with the Old and in with the New!



Dear UK geology alumni and friends,

Greetings from UK! We had another great school year of making positive strides in training and educating the next generation of geoscientists through our research and teaching efforts. In this issue of the department newsletter we are highlighting the research of many of our faculty, most of which is conducted in close collaboration with graduate and undergraduate students – please see the synopses of their most exciting projects on pages 7-13. As usual we highlight the students who have graduated and received various awards (pp. 4) and the contributions by our generous alumni (pp. 21-22).

My term as Chair of Earth and Environmental Sciences at UK ended June 30. It had been seven years that I was Chair, and it flew by. I was Associate Chair for three years before being Chair, so it has been a decade that I've been involved some way in serving the Department. The best part of being Chair was working with our generous, supportive, and enthusiastic alumni who have such great devotion to the Department. The Geology Alumni Advisory Board in particular plays a key role in maintaining support of the Department by the College. I want to extend my sincere appreciation for the Board's efforts over the past decade, and for the support of all the alumni in our development efforts.

I am also very pleased to introduce Professor Ed Woolery as the new Chair of EES. Professor Woolery is a Kentucky native and UK alumnus who received his M.S. and Ph.D. from the Department. Ed has served the Department in many ways but most recently was Director of Graduate Studies and Associate Chair. Please be as supportive of Professor Woolery as you have been for other prior chairs.

After a sabbatical I will be back full time as a 'regular' professor for the 2020-21 academic year and hope to remain active in alumni development.

Best wishes –

Dave Moecher

Alumni Professor and Outgoing Chair

Graduate Student Degrees

(WITH THESIS ADVISOR, AS OF MAY 2019)

Summer 2018

Matt Crawford, PhD: "Hydrologic Monitoring and 2-D Electrical Resistivity Imaging for Joint Geophysical and Geotechnical Characterization of Shallow Colluvial Landslides" (E. Woolery)

Ann Harris, PhD: "Occurrence and Attributes of Two Echinoderm-Bearing Faunas from the Upper Mississippian (Chesterian; Upper Viséan) Ramey Creek Member, Slade Formation, Eastern Kentucky, U.S.A." (F. Ettensohn)

Bailee Hodelka, M.S.: "Stratigraphy and Organic Geochemistry Reveal Patterns of Late Quaternary Paleo-Productivity at Mono Lake, California" (M. Mcglue)

Joseph Lucas, M.S.: "Geophysical Benthic Habitat Mapping at Lake Tanganyika (Tanzania): Implications for Spatial Planning of Small Scale Protected Areas" (M. McGlue)

Fall 2018

Ann Hislop, PhD: "Fault Evolution in the Northwest Little San Bernardino Mountains, Southern California: A Reflection of Tectonic Linkage between the San Andreas Fault and the Eastern California Shear Zone" (D. Moecher)

Rachel Hoar, M.S.: "Refining the Onset Timing and Slip History along the Northern Part of the Teton Fault" (R. Thigpen)

Cosmas Kujjo, PhD: "Mineral Exploration and Sustainable Development: A Case Study in the Republic of South Sudan" (D. Ravat)

Spring 2019

Josh Barna, M.S.: "Variability in Groundwater Flow and Chemistry in the Houzhai Karst Basin, Guizhou Province, China" (A. Fryar)

William Pierskalla, M.S.: "Rethinking Karst Hazard Assessment in Kentucky" (J. Zhu)

Wisam Muttashar, PhD: "The Effect of Depositional Processes on Compressibility and Strength of Sediments using Shear Wave Velocity" (E. Woolery)

Undergraduate Degrees

Bachelor of Arts

Gordon Dowell, Spring 2019
Timothy Duckworth, Fall 2018
Bryan Gordon, Spring 2019
Erik Gudmunson, Fall 2018

Bachelor of Science

Issam Al-Adawi, Spring 2019
Riyam Al Riyami, Spring 2019
Peter Boateng, Spring 2019
Dillon Booker, Fall 2018
Alyssa Eliopoulos, Fall 2018
Madison Hood, Spring 2019
Jonathan Wilson, Fall 2018

Undergraduate Awards

Pirtle Outstanding Senior Scholarship

Elizabeth Ann Winebarger

Glenn Rice Memorial Tuition Scholarship

Scott Anderson

Cole Denham

Spencer Dixon

Amber Dunn

Bailee Morrison

Rowan Rich

Sigma Gamma Epsilon Tarr Award

Bailee Morrison

Advancing Science for Kentuckians (ASK) Scholarship

Rowan Rich

Jay G. Henthorne Jr. Scholarship

Spencer Dixon

Rast Brown Scholarship

Alexandra Arimes

Gillian Clark

Bronson McQueen

Lucy Steiner



Above: Glenn Rice Memorial Tuition Scholarship awardees (L-R): Spencer Dixon, Amber Dun, Rowan Rich and Bailee Morrison.

Right: May 2019 Graduates: (L-R): Cole Denham, Peter Boatang , Riyam Al-Riyami, Issam Al-Adawi, Madison Hood, Bailey Foley, McKenzie Brannon, and Trevor Bryant (all B.S. or B.A.), Steven Zotto, and Josh Barna (both M.S.).

Kneeling: Mahnad Al-Jabri (B.S.)

Graduate Awards

Pirtle Summer Graduate Fellowships

Elizabeth Avery

Josh Barna

Drew Burford

Autumn Helfrich

Edward Lo

Eva Lyon

Alex Reis

Brooks Rosandich

Brandon Spencer

Meredith Swallom

Jonathan Wilson

Brown-McFarlan Fund Travel Award

Josh Barna

Morgan Black

Drew Burford

Mitchell Clay

Felicia Harris

Autumn Helfrich

Bailee Hodelka

Eva Lyon

Brooks Rosandich

Clay Seckinger

Kimberly Schindler

Amanda Sherman

Brandon Spencer

Meredith Swallom

Laura Streib

Frank tamakloe

David Wang

Steven Zotto

Ferm Graduate Research Award

Cris Alvarez Villa

Josh Barna

Drew Burford

Felicia Harris

Autumn Helfrich

Brooks Rosandich

Brandon Spencer

Meredith Swallom

Jonathan Wilson

Outstanding TA Award

Elizabeth Avery

Brandon Spencer



Rast-Holbrook Seminar Speakers

The Rast-Holbrook Seminar Series is a weekly Department event. It is an opportunity for students and faculty to hear about emerging research and for us to showcase the Department. The Rast-Holbrook endowment was made possible by a generous foundational donation by Mr. Charles Holbrook, and numerous donations by alumni made in memory of Prof. Nicholas Rast.

Fall 2018

Dr. Vanessa Fichtner, University of Kentucky, "Incorporation and Diagenesis of Carbonate Associated Sulfate"

Dr. Ben Tobin, Kentucky Geological Survey, "Grand Canyon karst: understanding flow dynamics in a critical groundwater system"

Dr. Ryan Thigpen, University of Kentucky, "Extending and erasing the Teton fault"

Dr. Jason Dortch, Kentucky Geological Survey, "Tilting of the Ladakh Range, Northern India: erosion, topography & morphology"

Dr. Hap McSween, University of Tennessee, "Rocks on Mars: Igneous, sedimentary, and metamorphic"

Dr. Jim Yeh, University of Arizona, "Principle of Parsimony, Fake Science, and Scales"

Susan Seacrest, Groundwater Foundation, "Engaging in Place"

Dr. Nilesh Dixit, Northern Kentucky University, "CO₂-Enhanced Gas Recovery Workflow in Frontier Basins, Case Study: Nenana Basin, Alaska"

Dr. Simon Darroch, Vanderbilt University, "The 'Ediacara biota' and first mass extinction of complex life"

Dr. Dave Porinchu, University of Georgia, "Evidence of abrupt climate change at 9.3 ka and 8.2 ka in the central Canadian Arctic: Connection to the North Atlantic and Atlantic Meridional Overturning Circulation"

Spring 2019

Dr. Matthew Wielicki, University of Alabama, "Applications of thermochronometry: from the tectonic evolution of Death Valley, CA to the timing of the Popigai impact event"

Atticus Stovall, NASA, "Illuminating forest structure and function with ground, air, and spaceborne LiDAR"

Dr. Paul Betka, Lamont-Doherty Earth Observatory, "Coupled tectonic and deltaic systems of the Indo-Burman Ranges: Bangladesh, NE India, and Myanmar"

Dr. Mohamadreza Soltanian, University of Cincinnati, "A New Window into the Subsurface: How tracers reveal heterogeneity in both aquifer and flow processes"

Dr. Briony Horgan, Purdue, "Was Ancient Mars Warm and Wet or Cold and Icy? Mineral Signatures of Climate in Rover, Orbiter and Terrestrial Analog Studies"

Dr. Suzanne Birner, Berea College, "Assessing chemical heterogeneity in the oceanic upper mantle using coupled analysis of basalt and peridotite"

Dr. Emily Pope, Colorado College, "Earth's Deep Water Cycle"

Dr. Chris Shepard, University of Kentucky, "Soils, the Critical Zone, and Past Climate"

Dr. Evan Solomon, University of Washington, "Revisiting the Role of Continental Margin Sediment Diagenesis in Marine Geochemical Cycles"

Dr. Caroline Peacock, University of Leeds, "Mud, mud, glorious mud: how marine sediments control the earth system"

Dr. Mark Kulp, University of New Orleans, "Subsidence and Sea Level and Sediment, Oh My!"

Cynthia Blankenship, BP America, "Deepwater Horizon: An insider's perspective on a deadly \$65 billion tragedy"

Dr. Trisha Spanbauer, University of Toledo, "Revealing historical processes in Yellowstone Lake through Paleolimnology and Molecular Ecology"

Department News

Faculty Tenure and Promotion 2019

The Department is very pleased to be able to announce the promotions of Dr. Alan Fryar to the rank of Professor, and Dr. Michael McGlue to the rank of Associate Professor with tenure. The promotion of a faculty member is always a big deal in universities. Assistant Professors are subjected to a thorough tenure review by experts in their field outside the university; by senior faculty in their home departments; by a college-level committee appointed by the Dean; and by a university-level committee appointed by the Provost. If they pass this review they are appointed to Associate Professor with tenure. Associate Professors in turn are ALSO subjected to this same thorough review in order to be promoted to Professor. So you can be assured that faculty who make it through the ranks have exceeded a high standard of excellence in teaching, research, and service.

These are important career development stages for faculty, and for the department as it provides secure leadership for the future. Please join us in congratulating Alan and Mike (left and right, below).



KGS Commonwealth Research Assistantship in Earth and Environmental Sciences

On July 12, 2019, EES chair Ed Woolery and KGS director Bill Haneberg signed a memorandum of understanding to establish the KGS Commonwealth Research Assistantship in Earth and Environmental Sciences. KGS will support one UK EES graduate student per year on an MS or PhD research project, with preference given to applied research of direct and compelling interest to Kentucky and its people. KGS may also provide support for fieldwork,

laboratory analyses, conference travel, or other research expenses. Recipients will be required to present their research at one or more professional conferences, submit a paper related to the funded research to a peer reviewed journal, and have a qualified KGS staff scientist on their graduate committees. Recipients must also be eligible for the EES Pirtle Fellowship, which will be applied towards a summer stipend.

Late Breaking News – More Slone Building Renovations!

Thanks to two successful grant applications to UK written by Pete Idstein (UK EES Academic Lab Coordinator) and donations from eight alumni, we are renovating the third floor of Slone Building. Third floor gets a lot of traffic from students from various majors and the hallways get crowded between classes with students commonly sitting on the floor. The renovation will remove the lockers (a legacy of the former Pharmacy students who used to occupy Slone Bldg. in its original incarnation as the College of Pharmacy) and replace them with display cases and recessed seating with lighting and power (for all the electronic devices we have).

We renovated the first floor of Slone in 2014. With the third floor renovation we are 2/3 of the way to having all the hallway space in Slone renovated. Watch this space next year for a photo of the finished product!



EES Spotlight

Dr. Rebecca Freeman, Assistant Professor



The old adage “time flies when you are having fun” certainly applies to my time at UK, and it’s hard to believe that I’ve been in the department for eight years now, six of them as Director of Undergraduate Studies. I am happy that I now have alumni stopping by to see me when they are in town—keep the visits coming, folks.

Professionally I’ve been balancing my paleontological career of studying phosphatic microfossils with my interest in outreach and geoscience recruitment. My Co-PI’s (Mike McGlue and Alan Fryar) and I are wrapping up a three year NSF-funded project working with a STEM high school in Lexington, and Alan and I were also involved in State Department project pairing Kentucky high schools with high schools in India for

online education about water issues. I’m also co-editing a special volume of *Palaeogeography, Palaeoclimatology, and Palaeoecology* focused on a UNESCO-sponsored project looking at Ordovician biodiversification, and recently joined the editorial board of the *Journal of Systematic Palaeontology*. I am finding my new editorial roles to be strangely like paper grading!

I enjoy teaching two large classes for non-science majors (Oceanography and Earthquakes & Volcanoes) so am constantly on the prowl for interesting news and new teaching methods to keep these courses fresh. I also still teach the Regional Historical Geology class, with its trip to Maysville, and this year I’ll be taking over the Geoscience Orientation class while Dr. Moecher is on sabbatical. I’m excited about that opportunity as he takes a well-deserved break.

Dr. Jordan Munizzi, Stable Isotope Lab Manager



I joined the department in January 2018 as research facility manager for the Kentucky Stable Isotope Geochemistry Laboratory (KSI GL) after earning my Ph.D. from University of Western Ontario in December 2017. I’m fortunate to be here. With three isotope ratio mass spectrometers (IRMS), two laser spectrometers, five peripherals, and ample prep facilities, this is Kentucky’s premier light stable isotope facility.

This year was a busy one: we added a second elemental analyzer and a laser spectroscopic analyzer to our ‘stable’ of instruments, allowing us to measure stable sulfur isotopes in bulk solids, and stable hydrogen and oxygen isotopes in liquids, respectively. Along with several ‘legacy’ systems we’ve upgraded, these new instruments permit the analysis of stable isotopes of N, C, H, O, and S in almost any sample material. We also built a sulfur extraction line (with the help of post-doctoral scholar Dr. Vanessa Fichtner), and launched a website (isotopes.as.uky.edu) and social media accounts.

There’s always something exciting happening in this lab. Stable isotope analysis is a powerful tool for the natural, life, medico-forensic, and social sciences. On a daily basis, I’m working with researchers from our department, the broader university community, and beyond to apply or adapt our instrumentation to their analytical needs. I also have help from an outstanding team of undergraduate workers, April Collins, Bronson McQueen, Bailee Morrison, and Rowan Rich. If you’re ever in the department, please stop by the lab. We’d love to give you a tour and show you what we’re working on.

Dr. Alan Fryar, Professor



The hydrogeology group has been busy! Josh Barna did field work in Guizhou province, China, in June and December 2018. His research focused on groundwater flow and chemistry in a mountainous karst basin. I joined him for the first trip (his first outside the USA, apart from a childhood trip to Niagara Falls) and colleagues from the Institute of Geochemistry at the Chinese Academy of Sciences helped us throughout. He defended his MS thesis in April 2019 and started a job with ARM Group in Bethesda, Maryland, in June. In May, Amanda Sherman defended her thesis on groundwater flow and chemistry in the Cumberland River alluvial aquifer at a National Guard training site in southeastern Kentucky. Amanda also helped me, Dr. Rebecca Freeman, and Dr. Carol Hanley (UK College of Agriculture, Food and Environment [CAFE]) greatly on our water-education project for high-school students in India and Kentucky. Amanda moved back to San Antonio, Texas, and resumed working for the U.S. Army Environmental Command. My two current co-advisees with Dr. Andrea Erhardt are off to a great start. Elizabeth Avery is studying how restoration of a stream along Alumni Drive on campus will affect

groundwater-surface water exchange. She received a Casner Fellowship from UK CAFE and a Geological Society of America Student Research Grant. Starting in August, she will spend a year in Ukraine as a Fulbright Scholar, using stable isotopes to relate water sources to precipitation in the Kyiv region. Working with KGS staff, Cris Alvarez Villa is studying sources of methane in groundwater in eastern Kentucky. He received research grants from the Kentucky Water Resources Research Institute, the American Association of Petroleum Geologists, and the GSA Southeastern Section.

I've been slowly catching up on a backlog of papers with former students, including Abhijit Mukherjee (MS 2003, PhD 2006), Emily Eastridge (MS 2011), and Rachel Nally (née Hatch) (BS 2010, MS 2013) on arsenic in groundwater in India; Ashley Bandy (MS 2011, PhD 2016) and Ben Currens (MS 2016) on water quality in karst in central Kentucky; and Brett Howell (MS 2016) on groundwater recharge in Morocco. I'm pleased to say all of them are doing well. I was invited to speak on our work at a symposium at the University of Wah, Pakistan (hosted by Zulfiqar Ahmad, PhD 1992); at the GSA Annual Meeting in Indianapolis; and in seminars at Georgia State University, the University of Memphis, and Jilin University in Changchun, China. Both Josh and Amanda also gave presentations at GSA in Indianapolis, and there was a steady stream of visitors to our UK EES-KGS recruiting booth there. Zhenming Wang (PhD 1998; head of the Geologic Hazards Section at KGS) accompanied me to Jilin, which is one of the leading universities in China. EES is developing a dual bachelor's/master's program with several departments in the Faculty of Earth Sciences there; stay tuned for more details!



EES Spotlight

Dr. Mike McGlue, Associate Professor



I'm the director of the Pioneer Stratigraphy and Paleoenvironments Laboratory, and I also hold the Pioneer Natural Resources endowed professorship. My group conducts field- and laboratory-based studies of muds and mudstones, in order to answer questions related to climate change, water, and energy resources. Current research focuses primarily on lacustrine basins, though we retain long term interests in muddy petroliferous basins from all environments. Our toolkit is diverse and integrates techniques in stratigraphy, sedimentology, geochemistry, geophysics, and paleoecology. Areas of interest presently include the East African Rift Valley (Tanzania), the Pantanal wetlands (Brazil), the lower Amazon (Brazil), the eastern Sierra Nevada (CA), the Grand Teton (WY), and the Black Hills (SD). We have also developed extensive research in the lower Wolfcamp unconventional play (Midland Basin, TX) in collaboration with Pioneer Natural Resources.

Eight M.S. students have successfully graduated from my group since 2013. Current lab members include doctoral students Eva Lyon, Bailee Hodelka, and Edward Lo, as well as master's candidate Antonia Bottoms. I co-supervise several graduate students at UK and at universities abroad. I was tenured and promoted to Associate Professor in 2019, so I will be on sabbatical for AY 2019-2020. I will be spending part of my sabbatical at the Sierra Nevada Aquatic Research Laboratory in Mammoth Lakes, CA. I'm looking forward to some big projects on the horizon, especially scientific drilling on Lake Tanganyika, which will produce a new Neogene-Quaternary 'type section' for the continental tropics, and shed light on paleoclimate, paleobiology, and rift tectonics in the East African rift valley. A new area that has captured my interest is lacustrine paleoseismology, and I'm working with Professors Thigpen and Woolery to develop new research projects in this theme.

Dr. Keely O'Farrell, Assistant Professor



Dr. Keely O'Farrell has been busy expanding her research group. In addition to her postdoc, Dave Willis, a new masters student, David Wang, joined the group in Fall 2018. Dave Willis has been continuing work on ultrahigh temperature orogens. In particular, he has been exploring the continental melt generated from a sustained plume below. David Wang is currently completing course work and will be studying the effect of different viscosity variations in the deep interior.

Keely has been continuing to study the dynamics of the Earth's interior. She has been focused on tracking plumes through the mantle. These small-scale dynamical features might help tell us about the structure and composition of the deep interior. By tracking the plumes, she hopes to find the source of various geochemical signatures found at different surface hotspots.

Along with other colleagues, Keely has also been exploring the dynamics of slab holes. Seismic data shows us that there are possible gaps in subducting slabs. Using analog models, they have found that hot, deep mantle material is able to move through the gap into the above mantle wedge. This could effect local volcanism at the surface. Keely hopes to study this more using computational models with the help of a new masters student starting in the fall of 2019, Taylor Arrowood.

Dr. Dave Moecher, Professor



The 2018-19 academic year was with my final year as Chair of EES, after seven years in that role, three years preceding that as Associate Chair, and something like ten years before that as Director of Undergraduate Studies. I'm looking forward to a year of sabbatical leave next year and then coming back as a 'regular' Professor to focus on teaching and research. But I'm proud of the progress the department made in the past decade in terms of alumni development, improvements to Slone Building, student career development and job placement, and faculty development.

With regard to research (every faculty member's primary obsession), a famous geochronologist was asked what the most exciting project was that he ever worked on. He replied: "The one I'm working on

now!". And that goes for me and my current students, Mitchell Clay, Clay Seckinger, and Felicia Harris. Mitchell's Ph.D. project is evaluating the evolution of Precambrian basement of central Kentucky where the Grenville Front, a collisional structure, intersects the East Continent Rift, an extensional structure. He is using rocks recovered in basement cores and well cuttings, and is conducting zircon U-Pb geochronology on crystalline rocks and detrital zircon in sedimentary rocks. Clay's M.S. thesis is a detrital zircon U-Pb provenance study of what are purportedly (according to Frank Ettensohn) latest Devonian glacial diamictites (see the photo on p. x of Clay in Frank's class at the diamictite locality in Maryland). Felicia at the time of this writing just returned with me from Brazil where we collected sedimentary rocks that correlate with late Precambrian sedimentary rocks formed by erosion of the Grenville orogen. She too will be conducting primarily a detrital zircon U-Pb geochronology study to determine if sediment from the Grenville orogeny spilled out onto Amazonia, the continental landmass that purportedly collided with North American to form the Grenville orogeny.

Finally, just a shout out to Dr. Ann Hislop (Ph.D.), Steven Zotto (M.S.), and Kevin Walsh (M.S.), who finished their dissertations and theses in the past academic year. Ann has a position with the KGS, Steven is doing an internship in Dallas, and Kevin is a mine geologist in the Juneau, Alaska, area.

Pete Idstein, Academic Lab Coordinator



I continue to lead an optional field trip to Mammoth Cave National Park for Dr. Ratajeski's EES-180, Geology of National Parks. We spend Saturday examining the karst features adjacent and within the park and then get afterhours access to the cave. After spending the night at the Cave Research Foundation's Hamilton Valley Facility we finish with half a day of examining regional groundwater pollution issues.

I attended the national GSA meeting in Indianapolis where I presented results from my volcano lab exercise to a session on geoscience education. The lab activity involves exploding soda bottles partially filled with liquid nitrogen submerged in barrels of water.

Rubber ducks floating on the surface are ejected with the exploding water and the students map the distribution of the ducks.

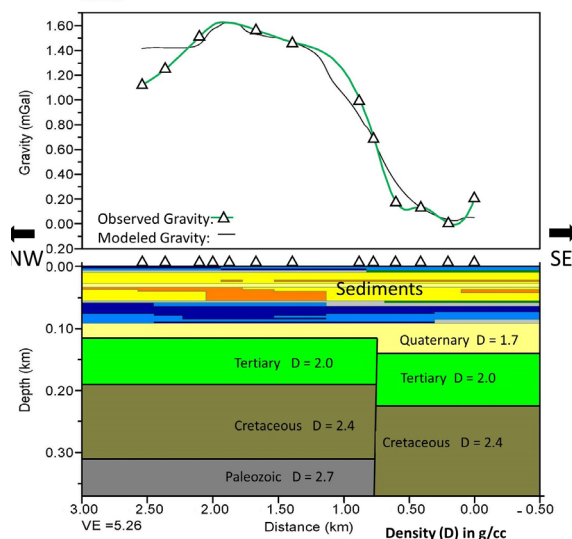
EES Spotlight

Dr. Dhananjay "Tiku" Ravat, Professor

We are now in pretty much the golden age of space exploration and the Geophysics Laboratory at UK has been at the forefront of the new research on the Earth, the Moon, and Mars magnetic and gravity fields, heat flow, and tectonics. We also have a lot of folks in the lab doing interesting projects. In January, we were joined by Dr. Yasir Soobiah, a space physicist who was working at Goddard Space Flight Center on NASA's MAVEN satellite which is currently orbiting Mars. He has been working to solve the mystery of how the Moon's enigmatic "swirls" formed. (Swirls are bright hazy patterns on the Moon that are in some way formed by the interaction of the solar wind, magnetic anomalies, and the charged dust particles on the Moon. If you haven't yet known of the swirls, search on the web using the term "Reiner Gamma swirl".) In June, Dr. Ratheesh Kumar, who is a professor at Cochin University of Science & Technology, joined us on a project to derive Mars's elastic thickness variation in the region of crustal dichotomy boundary using new methods. This holds the key to understanding the strength variation of Mars' lithosphere today, which in turn also constrains its geologic evolution.

From August, Aspen Davis, a student from Colorado School of Mines, will be joining the master's program and will work also on Mars' gravity and topography. Lillie Cole, an undergraduate student in physics, has been working on deriving magnetization direction of some of the key magnetic anomaly features on the Moon. She picked up where Dany Waller who graduated this past May left off and has gone way beyond. Lillie is developing methods that are leading to better magnetization directions than work from previous research. These directions allow us to locate rotational axis of the Moon at the time the rocks acquired magnetization. The directions are so different for different magnetic features and they tell us that the Moon has been tilting this way and that between 3.5 to 4 billion years ago (we wouldn't want to be on the Moon if it begins to do that again). Zach Esenbock, an undergraduate student in computer engineering, has been working for the past couple of years on extracting the cleanest crustal magnetic field data from the Mars MAVEN mission. We will soon use that data to develop very high resolution lithospheric magnetic field models of Mars which will help in deciphering its early history at the times when its core field dynamo was active.

In the past three years, we have also succeeded in developing a very high resolution lithospheric magnetic field model of the Earth from the gradients computed from European CHAMP and Swarm constellation missions. The Swarm constellation has three coordinated satellites and this lithospheric magnetic field model is now the new "standard" against which other efforts are measured. We developed also methods to make very high-resolution models of the lunar crustal magnetic field from reviving old data from NASA's Lunar Prospector (1998-1999) and also Japanese SELENE/Kaguya mission in 2007-2009 (Leah Newman's project). We plan to use models from these and future "moon-kissing" orbit nanosatellites to develop and assess targets of resource exploration on the Moon.



Drew Burford uses gravity data to detect faults on Charleston Uplift, New Madrid Seismic Zone.

Dr. Kent Ratajeski, Lecturer



I will be starting my 13th year at EES this fall semester. My teaching assignments during the past year have included EES 110 (Environmental Geology), EES 180 (Geology of the National Parks), EES 220 (Physical Geology), EES 230 (Fundamentals of Geology I), and EES 360 (Mineralogy). This fall, I will be teaching EES 461 (Igneous and Metamorphic Petrology) while Dr. Moecher is on sabbatical. Highlights of this past year include developing and leading a new field trip to the Tennessee/North Carolina Blue Ridge for EES 360, leading EES 110 and EES 220 students on an extra-credit field trip to Raven Run Nature Preserve, collecting geodes with his EES 360 students in Lincoln County, KY, co-leading a field trip to Mammoth Cave National Park with Pete Idstein for EES 180, teaching an introductory geology course at the Wheaton College Science Station in Rapid City, South Dakota, visiting Cumberland Falls with my family for the first time, and cheering on the Cats to victory at the Citrus Bowl in Orlando, FL.

Edward Woolery, Professor and Chair

Near-surface geophysics, engineering seismology, and paleoseismology have been primary research interests during my nearly two decade tenure in the department. Locations for these field-based endeavors have largely been in the Mississippi and Wabash river valleys of the central U.S., and to a lesser extent along the Tibetan Plateau of northwestern China. More recently I have developed new, but allied interests in high-resolution geophysical imaging of paleolake and extant lake environments in the eastern High Sierra (CA) and Grand Tetons (WY) with Profs. McGlue and Thigpen. Of course any successful science stemming from these pursuits would not be possible without quality graduate students, and as such, it has been my great fortune to recruit, mentor, and graduate 22 M.S. and 5 Ph.D. students since arriving in 2001. This past year has produced two PhD graduates, Matt Crawford and Wisam Muttashar, co-advised with Sebastian Bryson in Civil Engineering. Matt determined that electrical properties of colluvium are useful proxies for the geotechnical characteristics of landslides. Wisam successfully established a relationship between the consolidation behavior and various parts of riverine sedimentary environments using shear-wave velocity. Collectively, these two dissertations have thus far produced 7 peer-reviewed publications.

In addition to the doctoral graduates, the past year had one MS graduate, Drew Burford. Drew pursued an integrated microgravity and seismic-reflection investigation which imaged and established a fault-controlled southern boundary for a stratigraphic uplift in the central U.S. that likely acts as the northeastern extension of the New Madrid North Fault. His findings, along with former MS student Clara Rucker's work on the northern boundary, will make an excellent submission for the Seismological Research Letters. We also look forward to the upcoming defenses of Brooks Rosandich (MS) and Seth Carpenter (PhD), as well as the arrival of a new MS near-surface geophysics student, Cooper Cearly.

Along with continuing these research tracks, the academy also asks senior faculty to assume more administrative responsibilities as their career matures. In other words, as Milton Friedman insisted: "there is no such thing as a free lunch." To this end, I have served as the Director of Graduate Studies for the past seven years and Associate Chair for the past two. As DGS, I have found it very rewarding and enjoyable to assist students work through the logistics of a graduate education (doing program assessment for the Graduate School is another story, however). Going forward, I have been asked to assume the department chair as Prof. Moecher steps down after 7 years in that role. I want to thank Dave for his mentoring along the way, as well as his patience and assistance during the seemingly never-ending transition. Although initially reluctant to take this career detour, I am both flattered and grateful for the positive support and encouragement I've received from EES faculty, staff, students, and alumni. I will continue to need this support as I find my new normal, and we work together for program excellence. Essayons!

EES Spotlight

Dr. Ryan Thigpen, Assistant Professor



The 18-19 academic year was very busy and exciting for Prof. Ryan Thigpen and the Structure and Geodynamics Group. We had our first two M.S. graduates (Rachel Hoar and Meredith Swallow), both of whom were working on our Teton fault research project. In Fall 18, we were able to take 13 students to the Tetons, along with faculty members Mike McGlue, Ed Woolery, and Summer Brown, to continue our ongoing work there. We are incredibly grateful for the Overcash Field Trip Fund, which provided student funding for the trip. As a bonus, Wendell and Joanne Overcash were also able to join us in Wyoming and see firsthand the great work we are able to do with this funding. Ph.D. student Brandon Spencer and M.S. student Autumn Helfrich received multiple small grants to continue their ongoing work in Scotland and the Tetons, respectively. We also received two major grants; one will support ongoing work in the southern Appalachians and the

other will support a brand new study focused on salt tectonics in Utah, Mexico, and Germany. These grants will also support two new M.S. students, Bill Swanger and Nick Powell, that will be joining the group in Fall 2019.

Finally, our group was recognized in numerous ways this year, including write-ups in Scientific American on our earthquake study in Tennessee, numerous Wyoming newspaper articles about our Teton fault work, and an invite to give a public talk to the people of Jackson, WY in June 2019. Also, honorary group member Summer Brown was chosen by the students as the EES Professor of the Year. We hope that academic year 19-20 will even more productive and exciting.



EES Geoscience Students in Action



Gordon Dowell collecting geodes in Lincoln County while in the field with Dr. Ratajeski's mineralogy class.



Students examining their first metamorphic rocks on Summer Brown's Field Methods field trip in the Blue Ridge.

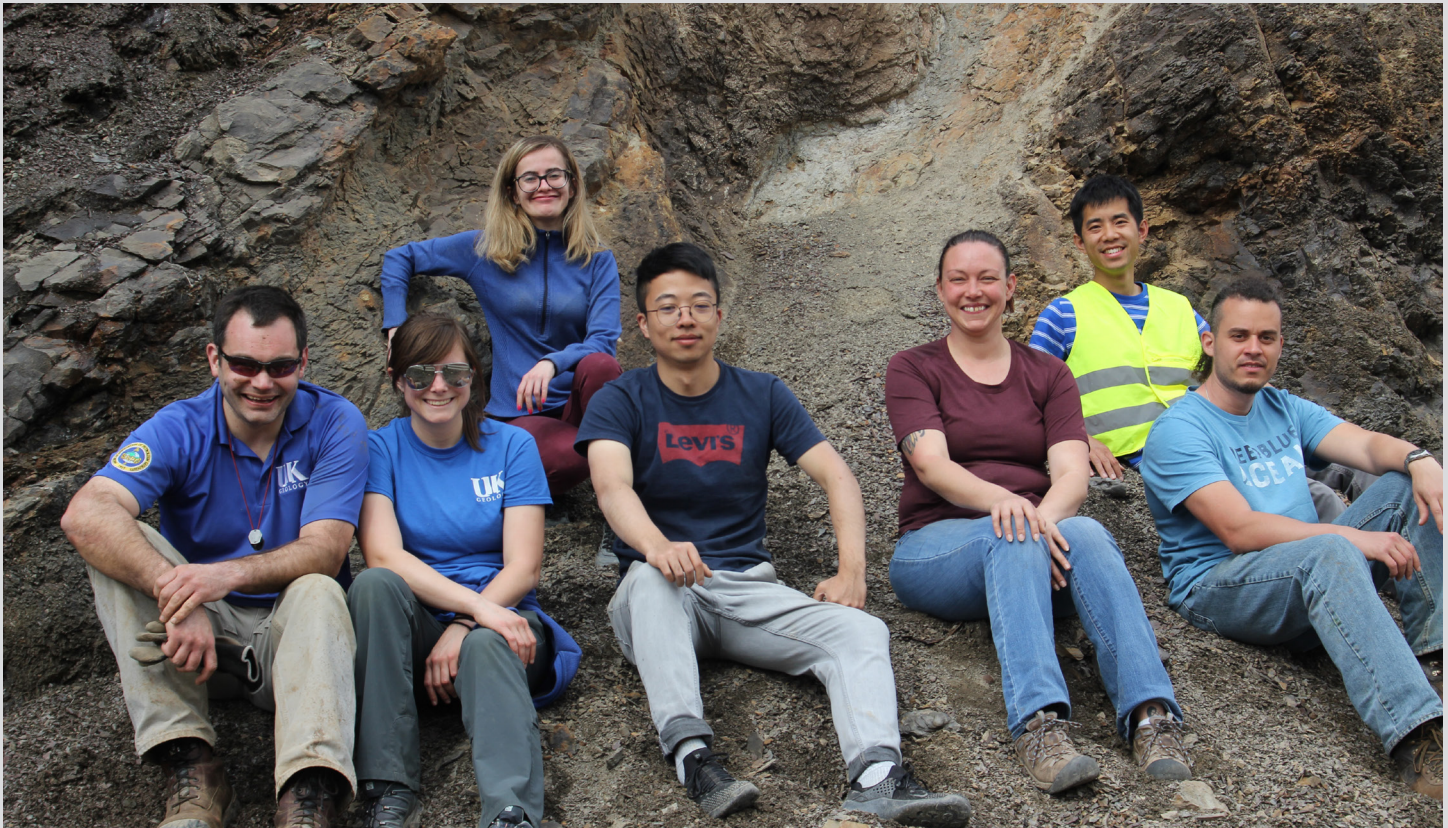


Prof. Ryan Thigpen and students sampling granites in the Tetons for a field research class taught with Mike McGlue and Ed Woolery, and funded through the Overcash Field Trip Fund.



Elizabeth Avery (left) and Felicity Shirkey (undergrad major, right) injecting tracer solution into stream along Alumni Drive.

EES Geoscience Students in Action



EES 730 (Sedimentary Petrology as a Tool in Developing Tectonic Context) students in West Virginia, led by Dr. Frank Ettensohn.



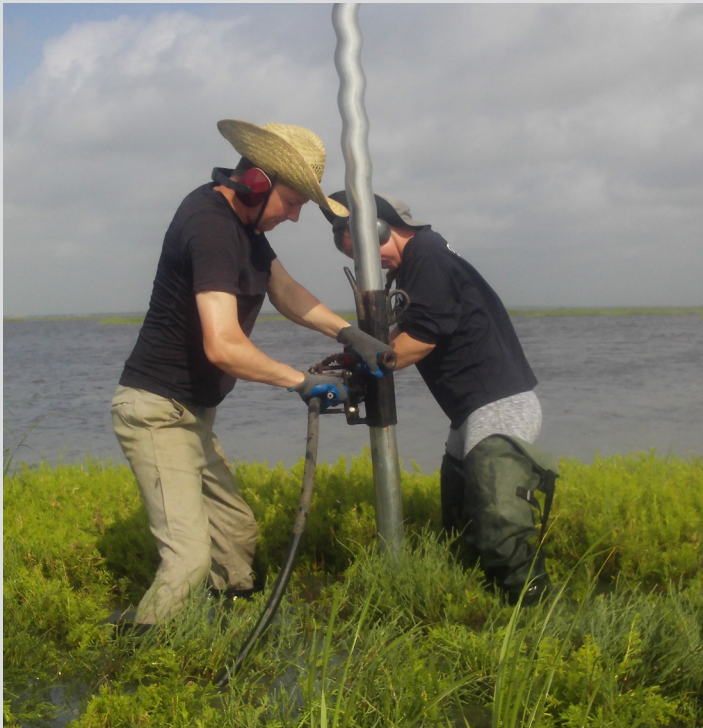
EES 230 students mapping Ordovician bedrock in Garrard County, KY, led by Dr. Kent Ratajeski.



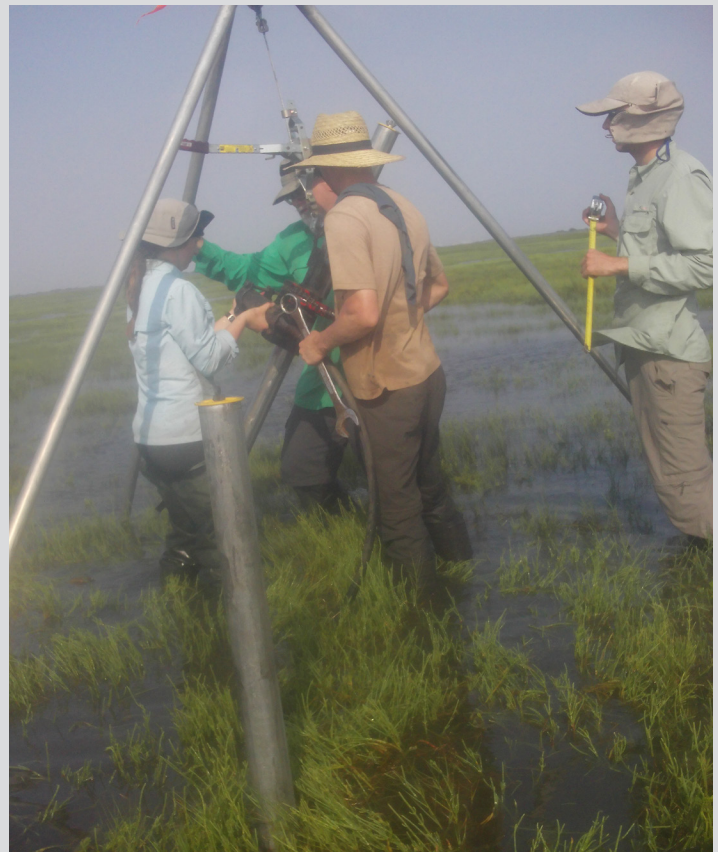
Brooks Rosandich collecting gravity data to detect faults on Charleston Uplift, Mo. Brooks is an MS student in Geological Sciences, working with Professor Edward Woolery.



Undergraduate students taking part in "Field Camp Boot Camp", lead by Instructor Summer Brown, far left.



(above and right) Prof. Kevin Yeager and students collecting sediment vibracores in marshes of the Brazoria National Wildlife Refuge in coastal Texas (2019).



Letter from Wendell Overcash, Chair of the UK Geology Alumni Advisory Board

Greetings to All Alumni and Friends,

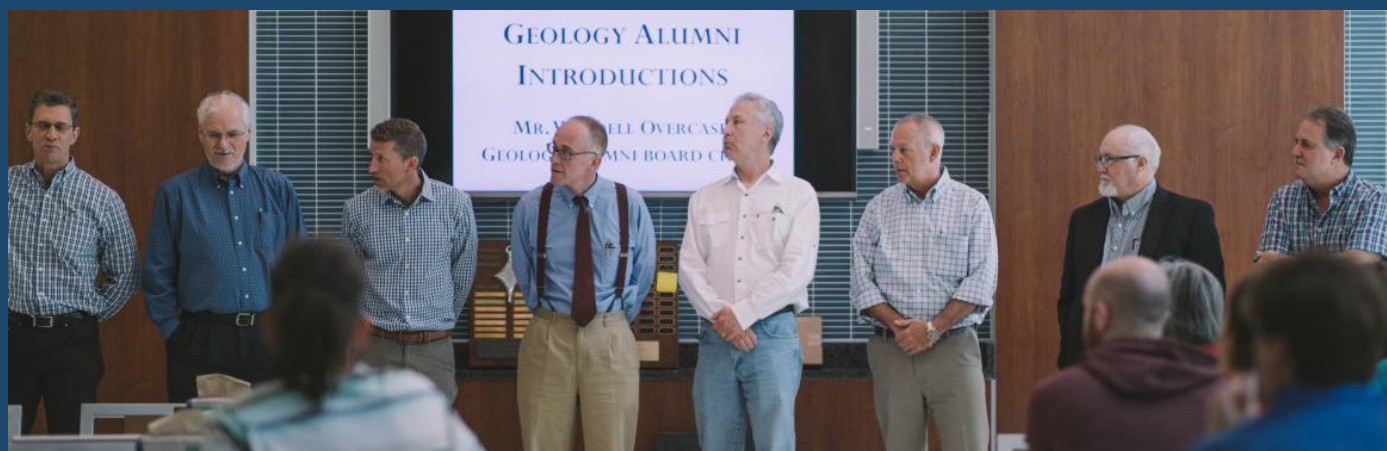
There are a number of supportive alumni that serve on the Board and thus, it is through the efforts of many that a synergy exists with the administration and faculty. The Board has served as the example as other departments within the College of Arts and Sciences have formed their own alumni organizations. There is gratification to having this Board lead the way for the College of Arts and Sciences. As expressed previously, your Board has allowed its members to be part of something bigger than ourselves; to both acknowledge the value of the education we received and to assist present and future students in their endeavors. Other departments within the college have taken note of our success!

The Board is involved in a number of on-going efforts, including fundraising. While state funding support continues, it is the alumni efforts that have allowed the Department to continue to offer a significant "value added." Without the efforts of alumni the Department could not offer all the educational opportunities and experiences that are currently enjoyed. Space constrains me listing all the generous contributions received but suffice to say that the fundraising continues. Many alumni and friends generously contribute as part of their ongoing charitable giving and we wish to express our appreciation for all gifts in any amount. Large gifts occur in a "fits and starts" manner and I am happy to report several significant gifts have been made in the last several years.

Additional resources are necessary to provide continued academic excellence. The Board is strongly encouraging all alumni and friends to continue their support. It is through the foresight of many that all students have benefited from the "value added" that fundraising affords - it is a major reason for this Department's solid reputation.

It has been my distinct pleasure and honor to continue to serve as Board Chair and it is fair to say that your Board will continue to its support and assist in growing the Department, but your support is critical.

Wendell H. Overcash
Chair
Geology Alumni Advisory Boards



Geology Alumni Board members (L-R): Tom Spalding, Mike Bourque, Kit Clemons, Tom Scott, Steve Sullivan, Curt Hull, Rodney Metcalf, and Butch Butler.

Alumni News

Recent Developments in Alumni Development

We have been very fortunate in the past decades to have a very enthusiastic, devoted, and generous group of Geology alumni. Having an Alumni Advisory Board has kept us in good stead with the College administration, and served as a model for all the other departments in the College, most of whom have done no alumni development until recently.

We have 16 separate endowment funds that mostly support students through scholarships, fellowships, or research/travel support. Others also serve the mission of the Department – seminar and development. Several of these funds are listed at the end of the Newsletter – please continue to support our mission with an annual donation. To this growing list we add the most recent endowments created in 2018-2019 (listed in order of signing date):

- **Rast/Brown Endowed Scholarship Fund for Earth and Environmental Sciences**

Dr. Ken Neavel (UK M.S.) established this fund in honor of the late Professors Nick Rast and Bill Brown. Scholarships from the fund will be awarded to incoming students based on academic potential and financial need, preferably for students from Kentucky, as a means to recruit a more diverse student population.

- **Steve and Cindi Sullivan Excellence Award in Geology Graduate Fellowship**

Steve is a long serving and active member of the Geology Alumni Board. Steve and Cindi were both UK undergraduates, with Steve also receiving the M.S. in Geology at UK. This scholarship will be awarded to a qualified UK undergraduate who continues in the graduate program in EES, as a means to recruit the brightest Kentucky undergraduates into our graduate program.

- **William A. and Rachel L. Thomas Graduate Fellowship in Geology**

Bill Thomas is a UK alumnus (B.S. and M.S.) who was the Hudnall Professor and Chair of the Department of Geological Sciences at UK from 1990 to 2010. This fellowship for students conducting field-based research was established by the daughters (Carolyn and Amy) and sons-in-law (Dr. Lyle Mars, UK Ph.D., and Robert Orr) of Bill and Rachel, in their honor. The department will formally recognize this new fellowship at the Geology Alumni Research Symposium on October 3, 2019.

2018 Distinguished Alumni

Rodney Metcalf

(UK B.S. 1979, M.S. 1984)

Nomination by Doug Gouzie (UK Geology B.S. '81, Ph.D. '86) and Curt Hull (UK Geology B.S. '78)

Dr. Rodney V. Metcalf is a Kentucky native raised in Paducah and a 1973 Graduate of Paducah Tilghman High School. He received the B.S. ('79) and M.S. ('84) in Geology from the University of Kentucky. Rod became an avid caver at a young age which led to his participation in mapping of the Roppel Cave with the Central Kentucky Karst Coalition which eventually added tens of miles to the Mammoth Flint cave system. Rodney has been married to Tracey (UK Pharmacy '78) for 42 years and they have three children and six grandchildren. Rod is also an accomplished boatman holding a commercial guide license for the Colorado River in the Grand Canyon.

Professionally, Dr. Metcalf has distinguished himself by earning a PhD in Geology and serving on the faculty of the University of Nevada, Las Vegas for over 25 years. In that time, Rodney not only established himself as an excellent teacher and researcher, but he also rose to the position of Associate Dean of the College of Sciences, and now serves as Chair of UNLV's Department of Geosciences. Related to his faculty position at UNLV, he has served as Associate Editor of the Geological Society of America Bulletin and as an officer of the Cordilleran Section of GSA.

Beyond his faculty duties at UNLV, Dr. Metcalf has always found time to serve the geologic community. He played a key role in the 21st century relaunch of the EES Alumni Board, serving on the Board from 2006 to the present. He has also gladly assisted other UK alums, faculty, and students by meeting with prospective grad students and guiding field trips visiting his home area in the western US.



Alumni Board Chair Wendell Overcash (left) and 2018 Distinguished Alumni Recipient Dr. Rodney Metcalf.

Perhaps most compelling in Dr. Metcalf's nomination is his willingness to expand the science of geology into the service of his community and our nation by applying his detailed knowledge of petrology to potential public health issues with asbestiform minerals in soils and dusts around the metropolitan Las Vegas area. This work thrust Dr. Metcalf into a public arena many geologists are unfamiliar with – but one where Dr. Metcalf displayed skill in dealing with the public and dedication to scientific truth. In fact, this work led to Dr. Metcalf being interviewed and quoted in a lengthy article in the New York Times regarding geology and public health. Not many UK alums have been quoted in the New York Times for their professional knowledge, making Dr. Metcalf's accomplishment truly worth recognition. And the relatively recent (globally) expansion of geologists into the public health arena has opened a broad expanse of future opportunities for young geoscientists.

Distinguished Geology Alumni Award Recipients

- 2005:** William A. Thomas, B.S. 1956, M.S. 1957
- 2006:** Charles E. Holbrook, B.S. 1962, M.S. 1964
- 2007:** Alma Patty, M.S. 1984
- 2009:** Sam Boggs, B.S. 1956
- 2012:** David C. Scott, B.S. 1977
- 2013:** Niel Plummer, B.S. 1967, M.S. 1969
- 2014:** Donald C. Haney B.S. 1959, M.S. 1962
Thomas S. Spalding B.S. 1980, M.S. 1982
Elizabeth A. Haynes, M.S. 2000
- 2015:** Larry R. Rhodes, B.S. 1971
Jay G. Henthorne, Jr. B.S. 1964
- 2016:** Bridget Scanlon, PhD 1985
- 2018:** Rodney Metcalf, B.S. 1979, M.S. 1984

Donations 2019

Thank You!

The following people, companies, and entities constitute the donors who helped us achieve one of our fundraising goals to various department endowments. Some folks contributed to more than one fund, and corporate matches were counted as donations. We greatly appreciate this outpouring of support!

Geology Support Fund

Mr. Robert J. Hurd
Mr. Timothy D. Elam

Wallace W. Hagan Scholarship Fund

Mr. Timothy D. Elam

Brown-McFarlan Fund

Mr. Timothy D. Elam
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Alumni Professorship Fund

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John C. Ferm Graduate Fellowship Fund

Ms. Margaret H. Ferm
Dr. Stephen Greb
Dr. Peter D. Warwick

Wendell H. Overcash EES Student Travel Scholarship Fund

Mr. Wendell H. Overcash
Dr. Robert Kelly Vance

Boone Graduate Fellowship Fund

Mr. Matt and Mrs. Jill Gregory

Elizabeth A. Haynes Field Trip Fund

Drs. Thomas and Natasha Becker
Ms. Sarah Mardon
Mr. John T. Johnson
Ms. Mary Witt Wilson, *in memory of David Wilson*

William A. and Rachel L. Thomas Graduate Fellowship Fund

Dr. William A. and Mrs. Rachel L. Thomas

Glenn Rice Memorial Scholarship Fund

Dr. William M. Andrews, Jr.

Rast Brown Scholarship Fund

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Geological Sciences Development Fund

Mr. Frank M. McGilvary

Jay G. Henthorne, Jr., Scholarship Fund

Mr. Jay G. Henthorne, Jr.

Steve and Cindi Sullivan Excellence Award Fund

Mr. Steve and Mrs. Cindi Sullivan

Pirtle Gift Fund

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Rast-Holbrook Research and Seminar Fund

Mr. James W. Thornton, Jr.
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Contributions for Third Floor Slone Renovation

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Support Opportunities

Your support of the UK Department of Earth & Environmental Sciences helps provide opportunities for our outstanding undergraduate and graduate students. All contributions to the department are tax deductible.

RAST-HOLBROOK FUND

Supports the department seminar program, an opportunity for students to interact with researchers outside the department

GEOFUND

Supports general departmental needs including undergraduate and graduate scholarships

GLENN RICE MEMORIAL FUND

Supports undergraduate tuition scholarships

HAYNES FIELD-TRIP SCHOLARSHIP FUND

Supports student travel on field trips

DEVELOPMENT FUND

Provides resources for graduate student recruitment and alumni development functions

GEOLOGY SUPPORT FUND

Supports initiatives for long-term quality of the department

RAST-ROWN FUND

Supports scholarships for under-represented students matriculating at UK as Geoscience majors

PIRTLE FELLOWSHIP GIFT FUND

Provides summer stipends for academically qualified graduate students

THOMAS FELLOWSHIP FUND

Provides support for students conducting field-based research

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Lexington, KY 40506-0053