



Fall 2015

From the Chair.....



Dr. Dan Larsen

2015 has been an eventful year for Earth Sciences at the University of Memphis. Our faculty members have been busy on many research fronts and mentoring undergraduate and graduate students toward becoming tomorrow's professionals. We have worked on improving our introductory courses, re-formulated our M.A. program as a non-thesis degree for professionals, and made a number of improvements to the facilities in Johnson Hall and the academic experience in Earth Sciences.

Some of the exciting improvements in Johnson Hall include replacement of our old globe in the lobby area and installation of a video monitor with information on our program and upcoming events and activities. We also became a partner in the WREG, Channel 3, Weatherbug Schools network with the installation of a new weather station on the roof of Johnson Hall. You can access weather information for the University of Memphis at weather.weatherbug.com. To facilitate field trips and student research

activities we have acquired another van, a 2016 Ford Transit, which will help with our field camp and field school programs. Starting this fall we will construct an outdoor rock garden to display our treasured and voluminous rock collections from around the U.S. and other countries. We have initiated a colloquium speaker series in Earth Sciences in which we invite prominent researchers and professionals to give lectures to the students and faculty. Please review the 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? Please join us for our *departmental open house, Earth Sciences Day*, on **Saturday, October 24th, 2015** (see announcement below). I encourage you as well 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 Faculty

Dr. Angela Antipova – During the fall 2014, I participated at the UT Health Science Center on exposure research in Memphis. My participation resulted in preparation of a series of maps used in the

writing of the grant proposal, e.g., a location of all schools in Shelby County for which air quality ranking was provided by the *USA Today Special Report*. The maps were also used for the U.S. Environmental Protection Agency (EPA) Port Community Resilience meeting held in July 15, 2015 at the U of M. I was also a presenter and a convener of a session titled “Re-theorizing the Urban: Rights and Urban Form” at the 60th Annual Meeting of the Association of American Geographers (AAG), April 21-27, 2015, in Chicago, IL.

In 2015, I published the following papers: 1) Antipova, A., Black, White, male, and female concentrated employment: the effect of spatial and aspatial labor factors in the journal *Cities*, and (2) Antipova, A., and A. Curtis, The post-disaster negative health legacy: pregnancy outcomes in Louisiana after Hurricane Andrew in the journal *Disasters*.

Currently I am collaborating with colleagues at University of Memphis and UT Health Science Center, Memphis on: (1) a spatial approach for assessing correlations between school performance and unhealthy environments in Shelby County, (2) environmental exposure and maternal health in Shelby County using CANDLE data, and (3) urban built environment accessibility and satisfaction in Germany.



Dr. Angela Antipova with graduate students Daniel Guerra-Monje, Lauren Goddard, and Zeb Wallace, and alumnus, Jian Chen, at the 2015 AAG meeting in Chicago, IL

Dr. Jerry Bartholomew – I was coauthor on two papers published during the past year. Pujol et al. (2015) and Feng et al. (2015) were published early in 2015. The second paper was a product of Lian Feng’s research, Lian received her MS degree in the spring of 2015. Talks at the upcoming Annual GSA in early November for the “Bridging Two Continents” sessions will be presented by Guifen Chen and Taylor Armstrong, which are related to our work on large earthquakes in China.

In April I completed a chapter on the history of Wintergreen (the designed recreational community in the Virginia Blue Ridge which was developed after Hurricane Camille devastated the area in 1969). As one of the five surviving members of the folks involved in the development of Wintergreen, I recounted my work there from 1969 to 1973. The Nature Foundation at Wintergreen had a “Founders of Wintergreen” plaque

Earth Sciences Day 2015



10:00 am – 2:00 pm
Saturday, October 24, 2015



**Join us for an open house of Johnson Hall - collection displays,
research posters, meet the faculty and students**

***But wait, there's more! We will have a cookout,
outdoor fun for kids, and
games for budding Earth Scientists of all ages!***

THE UNIVERSITY OF
MEMPHIS
Dreamers. Thinkers. Doers.

For more information, please contact:
Dan Larsen, 678-4358 or
Julia Crutchfield, 678-2177

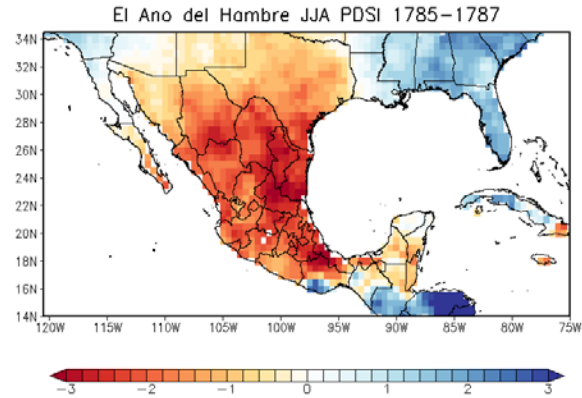
placed at an overlook about mile 15 on the Blue Ridge Parkway in 2010. The author, Mary Buford Hitz, is a Virginia native and grew up at Royal Orchard and has written several books. The Publisher, Nancy Blackwell Marion, is owner of Blackwell Press in Lynchburg, Virginia and has published many notable books including some about Nelson County, Virginia. The Nature Foundation at Wintergreen, which has the copyright, has funded preparation of the book which is expected to be released in October, 2015.

I am working with five current graduate students, Graham Ellsworth, Avery Soplata, Chris Loyacano, Alberto Jimenez, and Lian Feng. Graham is finishing the field phase of his MS research on the Heart Mountain detachment fault in Wyoming. Avery is also

involved in the field phase of her MS project on the assessment of landslide hazards in the area around the Chimney Rock State Park, North Carolina. Chris is considering a MS project resolving Laramide versus Cordilleran fold-thrust development in southwestern Montana. Alberto and Lian are both in the early stages of developing their PhD proposals. I am also continuing my field work along the Beartooth fault in Montana/Wyoming and collecting fracture data in Georgia, Alabama, and Mississippi.

Dr. Dorian J. Burnette – Over the last year I have been concentrating on the development of web-based analysis and visualization tools for current, new, and forthcoming tree-ring reconstructed drought atlases. For example, the map below shows average summer (June-August) Palmer

Drought Severity Index (PDSI) values across Mexico during 'El Año del Hambre' (The Year of Hunger), when pronounced drought, depicted by the negative PDSI values, significantly affected crop yields and led to one of the worst famines in Mexican history. These drought atlas websites will allow interdisciplinary groups of researchers to explore the spatial and temporal variability of droughts and pluvials (prolonged wet periods) over the past 500 to 2000 years depending on the region. Our undergraduate and graduate students have been using and beta testing these websites. Feedback from them has resulted in adjustments to the websites for clarity and bug fixes. These drought atlas websites will start going live in 2016 with the publication of an invited *Quaternary Science Reviews* paper highlighting the new Mexican Drought Atlas. The Mexican Drought Atlas is a smaller part of a larger National Science Foundation funded project where my colleagues, Dave Stahle (Arkansas), Ed Cook (Columbia), Ben Cook (NASA GISS), and I will reconstruct cool and warm season moisture across much of North America back to at least AD 1500 and possibly to AD 1000. We will perform the first calculation of this North American Season Drought Atlas in December.



Dr. Robert Connolly – C.H. Nash Museum Director, Dr. Robert Connolly returned to Peru for his third field season this summer. He was accompanied by Museum graduate assistant Elizabeth Cruzado Carranza, who is pursuing her MS in Earth Sciences and Museum Studies Graduate Certificate at the University of Memphis. Connolly and Cruzado along with their colleague Rebecca Bria have collaborated for the past few years on linking research opportunities in the United States and Peru through the Proyecto de Investigación Arqueológico Regional Ancash (PIARA). In the summer of 2014 they opened a small museum in Hualcayán, Peru. Connolly's 2014 Museum Practices graduate seminar created a suite of exhibits and other products that were installed in the Museo de Hualcayán in January of this year. In addition, Dr. Connolly has had another busy year with several submissions for publication and professional service to several organizations, including an invitation to serve on the editorial board for the peer-reviewed journal, *Advances in Archaeological Practice*, from 2016-2019.

Dr. Randy Cox – My students and I did quite a bit of field work again this year. We have continued our paleoseismology

investigations in the Valley and Ridge Province near Knoxville and into northern Georgia. This work involves assessing the seismic hazard of the eastern Tennessee seismic zone and is funded by the Nuclear Regulatory Commission. The work involves tromping through a lot of sand and gravel quarries and around miles of muddy lake shore and canoeing mountain rivers looking for deformed Quaternary sediments as evidence of paleo-earthquakes. We had a fairly exciting canoe trip this summer on the Little River that flows out of the Smoky Mountains, during which my student Eric Gamble found an exposure of a Quaternary thrust fault and we had to carry the equipment and canoes through the forest quite a distance around a log jam. Even more recently while scouting a field trip for the Eastern Section of the Seismological Society of America, Gary Patterson (CERI) and I found an exposure of Eocene clay thrust several meters over Pleistocene sand and gravel in Tipton County, Tennessee (photo below). It should make for an interesting field trip.



Earth Science students and Dr. Van Arsdale ponder a thrust fault in Tipton County

How Can You Help?

Alumni support is an important part of our ability to offer student scholarships and support student research and activities.



Please consider giving to the University of Memphis and request that your gift be directed to the *Earth Sciences Enrichment Fund*

Please contact Dan Larsen for further information
dlarsen@memphis.edu, 901-678-4358

Dr. David Dye – This past year I published three journal articles: *Anthropocene* (with Markus Dotterweich, Andrew H. Ivester, Paul R. Hanson, and Dan Larsen), *North American Archaeologist* (with Charles H. McNutt and H. Terry Childs), and *Tennessee Archaeology* (with Marlin F. Hawley). In addition I published a book chapter in *Picture Cave: Unraveling the Mysteries of the Mississippian Cosmos*, and an encyclopedia entry, “Conflict and War, Archaeology of: Behavior and Social Organization,” in the *International Encyclopedia of the Social & Behavioral Sciences*, (2nd edition), 4:600-606, Elsevier, Oxford. I also presented 6 papers at conferences, including an invited paper, “Cooperation and Violence in the Tunican Homeland: Rituals of Exchange and Warfare in the Seventeenth-Century Lower Mississippi Valley” at The Specter of Peace in Histories of Violence, University of Utah, Salt Lake City. In May I attended a workshop at Texas State University for the upcoming Spiro exhibit. This past summer I photographed four major artifact collections and currently serve as photographer for the

forthcoming exhibit, “Ancestors: Ancient Native American Sculptures of Tennessee” at the Tennessee State Museum. Over the course of the year I have reviewed manuscripts for *American Antiquity*, *Plains Anthropologist*, *Southeastern Archaeology*, *World Archaeology*, and reviewed a book manuscript for the University of Alabama Press. I also reviewed an NSF proposal. I have been invited to serve as an adjunct faculty member at the University of Alabama and serve on a dissertation committee there. I am currently chairing Amanda Pesce and Karla Oesch’s committees, both of whom are completing their theses this semester. I taught Biological Anthropology and The Art of Earth Science in the spring semester and I am currently teaching Old World Archaeology and the Archaeology of Complex Societies.



One of the many amazing artifacts
photographed by Dr. Dye last summer

Dr. Arleen Hill – I have been looking into disruption associated with recent flooding events with both graduate and emergency management undergraduate students. The concept of disruption and how it can be

predicted and mitigated came up originally while doing fieldwork in Haiti in 2010 and I am revisiting the Haiti case as a part of my disaster recovery and community resilience focused research agenda. Additionally, beginning in the spring 2015, Keri Brondo (Associate Professor, Anthropology) and I co-chair a Gender and Environment Research Interest Group (RIG) at the Center for Research on Women (CROW). This RIG aligns with an area of interest and opportunity across campus. We are also teaming up in the classroom and on an engaged-scholarship project in Honduras.

Dr. Hsiang-te Kung – I continue to serve as Director of the Confucius Institute at the University of Memphis (CIUM) and Asian Studies and International Trade (ASIT) program. The CIUM has been awarded as one of the six Model CIs in the country. I most recently completed a “Sustainability Action Plan for the CIUM” for the University. I also was interviewed by the CI Headquarters on Chinese genealogy, especially, the Confucius family tree. I serve as external assessor for faculty promotion in Malaysian universities and assessor for geography programs in Hong Kong University. I have been invited by the Colorado State University to give a lecture on China’s environmental challenges and economic growth, and invited to be an associate editor for the peer-reviewed Journal – *Frontiers of Earth Science* (FESCI). I co-authored and submitted several research papers to FESCI and Remote Sensing, and, through the CIUM, received several contract grants for teaching Chinese language in the state of Tennessee. Li Yingnan just defended her thesis and will

be graduating this fall. Her thesis is the “A Study of Spatial and Temporal Distribution of the Confucius Institutes in the U.S.”



Dr. Kung with Chinese Yi minority costume and dancing in the Germantown multi-cultural festival, August 2015

Dr. Youngsang Kwon – My research interests lie in biogeography and, more specifically, terrestrial carbon cycling and climate change with a specific focus on the application of GIS and Remote Sensing. As I keep my main research agenda rolling, such as understanding the latitudinal species distribution in North America or spatial filtering model to tree species richness, I conducted small scale collaborative work together with colleagues from University of Tennessee and Rhode College to predict tick populations at AMES plantation. The work is submitted to PLOS ONE title as “Habitat and vegetation variables are not enough when predicting tick populations in the southeastern United States” and is currently under review. I also had a chance to work with Korean researchers when I was visiting Korea over the summer. The work is also submitted to Science of the Total Environment and it is under review titled as “Comparison of Physicochemical Properties

Between Fine (PM_{2.5}) and Coarse Airborne Particles at Cold Season in Korea”. Also, I have a pending research project teamed with psychology department submitted to the Institute of Education Sciences under the title as “Long-term memory for mental models using topic of Global Carbon cycle”

Dr. Dan Larsen – I had another busy year juggling administration, teaching, and research activities. In regard to research, I focused mainly on regional hydrology and stratigraphic studies. Haley Gallo defended her MS thesis this summer on groundwater leakage pathways for the Memphis aquifer at the McCord well field. John Bursi has all but defended his MS thesis on recharge processes in the unconfined region of the Memphis aquifer at the Pinecrest Presbyterian Camp near LaGrange, TN. Justin Paul is closing in on finishing his MS thesis on anomalously high chloride concentrations in the Mississippi River alluvial aquifer in SE Arkansas. Each of these projects has profound implications for regional water resources and should find their way to appropriate journal articles in the coming year. Kristian Olson (MS, 2014) and I recently submitted a manuscript to Geosphere on his research in the Tecopa Basin in southeastern California. Scott Schoefernacker, Jack Koban, and Chuck Thibault are each nearing completion on their respective dissertations, such that submissions for publication are on the way from each of them. Candice Brock (MS, 2012) and I recently published an article in Southeastern Geology on her mapping and sedimentological work on the Memphis Sand. Clearly, I am blessed with exceptional graduate students such that my

job is easy (well, not too easy!). I co-edited a recent GSA Special Paper entitled, "Paying Attention to Mudrocks: Priceless!", which included my paper on clay mineralogy of the Porters Creek Formation in SE Missouri. The edited volume, GSA Special Paper 515, will make its debut at the Annual GSA meeting in Baltimore, MD, this fall. When I was able to temporarily shed the administrative and editorial shackles during the past year I enjoyed the spring field trip to Big Bend National Park (photo below) and Geology Field Camp in South Dakota.



2015 Field Excursions in Earth Sciences – on the rim of the South Rim caldera, High Chisos Mountains, Big Bend N.P.

Earth Sciences Club



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

Please contact Billy Simco (wasimco@memphis.edu) or Katie Dagastino (kdgstino@memphis.edu) for further information.

Dr. Andrew Mickelson – Over the last year I have continued working at several archaeological sites in western Tennessee. In particular, I have completed my ninth year of research at Ames Plantation, about an hour east of Memphis and home to the National Birdog Championships. My field research consisted of continued work at a prehistoric (ca. 1100-1300 AD) town site which includes numerous house remains as well as four mounds. My students and I are also hard at work trying to locate small farmsteads associated with the town site.



Ben Cross and Shelby Hobbs, two MS students in archaeology, excavate a large storage pit at Ames Plantation, TN.

Dr. Esra Ozdenerol – The wait is nearly over! Dr. Ozdenerol was hard at work on her upcoming book “Spatial Health Inequalities: Adapting GIS Tools and Data Analysis”. On April 2016, it’ll finally hit bookshelves and Amazon. Her book provides the technical and practical aspects of GIS-assisted investigations in public health and discusses data and data collection processes, key literature for the appropriate spatial analytical methods, and illustrations of cartographic techniques for visualizing and mapping health disparities.

Dr. Ryan Parish – My research, focusing on prehistoric tool stone acquisition, consumption and distribution, continues as analysis of stone artifacts is giving us clues regarding ancient human behavior. However, prior to discussing prehistoric trade and migration a comparative collection of various material types and known deposits has to be assembled. To this end, I have amassed a large reference collection of over 4,000 samples representing various chert types

from nine Midwestern and Southeastern states. The spectral analysis of these geologic samples provides a comparison database within which to potentially match artifacts to raw material source. The data gained from this project is allowing us to better understand Paleoindian mobility in Hardin Co. Tennessee and later culture group subsistence activities along the Ohio River in Illinois.



Chert samples from Midwestern and Southeastern United States.

Dr. Jose Pujol – Early in the year I published a paper on the shallow seismic detection of the fault zone associated with a high scarp in southwestern Montana with J. Bartholomew, A. Mickelson, and M. Bone as coauthors. Our goal was to image the normal fault associated with the scarp, observed in an adjacent trench (see photo). The presence of the scarp made the processing of the data challenging, but we were able to devise a method that took care of that. Our research in SW Montana was motivated by Bartholomew’s long-standing interest in the seismo-tectonics of that area. This year I submitted a paper on the conversion between earthquake magnitudes. This is a topic of current interest and debate, and I presented an analysis of the problem

more detailed than what is currently available. I also worked on the determination of shallow shear wave velocities using surface waves, and I am currently working on a paper describing my results. One of my former students presented a paper during the 2014 annual meeting of the Society of Exploration Seismologists (SEG). I was second author. Only selected papers were accepted for presentation. In 2014 the SEG awarded one of my papers an honorable mention for “Best Paper in Geophysics in 2013” (Geophysics is a paper published by the SEG). Recently, I signed a contract with Wiley for the publication of a book on inverse theory and parameter estimation.



Faults in trench in southwestern Montana imaged using shallow seismic analysis.

Dr. Roy Van Arsdale – The 2015 year has been busy and productive. David Dye and I have coauthored a book that is in review tentatively entitled, “Geology, Native Americans, and Earthquakes of the central Mississippi River Valley”. Our intent is to write a book that is appropriate for a general audience. MS theses have been completed by Trevor Stine on the northern portion of

Crowley’s Ridge and Matthew Greenwood on the southern portion of the Reelfoot fault that we hope to publish. MS student Alex Ward has drilled through the Quaternary alluvium of the Mississippi River valley at 2 locations in NE AR. The objective is to OSL date the basal Quaternary section since the stratum at both locations appears to be fault displaced and we want to determine the age of faulting. The Meeman-Shelby fault being investigated in this project underlies the Mississippi River at Memphis.

Emeritus faculty in residence:

Dr. Phil Deboo – I have been retired for more than a decade, but I enjoy coming to my office almost every day. Usually, I now teach one course a semester...Physical or Historical one term and Invertebrate Paleontology when needed. I always have enjoyed having contact with students, and that joy has not abated.

Dr. David Lumsden – Dr. Lumsden (aka Dolomite Dave or Geogod) is retired but still active. He is currently teaching Historical Geology for the 4.6 billionth time, and is scheduled to teach Oceanography in the spring of 2016, and is still serving on graduate student committees. He has switched his research focus from Mississippian stratigraphy and dolomite origin to the origin of the Upland Complex gravel in the Mississippi Embayment, largely because Drs. Cox and Van Arsdale continue to carry him on publications about the gravel. His goal is to publish his last paper in 2017; thus, enabling him to brag about 50 years of unread articles!

Instructor:

Dr. Julie Johnson - I have very much enjoyed my first year as an Instructor in the Earth Science department. I had the opportunity to teach a variety of classes that were new to me. Teaching the Mineralogy-Petrology course to the undergraduate Earth Science majors and experiencing their dedication and hard work is very rewarding. I have also been happy to help some individuals in the community identify rock specimens during this past year, including an employee of the Cordova Library who brought a small (but eclectic) rock collection that had been donated to them. The library displayed the collection for the entire month of July.

My research interests remain in the field of igneous geochemistry and petrology as applied to the study of magmatic and subduction zone processes. Recently, I have been looking at certain ophiolite sequences for their potential to provide information about magma differentiation during the early stages of subduction. By pursuing this topic, in the future I hope to be able to address the question of whether the formation of felsic and intermediate plutonic rocks during subduction initiation is a common, and possibly large-scale process, or a rare phenomenon.”

Student Spotlight:

John Bursi



Graduate student, John Bursi, obtaining water samples from a well at Pinecrest Camp near LaGrange, TN.

Early in my collegiate career, I was unsure what I wanted to study and eventually do for a living. I changed my major three times before finding a home at the Department of Earth Sciences. I have always been interested in the physical and chemical processes of the planet we live on. Through the help of both the faculty and my peers, I found both the opportunity and inspiration to study geology. Upon completing my Bachelor of Arts in Earth Sciences, I knew I wanted to pursue my Masters degree as well.

I have always been fascinated in water. From fly fishing on a crystal clear river, kayaking at the ocean, or snowboarding in the mountains out west, many of my most treasured hobbies revolve around water. It was a no-brainer for me to study hydrology

for my Masters of Science in Geology. Through the guidance of Dr. Larsen and the assistance of the Ground Water Institute at the University of Memphis, I was granted the opportunity to study groundwater recharge processes to the Memphis aquifer.

As the primary source of water for Memphis and the surrounding areas, this natural resource is extremely important. The ways in which it is replenished are not well known. In order to better understand the sustainability of this precious resource, precipitation, soil and surface water, and groundwater were monitored for a year at the Pinecrest research site in Fayette County. Being in charge of a large scale research project was new to me. At first it was overwhelming, but I quickly learned the skills necessary to both perform the research and coordinate with fellow students, volunteers, and supervisors. These skills, along with the knowledge I have gained of physical hydrology, will prove invaluable for my future career. None of this would have been possible without the Department of Earth Science, Ground Water Institute, and the University of Memphis.