Earth Science News

Fall 2017

Dr. Dan Larsen

Greetings from the University of Memphis! Another bustling semester has begun with students lining the hallways and filling classrooms. And there are more of them! President Rudd recently informed us that enrollment is currently at about 21,800 students, which reflects enrollment growth during the past two years. We have enjoyed increasing enrollment in the Earth Sciences in recent years and look forward to continuing success in recruiting students. In addition to success of our academic program, our faculty have had another great year of research excellence, with most faculty having support from one or more research grants and many of those grants supporting graduate students. Approximately 1/3 of our active graduate students (24) have received some external support for their research and education. Our faculty have had another year of solid performance in regard to peer-reviewed publications and at least two are currently working on book projects. In the pages that follow we highlight several of our activities, congratulate faculty, staff, and student award winners, and explore the progress we are making in Earth Sciences.

We continue to follow through on enhancements to our teaching and research environment. The final touches are being made on our outdoor rock garden to display our treasured and voluminous non-teaching rock collections. We recently installed academic banners for the windows in the north and south stairways of Johnson Hall. Earth Sciences is formally proposing the addition of a concentration in environmental sciences. A multidisciplinary committee, led by Dr. Arleen Hill, formulated an Environmental Science concentration in our B.A. program that provides a flexible degree option for students interested in technical aspects of our environment.

We have a colloquium speaker series in Earth Sciences in which we invite prominent researchers and professionals to give lectures to the students and faculty. Please see our departmental web page, http://www.memphis.edu/earthsciences/, for more information on upcoming speakers, departmental activities and events.

Interested in visiting campus, meeting faculty and students, and seeing what is happening at Earth Sciences? I encourage you to explore the many facets of our program through our web site and feel free to contact me or any of the other faculty members – we would love to hear from you!

Earth Sciences Awards

Several faculty and staff in Earth Sciences either received awards or were nominated for awards or last year. Dr. Angela Antipova was awarded a Professional Development Assignment (PDA) for fall 2017, which she is using to complete a book contract on perception of the urban environment and travel with Palgrave-MacMillan. Staff member, Julia Crutchfield, who takes care of a multitude of tasks in running Earth Sciences, received the Dean's Outstanding Administrative Professional Award from the College of Arts and Sciences. Dr. Arleen Hill was nominated for the Alumni Distinguished Teaching Award and Dr. Esra Ozdenerol for the Thomas Briggs Teaching Award.

Within the Department of Earth Sciences several awards are made to students. Two students, Lucas Skinner and Michelle Field, received the Paul H. Sisco Outstanding Senior Awards in Geography. Jason Doan received the Outstanding Senior in Geology. Junho Yang received the Chi Beta Phi Science Award in Geology. Chris French received the Davies Award in Archaeology. Our newest award, the Outstanding Earth Scientist Award, was given to Benjamin McCall for all around service contributions to the department and academic excellence. Jason Doan and Krista Knight also received the Lounsbury Scholarship in Geology.

Awards and scholarships are some of the best ways to recognize student achievement and to provide assistance to students achieving academic excellence. Please feel free to contact Dr. Larsen (dlarsen@memphis.edu) if you are interested in contributing to an award fund or developing a new award fund.

Earth Sciences Alumni

One of our alumni recently suggested adding an Alumni section in the Newsletter to help inform others of their activities and career/life pathways, and renew connections.

Michael Rogers, who did graduate work in Geology at UM in the late 1970s (MS degree College of Education 1979), recently contacted the Department and gave us an update of his whereabouts and his past career. He is currently working as a hydrogeologist with the NC Department of Environmental Quality – Division of Water Resources in Raleigh, NC. He was promoted to Program Manager of the Underground Injection Control (UIC) program for North Carolina where he oversees issuance of groundwater remediation and geothermal injection well permits.

His career, after a serving with the USAF after graduation, included working for the Alabama State Geological Survey/State Oil and Gas Board in Tuscaloosa conducting water resource studies and permitting and inspecting oil/gas exploration and producing wells, and various environmental consulting firms in Alabama and Florida conducting groundwater contamination assessments and Phase I and II Environmental Site Assessments. Prior to working for the NCDEQ, he worked for the Orange County Utilities Commission in Orlando, Florida as an Environmental Specialist in groundwater compliance. He is a registered Professional Licensed Geologist in FL and NC. When not on duty, he is involved in his church and

community theater where he writes, acts, and directs.

https://deq.nc.gov/about/divisions/water-resources/water-resources-permits/wastewater-branch/ground-water-protection/injection-wells

We welcome additional alumni contributions in next year's newsletter, so let us know what you have been up to!

Earth Sciences Faculty

Dr. Angela Antipova – Dr. Anzhelika Antipova is currently working with a colleague from the LSU on a funded project studying trip generation modification. In other current research, she continues working in the field related to air pollution with Dr. Dan Larsen and, more specifically, the public health impacts of air pollution in Shelby County using 2011 vital records data obtained from the TN Department of Health). The analysis is still ongoing, so results are not yet ready for publication.

Her scholarly presentations included 1) "GIS in the study of the relationship between environmental exposure and maternal health in Shelby County, TN." at MAGIC GIS conference last November in Memphis, TN. 2) "Analysis of the relationship between environmental exposure and maternal health in Shelby County, TN." presented at the (AAG), in April in Boston, MA. (both co-authored with D. Larsen). Additionally, she presented her neighborhood satisfaction research to the colleagues and graduate students at the University of Tennessee at Knoxville, TN, in September 2016, and an Aerotropolis-related presentation was given at the geography seminar at Miami University last October.

She published a paper titled **"**The impact of geography and labor upon the size of job agglomerations in Memphis, Tennessee," Antipova, A., L. Skryzhevska, Hsiang-te Kung. *Data-Enabled Discovery and Applications* (in press). She is currently on a PDA assignment as she is working on a book project for Palgrave Macmillan Publisher titled "Urban Environment, Travel Behavior, Health, Resident Satisfaction" based on her 2010 research visit to the University of Duisburg-Essen in Essen, Germany. The University of Memphis generously awarded the author with the PDA during the Fall 2017 semester so that the manuscript could be finalized and submitted to the publisher during the Fall 2017.

During 2015-2017 she has been involved in the EPA *Inland Port Community Resilience Roadmap*. This is a series of air borne emissions maps in Shelby County, TN, that will be used for the *Inland Port Community Resilience Roadmap* webinar held by the US EPA, tentatively scheduled for mid-September 2017.

Dr. Jerry Bartholomew – I was pleased to have Graham Ellsworth finish his MS thesis this year and submit two GSA abstracts. We are preparing a manuscript on the Heart Mountain detachment fault this fall. Taylor Armstrong and I will submit our revised manuscript on the Yushu fault this month. This fall I expect to go to China again to work active faults there with Taylor, Guifan Chen and colleagues in China.

Graham Ellsworth holding up Eocene Willwood Formation with overlying Ordovician Big Horn Dolomite and Mississippian Madison limestone in the background, Heart Mountain, northern Wyoming.

Dr. Dorian J. Burnette – I am in the final year of a collaborative project with Dave Stahle (Arkansas), Ed Cook (Lamont-Doherty Earth Observatory), and Ben Cook (NASA Goddard Institute for Space Studies) funded by the National Science Foundation. A seasonal drought atlas using a network of tree-ring chronologies across North America has been computed, and the initial results will be presented at the American Meteorological Society annual meeting in January 2018. I have continued the development of the forthcoming "Tree-Ring Drought Atlas Portal" over the past year, which will be located at http://drought.memphis.edu. This suite of webtools facilitates analysis of all the gridded drought reconstructions from tree rings (Eastern Australia and New Zealand, Mexican, Monsoon Asia, North American, Old World, and the forthcoming North American Seasonal Drought Atlas). Our undergraduate and graduate students have been assisting in the beta testing process for the last few years. This has not only allowed them to explore droughts and pluvials (prolonged wet periods), spatially and temporarily, in their classes and research projects, but also provide valuable feedback to me, which has improved the webtools. I will describe these webtools at the upcoming American Meteorological Society annual meeting, and submit a paper about them for publication soon. I am also using these webtools on another project with Drs. David Dye and Arleen Hill looking at drought variability and its associated impacts at the Spiro Mounds archaeological site. We will be giving presentations on this research at the Southeastern Archaeological Conference in 2017 and at the Society for American Archaeology annual meeting in 2018.

I have begun a new interdisciplinary project with Claudio Meier and Laura Saija in the Departments of Civil Engineering and City and Regional Planning, respectively. Funding comes from an internal grant from the University of Memphis. This project will select a community within the city of Memphis that has not only had problems with flash flooding but also shows other signs of urban decline. We will then initiate conversations with this community, and propose low-tech solutions to enhance the community's flash flood resilience in the most cost-effective and sustainable way.

My three graduate students continue to make progress. Brad Baker (Ph.D. candidate) is actively performing research in various state archives on severe thunderstorm days that occurred over the southeastern U.S. since

1925 to compare with reconstructions of severe thunderstorm environments obtained from meteorological reanalysis. Tim Alexander (Ph.D. student) has completed a draft of his dissertation proposal, which will seek to develop aviation icing climatologies to assess the impact of active winter storm seasons on the efficiency of subsurface flow constructed wetlands, which treat contaminated stormwater runoff. Finally, Sarah Wilson (M.A. student) is interning with the Chucalissa Museum this semester. She is helping them prepare museum specimens, build displays, and digitize information.

Dr. Randy Cox – I had an enjoyable year in 2016-2017. Besides teaching eager pupils in my introductory classes, a Graduate Seminar, and Field Camp, I got to teach Spring Break Field Excursion, always fun. This was my favorite trip to lead, the Arkoma Basin, Ouachita Mountains, Gulf Coastal Plain limestones, Arbuckle Mountains, and last but not least, the Wichitas. After taking in the breathtaking view at Mount Magazine in the Arkoma Basin we tried to hike the rock-climbers trail from the summit but were pushed back by gale force winds. We dipped our toes into the waters at Hots Springs National Park then hightailed it to Lake Texoma to collect Early Cretaceous fossils along the shore. They found some real keepers (ammonoids, gryphaea, echinoderms, and other stuff). We hiked a few interesting routes in the Arbuckles. Some of us tried to find the source of water for Turner Falls, but only found a hermit hut, and on another hike to the Washita River gorge we had an exciting return route through an active quarry. The Wichitas are the best kept secret in the country as far as scenery (see photo). Punching up from the western Oklahoma prairie, they are much farther east than other arid mountains of the southwest, but they have a diversity of cacti, they have buffalo herds, they have prairie dog towns. You think you're in New Mexico or Arizona. We almost lost Chris Vanderlip to a "Seismoburger" at the Meers Café. A good time was had by all.

Spring Break Field Excursion students and Dr. Cox on top of Mt. Scott, Oklahoma

Dr. David Dye – In 2017, I presented papers at national and international conferences, published articles and book chapters, and documented Mississippian artifacts through photography. This has been a great year and I have had the privilege of working with some outstanding scholars. I have presented papers at nine conferences, including the Society for American Archaeology in Vancouver, the Center for Cross-Cultural Study in Seville, and the Spiro Mounds Iconography Presidential Seminar, School for Advanced Research, in Santa Fe. In addition to two journal articles, I published a book chapter in *Prehistoric Games of North American Indians: Subarctic to Mesoamerica*. There are a number of articles and book chapters

currently in press. My photographs have been chosen for inclusion in two textbooks, *Ancient North America* (5th edition) and *People of the Earth* (15th edition), both by Brian Fagan. Reviewed manuscripts include articles for *American Antiquity* and *Ethnobiology*. I also serve on three graduate committees, including a doctoral committee at the University of Alabama, where I am an adjunct faculty member. My research focus includes Mississippian exchange, religion, ritual, and warfare in the Lower Mississippi Valley.

The Tevis Cobb Clovis point (c. 13,200 to 12,900 B.P.) from Woodford Co., KY; length 20.3 cm in (8 in), the largest Clovis point ever found, photographed by Dr. Dye

Dr. Arleen Hill – This year has highlighted the applied and multidisciplinary threads that have always been central to my work. In this year's newsletter I'd like to focus on three projects that explore these threads and themes. During the summer of 2017 the Tennessee Board of Regents (TBR) grant exploring student success and the architectural characteristics of residence halls ended. The team of J. Myers, A. Hill and K. Brondo with students Z. Wallace, J. Graw, and N. Bond explored the relationship between residence hall design characteristics and student outcomes (including retention and success). The research questions and combination of architecture, geography, and anthropology fueled an innovative fusion of perspectives, data, and techniques. While the findings, presentations, publications and reports are tangible products, the collaboration and learning across our team was especially noteworthy. As the TBR project draws to a close; the TN Economic and Community Development (ECD) and US Department of Housing and Urban Development (HUD) sponsored Rural by Nature: Hazards Mapping, Assessment, and Education (HazMAE) project is taking off. I have two roles in the multi-year, multi-disciplinary, multi-hazard effort. One is as the lead-PI on a vulnerability assessment tool designed to house and distribute both the data and products collected across HazMAE sub-projects (7 total) as well as other vulnerability and resilience data sets. Working with co-PIs K. Abkowitz (TN Department of Environment and Conservation (TDEC) and J. Camp (Vanderbilt University) we are constructing a tool that fills a gap in comprehensive vulnerability and resilience decision-support and is transferrable beyond our West TN study region. Additionally, I serve on the HazMAE project management team as the Resilience Coordinator tasked to link all projects under the HazMAE umbrella with each other and with resilience metrics. Finally, turning to collaborations with ESCI colleagues using the North American

Drought Atlas to explore the implications of extreme events (pluvial or drought periods) in the archaeological record is something David Dye, Dorian Burnette and I have been considering for a couple of years. While looking at pre-history rather than contemporary hazard impacts is a new twist for me, our work resonates well with the concepts of disruption and response to disruption that I've been looking at since 2010 following the Haiti earthquake and on-going disaster recovery studies. Our team-taught, Spring 2017 Global Environmental Change course together with presentations, abstracts, and publications are products of our collaboration. All of these efforts will carry into the next year and continue to involve graduate and undergraduates in teams that cross disciplines and are applied in approach.

Dr. Hsiang-te Kung – During 2017, I have continued working with my colleagues in the department and with Chinese geographers and graduate students, we have published four papers – (1) Xiaoping Wang, Fei Zhang, Hsiang-te Kung, Abduwasit Ghulan, Adam L. Trumbo, Jianying Yang, Yan Ren, and Yunqing Jing. (2017) "Evaluation and Estimation of Surface Water Quality in an Arid Area based on EEM-PARAFAC and 3D Fluorescence Spectral Index: a Case Study of the Ebinur Lake Watershed, China." Catena 155 (2017) 62-74, (2) Haiyang Yu, Fei Zhang, Hsiang-te Kung, Verner Carl Johnson, Colton Spencer Bane, Juan Wang, Yan Ren, and Yue Zhang. "Analysis of Land Cover and Landscape Change Patterns in Ebinur Lake Wetland National Nature Reserve, China from 1972 to 2013" Journal of Wetlands Ecology and Management, ISBN 0923-4861 DOI 10.1007/s11273-017-9541-3, Springer 2017. (3) Zhihong Li, Patricia Davis-Wiley, and Hsiang-te Kung "Time Required for Learning Essential Elements of Chinese Characters." Learning Languages, The Professional Journal of the National Network for Early Language Learning, Fall/Winter 2016-17, Volume 22, Issue I, pp. 23-28. (4) Antipova, A., L. Skryzhevaska, Hsiang-te Kung. The Impact of geography and labor upon the size of job agglomerations in Memphis, Tennessee. Data-Enabled Discovery and Application, accepted for publication, July 23, 2017, DEDA-D-17-00021R1. I also co-authored several other research papers, continue to serve as an associate editor for the peer-reviewed Journal – Frontiers of Earth Sciences (FESCI), and serve as external assessor for faculty promotion in Hong Kong University and Universiti Kebangsaan Malaysia. Regarding graduate students, Mr. Thomas Lane Depriest, one of my Ph.D. students, plans to complete his Ph.D. in the Fall of 2017 and his dissertation is on "Impacts of Urban Sprawl on Floods and Water Quality – A Case Study of Jackson, TN". While travelling during the

past year, I was invited to give a seminar to faculty and students at the International River and Watershed Management Institute at Yunnan University, and also at Tainan University of Science and Technology in Tainan, Taiwan.

This is the 10th Year Anniversary of Confucius Institute at the University of Memphis (CIUM) and Asian Studies and International Program (ASIT) that I have served as Director since 2007. With the great support of the Dean of Arts and Sciences, Dr. Thomas Nenon, and Chair of the Earth Sciences, Dr. Dan Larsen, the CIUM has focused more on University and local community cultural programs. The CIUM recruited five new Chinese language teachers replaced the five who have completed their two to three year assignments. The CIUM hosted several visiting faculty from China and presented "lecture series" and "film appreciation series". The CIUM worked with CIMTSU and CIUTK on a consortium of Confucius Institutes in Tennessee in partnering and cooperating on various projects, e.g. K-12 Chinese language and culture teaching, summer bridge camp, China studies for principals and superintendents, educators, and university administrators. The CIUM was invited to participate in the Germantown International Festival in August to give a "Martial Arts" performance in International Agriculture Center and it was very warmly received and compliments by the audience. Ms. Elizabeth Walker donated 71 clay figures that her Grandma brought back from China in early 1900th to the CIUM.

Dr. Kung with Ms. Elizabeth Walker, who donated 71 clay figurines to the CIUM collection

Dr. Youngsang Kwon – This past year I have been busy extending my scope of research agenda. Through the FedEx Institute of Technology, I obtained a research seed grant for the project title: "A Planning Support System for Comprehensive Planning and Zoning: A Geospatial Simulation Model of Land Use, Land Cover Change for the Memphis Metropolitan Region." Through this project, I have served as a working group member for Memphis 3.0 Comprehensive Plan with City of Memphis. Also, as a co-PI, I started a project (PI. Dr. Van Arsdale) titled "Drone Imaging of Active Sand and Gravel Quarries to Optimize Exploration and Mining."

I started a new collaborative project with Arkansas State University colleagues involving modeling bats' distributions (SDM approach) in Ozark region using machine-learning techniques. A paper is currently in preparation on Habitat Use Patterns of Asian Elephants in Bardia National Park, Nepal. These projects will hopefully lead me to new grant opportunities next year. I recruited a

new master student, Michelle Field, and she will be working on eastern US tree species redistribution modeling through spatial statistics. Lian Feng, PhD student, is now working full time for a year as an intern at Monsanto Corporate headquarters in St. Louis getting hands-on training regarding advanced-level python programming, parallel computation and Postgres Database management for her dissertation in applied biogeography. I also serve as the Earth Sciences Colloquium series organizer and invited six distinguished guest speakers during the spring semester 2017 (seven will be invited in Fall 2017).

Dr. Dan Larsen – It has been another busy year juggling the duties of Chairing Earth Sciences, graduate student advisor, teacher and researcher. I am especially proud that one of my Ph.D. students, Charles (Chuck) Thibault, defended his dissertation and graduated this summer. Jack Koban, another one of my Ph.D. students, defended his dissertation recently and is now finishing final edits and a journal submission, with graduation this fall imminent. I currently have one Ph.D. student, Scott Schoefernacker, and four M.S. students, James Eason, Billy Simco, Mike Smith, and Spencer Smith. Scott is also in the final throes of his dissertation and manuscript preparation. James is finishing up his work on recharge processes in the unconfined region of the Memphis aquifer at the Pinecrest Presbyterian Camp near LaGrange, TN, building on John Bursi's (M.S. 2015) research. Billy and Spencer are investigating water balance and groundwater recharge research in an urban creek in Jackson, TN. Mike is working on groundwater leakage in the MLGW Lichterman well field and assisting with other well field projects. I am also co-mentoring Andrew Murphy, with Dr. Kwon, who is completing a spatial statistical analysis of the upper Claiborne confining unit in Shelby County.

Spencer Smith and Billy Simco describing cuttings during well installation in Jackson, TN along Sandy Creek, May 2017

Work with CAESER (Center for Applied Earth Science and Engineering Research) faculty and staff on water research in the region still occupies most of my time. We currently have several projects with MLGW, West TN River Basin Authority, and TN Valley Authority. Graduate student Chris Vanderlip, undergraduate student Jeff Mitchell, Dr. Cox, and I finished our USGS EDMAP-sponsored geologic mapping of the Drummonds and Nodena quadrangles in Tipton County. We are now working on the proposal for our next mapping area at Fort Pillow State Park with Ph.D. student Chris Marlow. I am also working with Roy Van Arsdale and M.S. student Audrey Eason on sedimentology of the Mississippi alluvium in several boreholes straddling fault systems in the Mississippi embayment. I continue to work on several manuscripts regarding my

long-term research in the Tecopa Basin in southeastern California. As Department Chair, I usually teach one course a semester (last spring it was Sedimentology and Stratigraphy) and geology field camp during the summer, but research needs required that I not teach during the fall 2017 semester.

Earth Sciences Club

The Earth Sciences Club is involved in several activities on campus and sponsors lectures, field trips, and other outdoor activities.

Aerial image of the 2017 field school participants taken from a drone.

Dr. Andrew Mickelson – This summer my students and I completed the 11th annual archaeological field school at Ames Plantation, Grand Junction, Tennessee. We continued to excavate at several sites located on the plantation, including portions of a Native American town and mound complex dating to about 1000 AD, as well as a small farmstead dating to 1445 AD.

Dr. Esra Ozdenerol – Dr. Esra Ozdenerol launched a free online tutorial with case studies that apply GIS to health research. This will provide students, public health professionals, and social scientists with the GIS skills necessary to tackle health disparities. She has received Smart city clusters research funding to demonstrate to City of Memphis officials the impact of a private collector recycling process using GIS and simulation techniques. Dr. Ozdenerol was invited to serve on Shelby Farms Sustainability Committee to eradicate Chinese Private invasive species. She has mapped Federally Qualified Health Center (FQHC) locations and working on a feasibility study establishing a new FQHC in the "medical district." Her research results will be evaluated to determine parameters in developing a physical presence and practice at that location for underserved and other patients. Her recent interest in applying GIS to drug addiction led her to medical examiner's data and to create links with crime, suicide and mental health issues in the state of Tennessee. She is in the process of establishing an addiction network that uses GIS as a platform for making associations and helping evidence based medicine practices in the state.

Dr. Ryan Parish – I am happy to give an update on the undergraduate Geoarchaeology Program at the University of Memphis as I am currently the advisor. In the past year we

had eight graduates, half of which completed their degrees with summa cum laude, magnum cum laude, cum laude honors. Congratulations to Garrett Ballard, Kristi Graves, Ben McCall, Demitrie Smith, Grace White, Andrew Leidlein, Hanna Pentz, Lainey Goodin. The Archaeology Graduate program is also flourishing with the addition of three master's students in the fall adding to an existing core who are exploring the rich archaeological record of the region.

The archaeology program won a significant National Science Foundation grant this summer that provides funding to acquire two new spectroscopy instruments, support a graduate student for two years, and fieldwork needed to build one of the largest prehistoric tool-stone databases in the world. The research project is an ongoing effort to develop a non-destructive, fast, and accurate method to determine raw material source of prehistoric arrowheads, spear points, and other stone tools manufactured by prehistoric peoples worldwide. Through the sourcing of stone tools we are able to gather a host of human behavioral data related to trade, resource consumption, migration, and others. I presented this research in Poland during the spring and will present more this fall in Argentina. Over the summer I analyzed over 200 proto-historic thumbnail scrapers (hide scraping tools) from two sites. The data helps us understand the response of prehistoric communities to the European fur trade. Other ongoing projects examine Ice Age Americans, hunter-gatherer groups, and mound building communities in the mid-west and southeast. Please visit http://blogs.memphis.edu/rmparish/ for more information regarding ongoing research projects and http://nonconnahcreek.org/ to get involved in the Nonconnah Creek Conservancy.

"Chocolate flint" from a chalk quarry in Poland.

Dr. Jose Pujol – I continued working on the book: "Fundamentals of inverse theory and parameter estimation," to be published by Wiley. This is a time-consuming task that involves a large amount of literature research and synthesis. Some of this work became the basis of the paper "The linear combination of vectors implies the existence of the cross and dot products," which I finished last year and that was recently accepted pending minor revision by the International Journal of Mathematical Education in Science and Technology.

Dr. Roy Van Arsdale – Perhaps the biggest event of the 2016-2017 academic year was becoming eligible for Social Security. Setting aside that rather depressing milestone, it has been an interesting year of teaching and research. My research has expanded a bit in that I currently have three projects in progress. The USGS-NEHRP project is a continuation of one conducted last year wherein we are trying to better constrain the timing of faulting on two buried (blind)

horst structures in the Mississippi River floodplain. One of those horsts (transpressive blocks) is 50 km northwest of Memphis and the other underlies the Mississippi River immediately west of Memphis. We are dating displaced strata collected from ~150 foot deep wells that we have drilled on opposite sides of one bounding fault of each horst. So far the penetrated alluvium has been young (< 20,000 years old) thus there has been faulting on both of these structures within the last 20 ka. In a second project we are flying a drone over a Memphis Sand and Gravel active quarry in DeSoto County, MS to photograph the stratigraphy exposed in interior vertical high-walls as the quarry expands. The sand and gravel is the Pliocene (~ 3.2 million year old) Upland Complex (ancestral Mississippi River terrace). In doing this we hope to get a better understanding of the depositional environment of the ancestral Mississippi River. Our third project is in conjunction with a number of other scientists and will continue for 5 years. In the first year we are building a three-dimensional model of the surface and subsurface geology of Lake County, TN: home to Reelfoot Lake and the Reelfoot fault scarp. This model will provide a more complete understanding of the Reelfoot fault, will be used as the geologic input necessary to estimate ground shaking in Lake County during future earthquakes, and will provide necessary lithologic information for mapping earthquake liquefaction susceptibility in Lake County.

Audrey Eason, graduate student, examining core from the Meeman-Shelby fault drilling project with undergraduate student, Nick Jackson, and Dr. V. in the background looking on.

Emeritus faculty in residence:

Dr. David Lumsden – Although retired Dr. Lumsden keeps busy. After a cool summer at his cottage in Canada (he wrote this when the mid-August temperature was 70 F) he will teach Oceanography again this fall and mentor an undergrad special problem. He plans to present two papers this fall at GSA Seattle (Quartz crystallinity and Mississippi River source evolution, the latter with Roy). Both of these are in manuscript for future submission if all goes well at the meeting. As a member of the "Drone Gang" he participates in the ongoing study of the evolution of the Upland Complex. Ongoing plans include a study of the origin of Petrified Wood in the Upland Complex, and future plans include a study of Mississippi River clay mineralogy. If all goes as he plans, he will be found stiff and stark in his office the day he retires. Burial will be in the rock garden; all are invited.

Instructor:

Dr. Julie Johnson - This past year I assisted with the 31st annual National Conference of Undergraduate Research (NCUR), which was held at the University of Memphis in April. Other faculty and I in the department reviewed abstracts submitted by Earth and environmental science undergraduates from all over the country who later came to present their work. It was an exciting endeavor and I was pleased to read about so many new and interesting projects that undergraduates are involved in; it was truly an incredible event for the University of Memphis to host this year. And as always I enjoy teaching our own undergraduates students here at the university, including our introductory courses which continue to attract many students from outside the discipline of Earth science as well as geology, geography and archaeology students in our own department.

My research continues within the field of igneous geochemistry, mineralogy and petrology, focusing on magmatic and subduction zone processes. I am now looking at collaboration potential in order to radiometrically date minerals in igneous intrusive samples from the Mariana trench. The goal is to better understand the timing and evolution of subduction initiation, a process about which little was known in the past but more is being learned every year.

Student Spotlight:

Shelby Hobbs

M.S. Candidate, Shelby Hobbs, cleaning off an excavation at Ames Plantation, her research area.

My research focuses on Mississippian, Native American settlement patterns and climate change in the Central Mississippi River Valley from A.D. 900-1600. My love for archeology is lifelong, but my interest in Mississippian archaeology stems from time spent at Ames Plantation with Dr. Andrew Mickelson. My first field school at Ames was in 2013, and I've been there ever since. I studied anthropology in my undergraduate at the University of Memphis, and I believe having that field school and that experience is what influenced me to pursue a Masters in Archaeology rather than Medical Anthropology. The Department of Earth Science is special for having such a close and cooperative archaeological research site, and its students are lucky to have a professor so in love with his work. I have quite the opposite experience with climatology, as I have never studied the subject, but my interest in the relationship between climate and culture pushed me to delve into it. It was

incredible luck that Dr. Dorian Burnette is with the department, and even more incredible that I was able to use his North American Drought Atlas for my research. How convenient is it to troubleshoot a problem in your data with the developer right down the hallway? My research aims to determine changes in Mississippian settlement patterns and whether prolonged drought had any connection to those changes. My goal is to add to the understanding of prehistoric cultural interactions with the environment and climate. I believe archaeology has a way of helping us learn from our mistakes. Ultimately, I hope similar research will allow us to draw parallels with the past to the present, and influence how we proceed in dealing with climate change in the future.

Through the Department of Earth Sciences, I was able to present my research at the Current Research in Tennessee Archaeology Annual Meeting as well as speak to a few classes within the department about my research. As a graduate assistant for the past couple of years, I have learned how to develop coursework, manage a classroom, and spread my love of Earth sciences. At Ames Plantation I have honed my archaeological skills and developed the ability to teach those skills in the field setting. Through processing my data and with the help of experts in the department, I have learned valuable and marketable skills in geospatial analysis. The University of Memphis and the Department of Earth Sciences have provided me a multitude of opportunities throughout my collegiate career and in my research. Without the continued support and guidance of the interdisciplinary professors in the department, I would not be where I am today or have the same options I have for my professional future.