



UNIVERSITY OF
ARKANSAS

Fall 2017

GeoHog Times

Newsletter of the Department of Geosciences



Organ Mountains
National Monument



Students hike during the 2017 Spring
Break Trip To Big Bend National Park

Photos courtesy of Abram Barker

From the Chair

Dr. Christopher Liner

Greetings! In this newsletter we have much to report, starting with the retirement of Professor **John Dixon** who joined the faculty in 1981. He plans to continue to be active in the department as Emeritus Professor. Thank you John for the many years of service!

On the other end of the spectrum, we are delighted to report three new faculty members. **Andrew Lamb** (Ph.D. Boise State) works on research problems that use geophysical methods, such as gravity, magnetics, and seismology, to help understand geologic problems in tectonically active regions. **Jill Marshall** (U. Oregon) has research and teaching interests involving quantitative geomorphology and earth surface processes; climatic (both past and present), lithologic, biotic and abiotic controls on geomorphic and Critical Zone processes and landscape evolution modeling. **Glenn Sharman** (Stanford) has research interests in the fields of sedimentary geology and basin analysis utilizing his expertise in deep-water stratigraphy and detrital geochronology, with application to the petroleum industry.

To the right are graphs detailing our 10-year Geosciences enrollment history, including the gentle rollover related to the 2014-present oil and gas recession. We are beginning to see recovery in the recruiting area with SWN, Devon and EOG on campus this year. Related to this is the new Geosciences Careers course offered this fall where off-campus guests (many alumni) discuss career options in diverse areas of geology, geography, geospatial and climate.

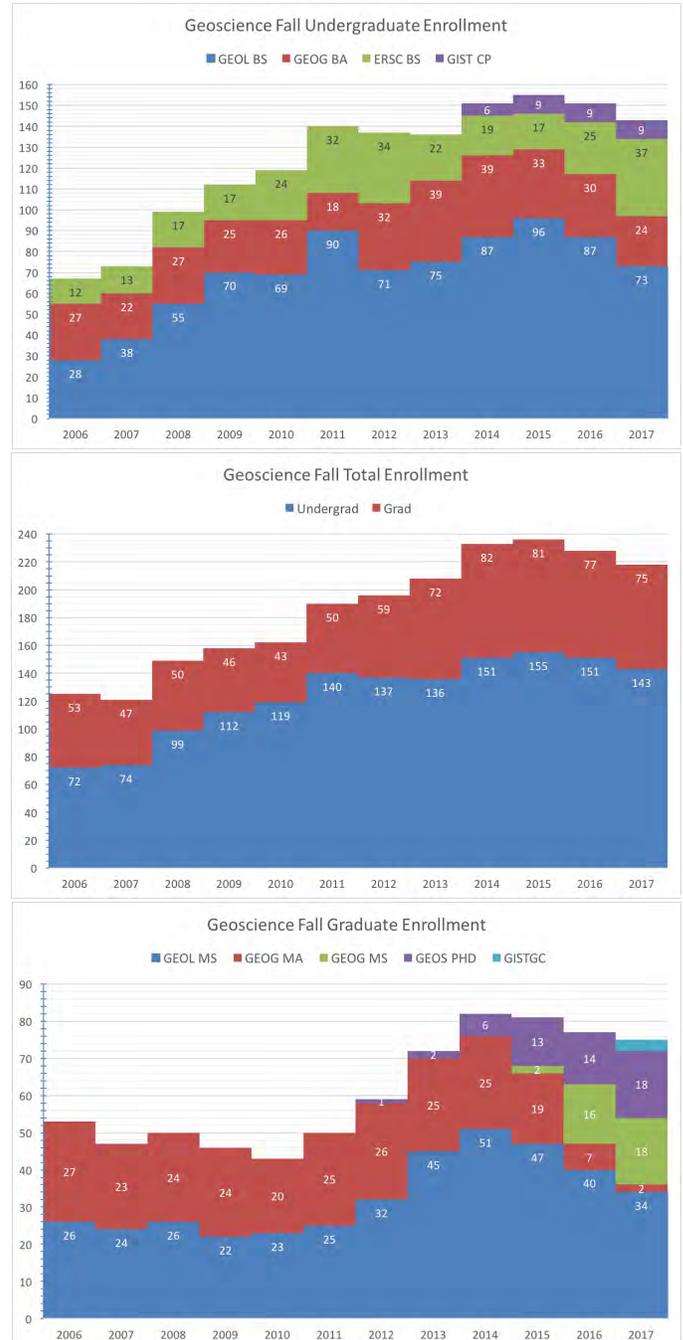
A concerning issue is a steep drop in geology field camp numbers (49 in 2011 to 23 in 2017) brought on by a 2015 administrative decision to charge out-of-state tuition for non-AR residents, effectively pricing us out of the market. At a recent meeting of the Departmental External Advisory Board, Chancellor Steinmetz committed to review the situation. It is with great appreciation that I can now report the UA Geology Field camp will be available to students from any school at in-state tuition rates beginning in summer 2018. Thank you Chancellor Steinmetz!

Speaking of the Advisory Board, it is worth recounting some major accomplishments of their first decade (2006-2016), including funding of the \$1M Maurice F. Storm Endowed Chair of Petroleum Geology, promotion and founding of the Geosciences Ph.D. program and raising \$1M (with Walton match) for Ph.D. fellowships. You can read more in Board Chair Bill Coffey's column later in the newsletter.

The AAPG Midcontinent Field Conference, co-hosted by UA Geosciences and the Ft. Smith Geological Society, was a rousing success with over 100 attendees. This fall our alumni event will be the 3rd UA Research Conference on Nov. 11, hope you can join us!

Much of what we are able to do and offer students is due to the involvement and financial support of you, the Geosciences alumni. Thank you and enjoy reading the accomplishments you have made possible.

GEOSCIENCES BY THE NUMBERS



All University of Arkansas GEOS alums
Are invited to
Join Us for the
Calling of the Hogs!
Monday, October 2
5:00-8:00 p.m.
At the Bricktown Brewery
During the AAPG MidCon meeting
in Oklahoma City

**Department of Geosciences
Fall Alumni Event**
3rd UARC
**UNIVERSITY OF ARKANSAS
RESEARCH CONFERENCE**
NOVEMBER 11, 2017

FACULTY**MOHAMED ALY***InSAR, GPS, GIS, Crustal Deformation Modeling, and Geohazard Assessment***STEPHEN BOSS***Geophysics, Marine Geology, Lacustrine Geology, Earth Systems, Sustainability Studies***JACKSON COTHREN***Director CAST**Geospatial Methodologies***MATT COVINGTON***Hydrogeology, Geomorphology, Karst and Glacial Hydrology***FIONA DAVIDSON***Department Vice Chair**Political Geography, European Studies, Urban Morphology and Planning***RALPH DAVIS***Vice Provost Research**Hydrogeology, Contaminant Transport, Water Resources Management***GREG DUMOND***Structural Geology and Tectonics***SONG FENG***Climate Change and Paleoclimates***JOHN HEHR***Meteorology, Climatology, Paleoclimatology, Global Change***EDWARD HOLLAND***Political, Cultural, Religion Geography, International Studies, Conflict and Political Violence, Europe and Asia***ANDREW LAMB***Geophysics***FRED LIMP***Leica Endowed Chair**Computer Applications, Economic Anthropology, Midwestern Archeology***CHRISTOPHER LINER***Department Chair**Maurice F. Storm Endowed Chair**Geophysics and Petroleum Geology***JILL MARSHALL***Geomorphology***THOMAS PARADISE***Hazards, Historic Preservation, Cartography, Middle East and Mediterranean Geography***ADRIANA POTRA***Ore Geology and Radiogenic Isotope Geochemistry***GLENN SHARMAN***Stratigraphy***JOHN B. SHAW***Sedimentology***XUAN SHI***Geoinformatics***DAVID STAHL***Global Change, Dendrochronology, Paleoclimatology***CELINA SUAREZ***Stable Isotope, Low-temperature geochemistry, Paleontology***JASON TULLIS***Remote Sensing, GIS, Ecosystem Services***RESEARCH FACULTY****PHILLIP HAYS, USGS***Isotope Geochemistry***ERIK POLLOCK***Research Associate***BARRY SHAULIS***Research Associate***INSTRUCTORS****PAULA ANDERSON***General Geology***RASHAUNA HINTZ***Human Geography***HENRY TURNER III***General Geology***EMERITUS****J. VAN BRAHANA***Hydrogeology***MALCOLM CLEAVELAND***Dendrochronology***JOHN DIXON***Geomorphology, Weathering and Soils, Geoarcheology, Alpine Geography***THOMAS GRAFF***Political Geography***MARGARET GUCCIONE***Geomorphology***RONALD KONIG***Structural Geology***WALTER MANGER***Stratigraphy***RICHARD SMITH***Geography***KENNETH STEELE***Geochemistry***DOY ZACHRY***Stratigraphy***2016-2017
GEOS Colloquium Schedule**

Colloquium Meets each Friday during the Fall Semester at 3:05 pm in GEAR 26, the auditorium.

September 8

Edith Wilson

Rock Whisperer

Transformation:

From Fossil Fuels to the Future

September 15

Glenn Sharman

University of Arkansas

*Rivers of Sand:**Sea Level Control on Sediment Dispersal and Providence Since the Last Glacial Maximum, Southern California, USA*

September 22

Grant Byerley

Apache Corp

Resaturated Pay: A New Infill Target Type Identified through the Application and Continuous Improvement of 4D Seismic at the Forties Field

September 29

Tom Paradise

University of Arkansas

The Science and Analysis of Rock Art Decay in Wadi Rum, Jordan

October 6

Elizabeth LyonNational Geospatial Intelligence Agency
GEOS Advisory Board Speaker

October 20

Robert MahonUniversity of Arkansas Post-Doc
Qualifying Controls on Stratal Geometries in Clastic Sedimentary Systems

October 27

Jesse Edmondson

Alabama Graphite Inc.

November 3

Claire McLeod

Miami University of Ohio

November 10

Michael DeAngelisUniversity of Arkansas Little Rock
Using Analog Experiments to Study Hard-to-Reach Places

November 17

Matt Covington

University of Arkansas

December 1

Barry Shaulis

University of Arkansas

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ARKANSAS.**J. William Fulbright**
College of Arts & Sciences
Geosciences

Software Donations

Schlumberger

Petrel Shared earth—critical insight
Techlog Because every well counts

GeoTomo
 Earth Modeling and Imaging Solutions

CGG Passion for Geoscience
HAMPSONRUSSELL
INTERPEX IXRefrax

Rose & Associates
 Oil & Gas Exploration Risk Assessment
 Prospect Risk Analysis Suite

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GEOSCIENCE

IHS
 Petra Kingdom
MJ
 SYSTEMS

dGB Earth Sciences

drillinginfo
 better, faster decisions

Data Donations

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 PRODUCTION COMPANY

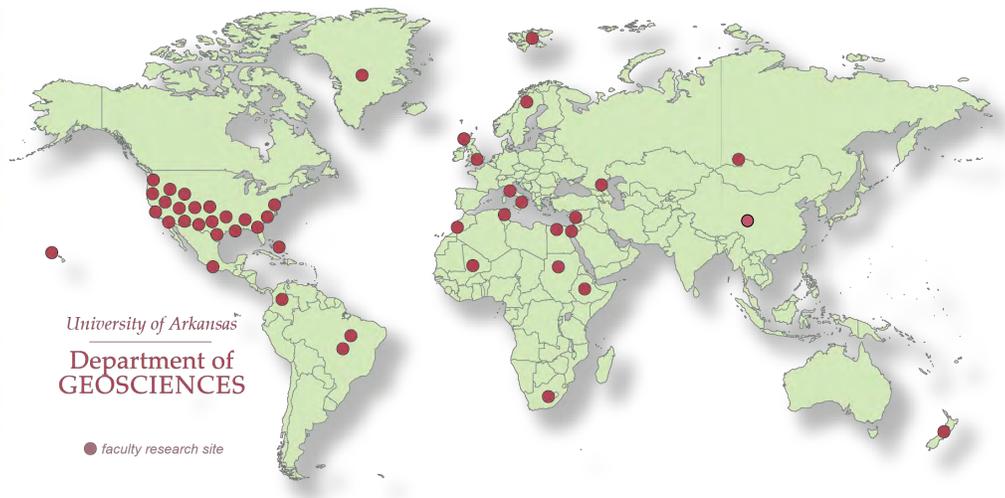
fairfield nodal

swn
 Southwestern Energy®

OSAGE MINERALS COUNCIL

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Worldwide Map of U of A Geosciences Projects



UA Geosciences Grants—One Year

Submitted Grants

57

Awarded Grants

39

Grant Dollars Awarded

\$798,000

UA Geosciences Publications—One Year

Refereed Pubs

75

Other Pubs

61

Authored Books

2

Edited Books

1

Second Arkansas Drone/UAS Summit

On behalf of Jim Rankin, Vice Provost, Research and Economic Development, please accept our invitation to the second **Arkansas Unmanned Aerial System Summit** on October 12, 2017 at the Reynolds Center Auditorium at 145 N Buchanan Ave, Fayetteville, AR 72701 on the University of Arkansas Campus.

There is ample parking in the Harmon parking garage across the street from the auditorium. The Summit agenda will be finalized in September and forwarded to invitees. The Summit will be from 08:30 am and 4:30 pm. The purpose of the second summit is to provide improved networking opportunities and give updates on research and operations utility of UAS in Arkansas. Our hope is that the connection between academe, industry and government officials will continue to grow while exploring ways to improve economic and development for UAS in the state. These applications include, but are not limited to, supply chain, emergency management, law enforcement, security, logistics management, geospatial/mapping, agriculture and forestry management, optimization and other engineering applications.

We have started an informal network to provide expert advice to operators on the type of platform, sensor and software applications best suited to your operational or research requirements. We also have a great group of experts to help you decide what type of authority you can use to fly (FAR 107, COA, 333, waivers, education exemptions, etc.) and export control questions.

Additionally, we will dedicate a short portion of this meeting to present the final requirements for an **AUVSI** chapter in Arkansas. Your input and participation is vital to this effort. Over this last year, it has become clear that this organization is key to assist Arkansas' economic development in UAS operations. Some of the research projects have led to new knowledge that we believe helps anyone wishing to begin or improve drone operations.

We are asking for your input on topics, dates and location for the next summit. If you would like a slot to provide information, please respond with any area you would like to present. We will reach out to some of you individually for participation as well.

Please feel free to forward this invitation to interested individuals and have them provide input so we can plan for the number of attendees. Please don't hesitate to contact Dr. Rankin or myself if you have any questions.

Richard G. Ham, Ed.D.



GEOS Hosts the AAPG MidContinent Field Conference

The [Department of Geosciences](http://geosciences.uark.edu) hosted the third Biennial Field Conference of the American Association of Petroleum Geologists (AAPG) Mid-Continent Section meeting September 30 to October 3, 2016. It was headquartered at the Chancellor Hotel in Fayetteville. Over 130 geologists from across the country attended the conference. It consisted of two separate field trip options lead by faculty from the Department of Geosciences, which allowed guests to examine locations representing the Carboniferous geological period.

"Most people living in Northwest Arkansas do not realize it, but the area is a world-class geological site for studying and answering questions such as how rocks in the field were deposited and later modified by tectonic forces of burial and uplift," said Christopher Liner.

The first trip highlighted the area north of Fayetteville, referred to as the lower Mississippian series, which consists of mostly limestone and chert deposits. This trip explored where limestone rocks, often seen in road cuts throughout the area, formed in broad shallow seas. These rock formations often hold clues about climate and sea level chang-

es that happened over 300 million years ago.

The second trip led south of Fayetteville along Highway 49, then on to Greenland and Hackett to explore the area that is referred to as the upper Pennsylvanian series. These rocks are a bit younger and progressively more influenced by a vast continental collision that formed the Ouachita mountains and the gas-rich Arkoma Basin.

"This field conference is an important opportunity for the Department of Geosciences and the University of Arkansas," Liner said. "Over 100 geologists visited Fayetteville and saw the natural outdoor laboratory of our geological outcrops."

Liner said that collaboration with the [Fort Smith Geological Society](http://www.fsgs.org) and [The American Association of Petroleum Geologists](http://www.aapg.org) made this event possible.

The AAPG is one of the largest professional geological societies in the world, claiming more than 36,000 members.

An Update from the GEOS External Advisory Board

Greetings from the new board Chair

My name is Bill Coffey and I have accepted the position of chair beginning this fall, serving a 2- year term. I received an M.S. in geology in 1981, and since then have been employed in the oil industry, serving in a variety of roles and companies. I am currently with Devon Energy and also serve as lead Geosciences recruiter for Arkansas.

Also elected to a 2-year term as Vice Chair of the Advisory Board is Heath Wallis. Heath is a geography grad and his input and experience will add to our board activities.

One main goal for my term is to focus on collaboration between all disciplines in the geosciences. One exciting trend I see within Devon and other E&P companies is the broad use of “big data” within our activities. I hope to leverage this trend to include the department’s GIS and geospatial expertise. I will also look for other areas of synergy across broader business applications, emphasizing wider collaboration between geography and geology.

Geosciences Careers Course

Beginning this month, a new course designed to prepare our students for a professional life in their new careers will begin. This 1 credit hour class will be led by alumni and other career professionals designed to help undergraduates develop a professional network, look for opportunities, and meet potential employers.

A total of 14 GeoHog alums and professionals employed in the geosciences will lead a weekly discussion, sharing what they have learned with the students and how best to use their degree and advance their career in a variety of geoscience professional fields.

Spring 2017 Board Meeting

Chancellor Joe Steinmetz met with our board outlining his academic priorities and gave an update on state funding and student retention and enrollment.

Blake Rickman (director of Development and External Relations) and Melody Kouchenbagh (associate director of Development) provided updates on geosciences funding and endowment.

Todd Shields—Dean of the J. William Fulbright College of Arts and Sciences discussed student retention and the increase in online courses.

Reports from department members included:

Jason Tullis, Departmental Liaison to the Board, reported on the test flight of the CAST department’s drone, with the help of Oak Ridge National Laboratory.

An update on the new Petroleum Geology class and the AAPG Imperial Barrel competition from Mac McGilvery

The Board will host fall and spring colloquium speakers, with dates set for Friday, Oct. 6, 2017, and April 6, 2018.

The board will nominate a Geosciences alumni for the University of Arkansas Distinguished Alumni Award each year, with the Ad Hoc committee working on a list of nominees.

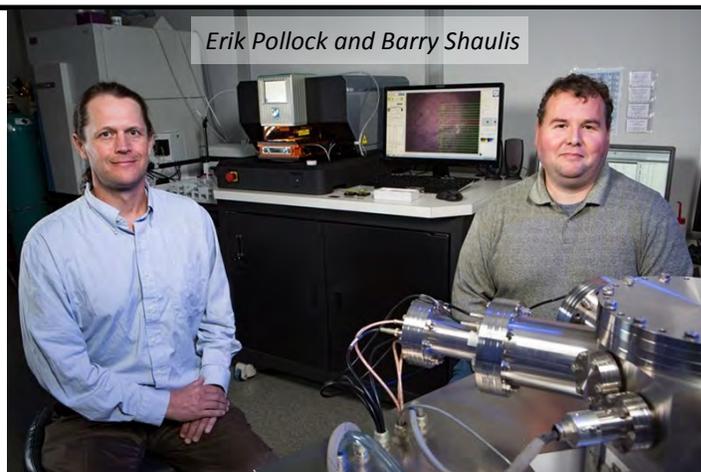
We also discussed alumni *meet and greets* in Houston, Tulsa, and Oklahoma City, and the Fall Chili Cook-Off and Board Panel Discussion set for Dec. 7, 2017.

Our board is very active and engaged in all aspects of the Geosciences. Come out and support our department by attending alumni events and send suggestions to me at bill-coff@yahoo.com.

Our next board meeting will be Friday, May 4th, 2018.

Sincerely,

Bill Coffey, Advisory Board Chair, on behalf of the board.



NEW LAB ON CAMPUS

A new lab called **TRAIL, or Trace element and Radiogenic Isotope Laboratory** at the University of Arkansas will help scientists better understand ore deposits in the earth’s crust, how fossils form and what they can tell us about the earth’s climate, and accurately date some of the planet’s oldest rocks, among other uses.

TRAIL is made up of three main pieces of equipment: two mass spectrometers that the university already owned, and a new laser ablation system that can burn holes as small as seven microns — about one-tenth the diameter of a strand of human hair — into samples. The resulting vapor is directed to the mass spectrometers, one of which can identify trace elements and the other of which is used to study isotopic ratios — the difference in atomic mass of two or more forms of the same element. These measurements can aid in dating the geologic processes that formed the Earth’s crust, help identify the source of economic ore deposits such as lead and tin, and are useful as a means of studying paleoclimate through the chemical composition of fossilized teeth. The combination of instrumentation is unique in the state; in fact, it’s one of only a handful of facilities in the nation capable of this kind of research.

Before the addition of the new laser ablation system, researchers who wanted to perform trace element mass spectrometry had to dissolve samples in acid. Laser ablation is faster, less destructive and preserves spatial relationships in samples, which could ultimately prove to be more versatile.

The laser was purchased with a \$542,000 grant from the National Science Foundation to geosciences assistant professors **Gregory Dumond, Adriana Potra and Celina Suarez**. The money also allowed the facility to hire research scientist **Barry Shaulis**, an expert in laser ablation. Prior to coming to the University of Arkansas, Shaulis was a post-doctoral researcher at the Lunar and Planetary Institute in Houston.

TRAIL manager **Erik Pollock** says laser ablation is more efficient and versatile than dissolving samples in acid. “There’s a time savings, and there is less waste. Not only can this be used by geoscientists, but also by chemists, biologists and engineers. One field develops a tool and other fields begin to think, ‘We could use that too.’ The grant is the capstone to the hard work of a diverse group of researchers including chemists, geoscientists and biologists.”

TRAIL is part of the Arkansas Statewide Mass Spectrometry Facility, established in 1999 with funds from the state and the National Science Foundation. It has also been funded by the Arkansas Bioscience Institute, and NASA. The facility’s mandate is to provide mass spectrometry capability for academic, governmental and industrial researchers throughout the state and nationwide.



Stephen Boss continues to work with the National Science Foundation, Geological Society of America, and National Association of Black Geoscientists to develop strategies for broadening participation in geosciences among underrepresented minority (URM) populations in the United States.

A current focus of those efforts is understanding the origins, persistence, and growth of the ‘diversity gap’ between the U.S. minority population and the geosciences workforce (see figure below).

The demography of the United States is rapidly changing and the demographic trajectory of the nation shows an increasingly diverse populace. Approximately 48% of Americans presently self-identify as minorities. By 2050, no single racial or ethnic group will hold majority status (i.e. >50%) among the U.S. populace. The diversification of the U.S. population will create a population where the majority of persons will identify as members of categorized minorities in less than a decade. In contrast, the demography of the national geosciences workforce lags far behind the observed demography of Americans. Annually, the proportion of minorities in the U.S. population increases 1.75-times faster than the proportion of minorities employed in geosciences. Only 17% of people employed in the geosciences workforce self-identify as minorities, resulting in a 30% ‘diversity gap’ compared to their proportions in the U.S. population (48%). The lack of significant progress broadening participation in geosciences over decades suggests barriers to participation that are foundational, systemic, and institutionalized across the discipline.

Jason Tullis, a geospatial science expert, will help refine international guidelines for greenhouse gas inventories that will be considered for adoption by the Intergovernmental Panel on Climate Change. He is an expert in analyzing satellite imagery and other geospatial data to evaluate a country’s land base and detecting land use conversions, such as from forest to farmland. He will travel in August 2016 with 10 other U.S. scientists to participate in an IPCC “scoping meeting” in Minsk, Belarus. The meeting will start and accelerate the formal process of updating the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Tullis has served as a technical adviser to the U.S. EPA’s Climate Change Division. He collaborated with scientists in Colorado State University’s Natural Resource Ecology Laboratory and others to develop geospatial methods that improve the calculation of greenhouse gas emissions and removals based on activity data.

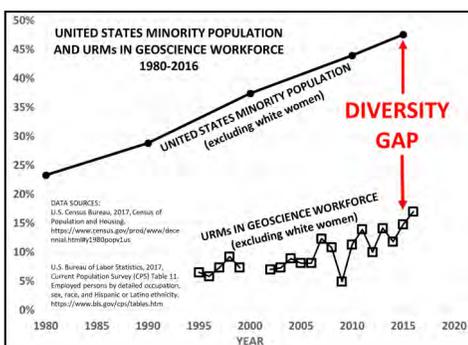
The Intergovernmental Panel on Climate Change (IPCC) panel was created to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. “The scientific consensus is that human activities are influencing climate change through a greenhouse effect, and that reducing emissions is well worth the effort,” Tullis said. “Rapidly advancing geospatial science, including remote sensing and geographic information systems, is an essential component in national inventories and will be an important factor in the refinement of the guidelines.”

In Minsk, Tullis will help set the scope for a methodology report that will be generated, and pending a formal approval process, will be adopted in 2019 by signatories to the Paris Agreement. Those signatories will use the report to estimate their national greenhouse gas inventories going into the next decade.

Tullis is a researcher in the U of A’s [Center for Advanced Spatial Technologies](#). He also provides expertise for SERVIR, a joint development initiative of NASA and the United States Agency for International Development.

Celina Suarez has again received the Connor Award. Robert and Sandra Connor of Little Rock established the Connor Endowed Faculty Fellowship in 2004 to provide essential faculty development opportunities to rising academic experts in the college. Annually, a college committee including the dean recognizes assistant professors who have made excellent contributions to the college and their departments.

She will use these funds to help continue her (and her students’) research into continental ecosystems during time periods dominated by greenhouse conditions. This includes the late Triassic and mid Cretaceous thermal maximums. These time periods saw large amounts of CO₂ and methane being emitted to the atmosphere as a result of the eruption of large igneous provinces (LIPs), allowing them to be analogues for modern climate change. Particularly, she will focus a portion of the funds to collect and analyzing rock and fossil samples that were deposited on land during these time periods in Montana, Arkansas, and Utah for stable isotopes, major and minor elements. Funds will be used to travel to the field, collect samples, and samples will be analyzed at the state-wide mass spectrometry facility here at the University of Arkansas. Stable isotopes of carbon and oxygen will allow me to determine ancient climate proxies such as CO₂ concentration, temperature, and precipitation rates. By determining how these characteristics changed over time, a determination of how LIP changed climate and life on Earth and in turn what can be expected from the current global warming trends. In the case of the late Triassic, it likely caused one of the five mass extinctions both in the marine and terrestrial world. In the case of the Cretaceous thermal maximum, global diversity suggests a turnover in faunal make-up but not necessarily an extinction. The rock record offers a natural laboratory to investigate these issues. It is also a natural classroom and Dr. Suarez’s goal is to use some of these funds to bring students into the field to learn the techniques necessary to understand these ancient processes and how they will affect terrestrial environments in the future.





Xuan Shi was invited to participate in an NSF workshop entitled *Building a CMMI Data Infrastructure Community* in February 2017 as well as to give a presentation at the Research and Development Division of the National Agricultural Statistics Service at the U.S. Department of Agriculture. His presentation was titled *Geocomputation Over Heterogeneous Computing Infrastructure in the Era of Big Data Science* as a part of the Spatial Analysis Research Section seminar.

Shi's presentation included an overview of the latest developments in the field of geocomputation and its possible applications for big data analysis and large scale image data classification which is the use of extensive data sets to expose unknown relationships, correlations, customer preferences, market trends and other information. A mission of the RDD is to produce national crop land cover classification annually. This is a typical geo-big-data computational process and is one of the fundamental national land cover data products that has been used nationally and internationally. "The RDD is interested in my research on high performance geocomputation over big spatial data using hybrid computer architecture and systems," he said.

Shi said that many geocomputation processes may not have dependency and data communication in such a distributed computing environment, but varieties of geocomputation may have a strong dependency and data communication. Different solutions have to be developed to efficiently use varied supercomputing resources to complete the geocomputation tasks. "RDD is seeking a more accurate, efficient and low cost solution with less human resource demand. My research on HPC solutions could potentially help RDD to further improve its operation."

Shi said the RDD application is particularly interested in the high-performance computing solutions that implement both unsupervised image classification by the Iterative Self-Organizing Data Analysis Technique Algorithm and supervised image classification by the maximum-likelihood-classification approach over big imagery data.

Xuan Shi also has a new NSF grant. It will investigate a methodology for topology and data generation for interdependent critical infrastructures (ICIs), with a focus on inland waterways, ground transportation systems that are connected or close to the inland waterways, and emergency services.

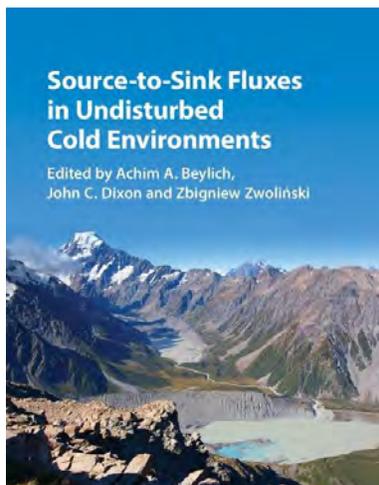


John C. Dixon's new book, *Source-to-Sink Fluxes in Undisturbed Cold Environments*, describes the diversity of arctic and alpine climates, and how they are susceptible to climate change.

The book provides an overview of the latest research of the working group of the International Association of Geomorphologists. Forty-four scientists worldwide contributed to the book, which includes case studies covering arctic, Antarctic and alpine environments. "We identify the main factors accounting for differences in the amounts of solid and dissolved materials transported across cold climate landscapes. We also explain why there are variations in the amounts of solid and dissolved materials transported in different cold climate landscapes, which has implications for water quality and nutrient availability in the ecologically sensitive environments," he said.

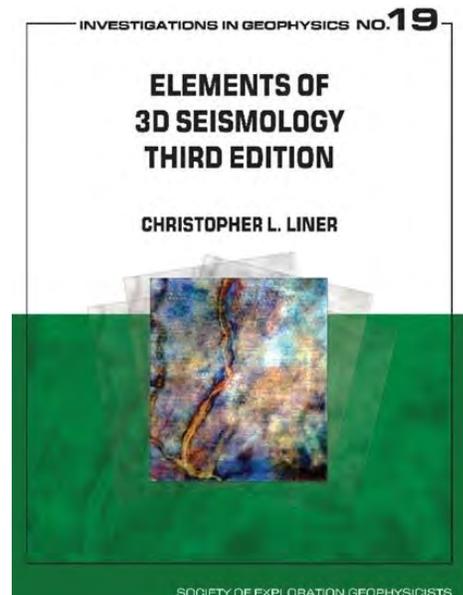
The book stresses that cold climates are not uniform in their appearance and in the processes that operate within them, Dixon said. There is much greater variability in alpine landscapes than other cold climates, for example. "This is a reflection of things like the bedrock that dominates, the aspect of the valley, the amount of vegetation cover or surface debris. All of these variables influence the rate at which materials are moved around on the Earth's surface."

Source-to-Sink Fluxes in Undisturbed Cold Environments is published by Cambridge University Press.



Christopher Liner recently published an updated edition of his book *Elements of 3D Seismology* now in its third edition.

"It's an in-depth introduction to acquiring, processing and understanding 3D seismic data," Liner said. "The book is not only intended for beginning geophysicists, but also for experts in related fields such as engineering, petroleum and geology, as well as professional geophysicists who want to learn about another subfield of their specialty." It focuses more on seismic interpretation than the other two editions, especially in relation to exploration in the oil and gas business. He modified this edition to include detailed information about updated seismology data and interpretation software, including [OpendTect](#), which allows researchers anywhere in the world to do 3D seismic interpretation.



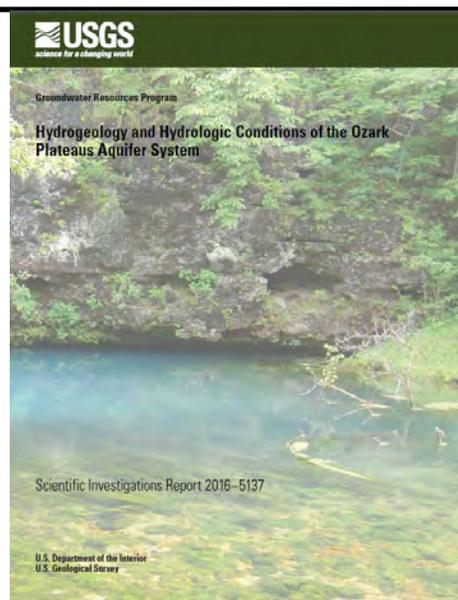
Fall 2017 Geosciences Courses

General Geology
 General Geology Lab
 General Geology Honors
 General Geology Honors Lab
 Human Geography
 Earth Science
 Earth Science Lab
 World Regional Geography
 World Regional Geography Honors
 Mineralogy and Petrology
 Foundations Geospatial Data Analysis
 Intro to Cartography
 Sustaining Earth
 Sustaining Earth Honors
 Geospatial Computing Toolkit
 Oceanography
 Principles of Landscape Evolution
 Geospatial Applications and IS
 Spatial Analysis Using ArcGIS
 Geospatial Data Mining
 Intro to Geodatabases
 Dynamics of Sediment Transport
 Digital Earth
 Geography of Contemporary South
 Geography of Popular Culture
 Geography of the Middle East
 Geography of the Middle East Honors
 Economic Geology
 Stratigraphy and Sedimentation
 Political Geography
 Meteorology
 Principles of Remote Sensing
 Geoscience Careers
 The Solid Earth
 Applied Climatology
 Applied Climatology Honors
 Intro to GIS Programming
 Intro to Raster GIS
 Intro to GPS and GNSS
 Low-Temp Geochemistry of Water
 Geography of Europe
 Geospatial UAS
 Geospatial UAS Honors
 Geosciences Colloquium
 Quaternary Environments
 Geoscience Research Methods
 Stratigraphic Principles
 Hydrogeologic Modeling
 Math Modeling of Geol Proc
 GIS Programming
 Tectonics

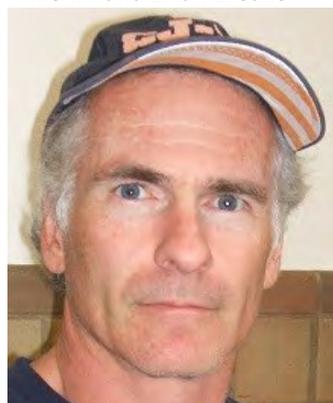
Phil Hays, Katherine Knierim (Ph.D. ENDY 2015, M.S. Geology 2009) Brian Breaker (M.S. Geology 2009, B.S. Geology 2006), and others published *Hydrogeology and Hydrologic Conditions of the Ozark Plateaus Aquifer System*.

The hydrogeology and hydrologic characteristics of the Ozark Plateaus aquifer system were characterized as part of ongoing U.S. Geological Survey efforts to assess groundwater availability across the Nation. The subject study integrates knowledge gained through local investigation within a regional perspective to develop a regional conceptual model of groundwater flow in the Ozark Plateaus aquifer system (Ozark system), a key phase of groundwater availability assessment. The Ozark system extends across much of southern Missouri and northwestern and north-central Arkansas and smaller areas of southeastern Kansas and northeastern Oklahoma. Groundwater flow is ultimately controlled by aquifer and confining unit lithologies and stratigraphic relations, geologic structure, karst development, and the character of surficial lithologies and regolith mantle. The regolith mantle is a defining element of Ozark Plateaus karst, affecting recharge, karst development, and vulnerability to surface-derived contaminants. Karst development is more advanced—as evidenced by larger springs, hydraulic characteristics, and higher well yields—in the Salem Plateau and in the northern part of the Springfield Plateau (generally north of the Arkansas-Missouri border) as compared with the southern part of the Springfield Plateau in Arkansas, largely due to thinner, less extensive regolith and purer carbonate lithology.

Data indicate that societal needs for freshwater resources in the Ozark Plateaus will continue to increase and will do so in the context of changing climate and hydrology. Groundwater will continue to be an important part of supporting these societal needs and also local ecosystems. The unique character and hydrogeologic variability across the Ozark system will control how the system responds to future stress. [Book link here](#)



Below: Phil Hays, Kathy Knierim and Brian Breaker.





The Center for Advanced Spatial Technologies at the University of Arkansas is leading a statewide effort to integrate industry-specific geospatial technology skills into existing degree and certificate programs at community colleges in rural areas.

The National Science Foundation, through its Advanced Technical Education program, awarded CAST a three-year grant for \$898,073 for the Opening Pathways to Employment through Nontraditional Geospatial Applications in Technical Education, which will be known by the acronym OPEN-GATE.

Geospatial technologies include computer-based mapping and data acquisition and analysis using geographic information systems. The U.S. Department of Labor has listed it as a high-growth industry and a major area of job creation in the next decade. A recent survey found a need for technicians, especially those who can store, create and manage data.

The program’s goals are to increase use of geospatial technology statewide, expand access to geospatial education and training and improve existing employee skills while expanding the workforce. “This provides an opportunity to seed a larger number of programs around the state in a way that reflects the way GIS and geospatial technologies in general are being used,” said CAST Director **Jackson Cothren**.

CAST will work with four community colleges in the University of Arkansas System to include geospatial technology curriculum in current programs. They are:

- Cossatot Community College of the University of Arkansas in De Queen
- Phillips Community College of the University of Arkansas in Helena-West Helena
- University of Arkansas Community College at Batesville
- University of Arkansas Community College at Morrilton

Each participating community college will work with local industry to create an Employer Advisory Board to provide feedback about employer needs for the developing workforce and facilitate direct interaction between employers, faculty and students. “We can build an accessible educational ladder for a local, technologically skilled workforce to meet the developing needs of industry in Arkansas,” Cothren said.

“If this program is successful, we’d like it to expand to other community colleges in the state,” said Robyn Lane, a GIS education specialist at CAST who will lead the program. “We would also like this to expand into a regional center that could provide support in neighboring states.”



ALUMNI NOTE: Ray A. Quick, B.S. Geology 1983, M.S. Geology 1985

Ray Quick was one of the graduates of our program who focused on a career in hydrogeology. Quick received his M.S. from the University of Arkansas in Fayetteville after conducting his thesis research in hydrogeology and hydrochemistry at the Edwards Aquifer Research and Data Center in San Marcos, Texas. After graduating from the university in 1985 he opened the first private sector environmental consulting firm in Little Rock, AR for a regional company, Environmental Management, Inc. He started this office with no backlog (billable projects), no personnel and turned it into a successful operation. In 1987 Quick was recruited by Woodward-Clyde Consultants (WC), a private international A/E firm, whose primary market sectors were geotechnical engineering and hydrogeology. WC was entering the developing environmental business sector due to evolving environmental regulations that were being enforced by state regulatory agencies and the Environmental Protection Agency. Quick also opened this office with no personnel or projects. In 1989 he was promoted to an associate (owner) in the firm due to his technical, business development and management skills. He developed the Arkansas Operations of WC into a cumulative multi-million dollar business adding new personnel and expanding the consulting range of the company. In 1997, WC was acquired by URS Corporation, who retained Quick as their Arkansas Operations manager for approximately two years. URS was subsequently acquired by AECOM and currently continues its operations in Little Rock.

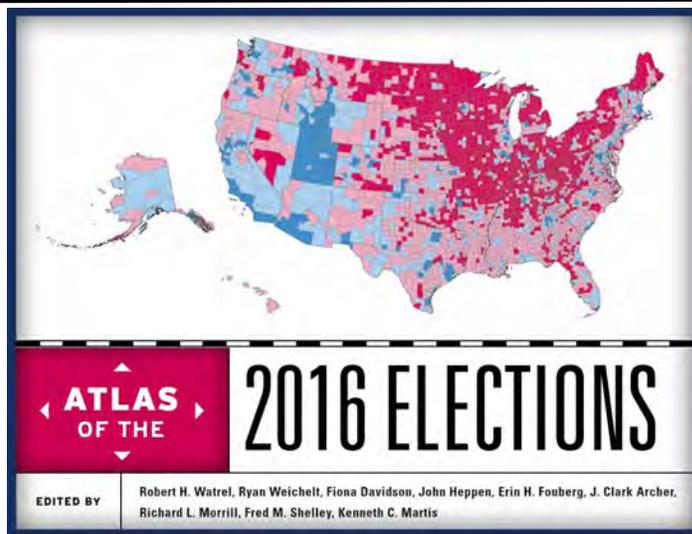
In 1999, Quick opened his company, Quality Solutions, Inc., where he did contract work for URS and private sector clients. In 2005 he was hired by the Arkansas Department of Environmental Quality. He resigned in 2012.

Ray is the past President of the of the Arkansas Section of the American Water Resources Association and was elected to be a member of Sigma Gamma Epsilon during college.

Quick is currently on the adjunct faculty of the Department of Geosciences and continues pro bono collaborated work with Professor Emeritus Van Brahana and the Karst Hydrogeology of the Buffalo National River team and has coauthored several publications and assisted on research projects since 2013.



Fiona Davidson is once again part of the editorial team for the forthcoming Atlas of the 2016 Elections. This is an ongoing series of atlases that document U.S. Presidential elections using county-scale data. The 2016 Atlas will be published by Rowman and Littlefield and should be available early in 2018.





Faculty member Edward (Ted) Holland has published *From Post-Soviet to Neo-Soviet*. In a series of polls conducted at various points over the past 25 years, the Levada Center has asked Russians about their nostalgia for the Soviet state and the reasons for its breakup. In the [most recent sample](#) (November 2016), 56 percent of respondents expressed regret about the Union's collapse. This figure peaked in December 2000 at three quarters of those surveyed and has been above 50 percent all but once over the past quarter century (49 percent in the December 2012 sample).

Responses in the November 2016 version to the latter question were also consistent with prior surveys (asked since December 2006). Twenty-nine percent of respondents endorsed the “feckless and misguided ‘Belovezhskaya collusion (sgovor)’ between Yeltsin, Kravchuk, and Shushkevich” as the main reason for the Union’s breakup. Other popular choices are also vaguely conspiratorial, such as the complicity of foreign powers hostile to the USSR—the second most common response at 23 percent.

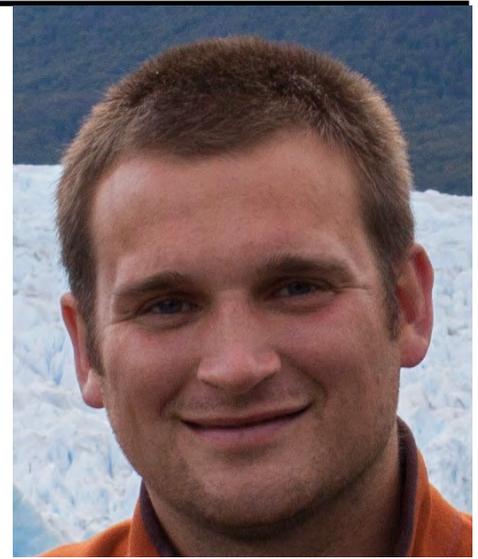
Other answers in the sample variously endorse the reasons for the Union’s breakup often cited in policy circles and academic interpretations: the disillusion-

ment of the populace with Gorbachev and his leadership team, the weight of military expenditures on the country’s economy, the technological and economic backwardness of the Soviet state (including a reliance on oil and natural gas), and nationalism in the republics, among others.

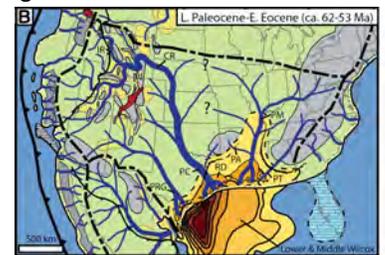
In some of the non-Russian republics, there is a similar level of regret for the breakup of the USSR. In a 2013 poll conducted by [Gallup](#) in 11 of the 15 successor states (Estonia, Latvia, Lithuania, and Uzbekistan were excluded), a majority indicated that the breakup was more harmful than good in Armenia, Kyrgyzstan, Tajikistan, and Ukraine, as well as in Russia (in Moldova and Belarus a plurality agreed with this position). Similar numbers are reported in surveys conducted in [Abkhazia, South Ossetia, and Transnistria](#), the separatist territories in Georgia and Moldova that rely on Moscow’s patronage for their continued existence. Only in Turkmenistan (62 percent)—and very likely in the unpolled Baltic states—did a majority indicate that this event was beneficial. There is also a generational divide: according to Gallup, “adults between the ages of 15 and 44 ... are nearly three times as likely as those 65 and older to say the collapse benefited their countries.”

Results from these and similar surveys form part of the basis for the argument that [post-Soviet](#) is a relevant idea for describing a shared identity among those living in the former Soviet republics. Nostalgia for the Soviet state still exists. These ties are rooted in similarities across the region composed of the successor states: migration pathways based on Russian as the lingua franca; the top-down management of religions (particularly Orthodoxy and Islam); urban forms that are only slowly evolving to more market-oriented conditions; and contestations over the state, sovereignty, and territorial organization that result from Soviet-era borders. As I wrote with Matthew Derrick in introducing our questioning of the concept post-Soviet: “Each of the successor states is post-Soviet, but they are so to varying degrees and in different ways.”

[Blog Post Here.](#)



Glenn Sharman has just joined us as an assistant professor. He came to the department from a postdoc fellowship at the Bureau of Economic Geology, University of Texas at Austin. Before that, Sharman worked as a geologist in new ventures exploration with ConocoPhillips in Houston, Texas. Sharman brings expertise in deep-water sedimentology, basin analysis, and detrital geochronology, and aims to support the department’s connection with the energy industry through research and teaching. He also looks forward to working with the trace element and radiogenic isotope laboratory and contributing to building an exceptional sedimentary geology and earth surface processes program here.



Paleogeographic reconstruction of North America during deposition of the sand-rich Wilcox Group in the Gulf of Mexico.



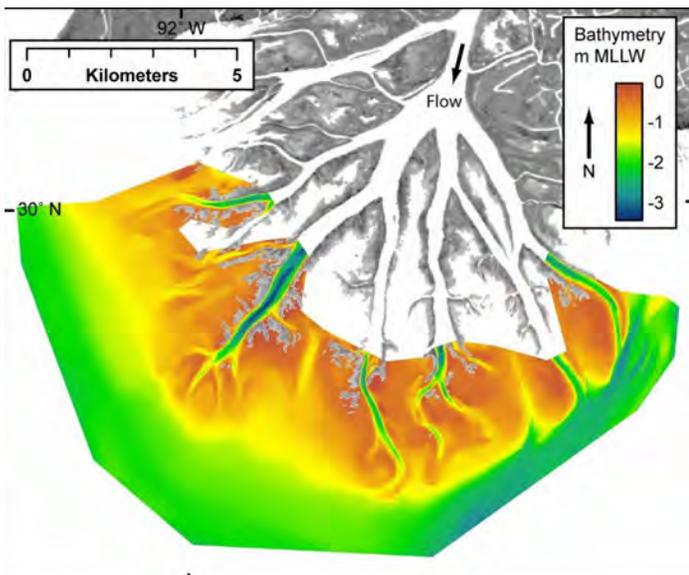
Congratulations!
Teresa Center married Neil Smith on April 29, 2017, at Devil’s Den State Park.



John B. Shaw has been awarded an Early Career Research grant by the U.S. Department of Energy’s Office of Science. He will use this to further his study of sedimentary basins, which have a complicated architecture of sandy channel deposits and muddy floodplain deposits. His project is designed to improve the understanding of how water, hydrocarbons and carbon dioxide move through the Earth’s subsurface.

“It is quite an honor to receive this funding,” Shaw said. “I look forward to pursuing this research with my colleagues and students at the U of A.”

Shaw joined the U of A faculty in 2014 after serving as a National Science Foundation postdoctoral research fellow at the University of Wyoming.



Participants in a field trip during the AAPG Mid Continent Field Conference, hosted here in October, 2016.



Mac McGilvery presents at a field trip during the 2017 AAPG MidCon Field Conference.



Maurice Storm, B.S. Geology 1982, was keynote speaker at the 2017 Outstanding Faculty Luncheon.

OUTSTANDING Faculty Luncheon



Matt Covington—In fall of 2016, I participated in a National Geographic sponsored glacier cave expedition to the [Polish Polar Station at Hornsund](#). The expedition was led by [Ken Mankoff](#) (Penn State). Geomicrobiologist [Jenn Macalady](#) (Penn State) and Italian geologist/caver/mountaineer Maurizio Mainiero filled out the team. Following up on [prior work](#), the focus of the expedition was 3D scanning within glacier caves. The team hoped to better characterize the roughness of subglacial conduits and the impacts that conduit geometry has on subglacial water flow and pressure. In general, glacier caves play an important role in routing meltwater from glacial surfaces to the toe of the glacier. The efficiency of these flow paths can have a strong influence on the speed at which a glacier slides. However, current models of these flow paths are relatively poorly constrained due to a general lack of data. Their trips to the belly of the glacier were aimed at filling this data gap. And was plagued by warm temperatures that made the field work challenging (due to high water in the caves). However, they had just enough days below freezing to collect the critical data we needed.

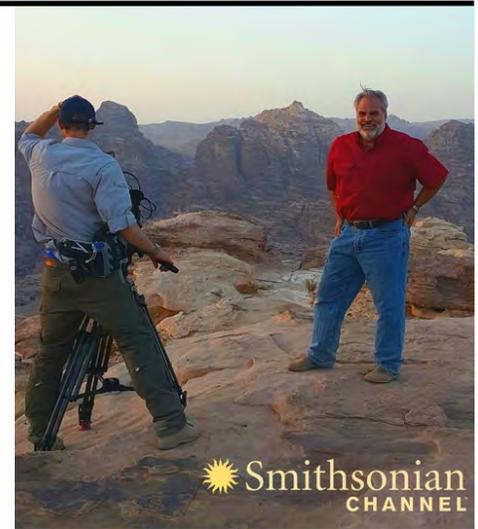
The team acknowledges the valuable support of both the National Geographic Society's Research and Exploration fund and the Polish Institute of Geophysics, which were our hosts in Hornsund.

This spring semester the team began preparations for upcoming fieldwork on the Greenland Ice Sheet, supported by an NSF project in collaboration with [Jason Gulley](#) at USF. The goal of the project is to study the links between meltwater delivery to moulins (deep holes in the surface of the ice sheet), the evolution of conduit systems within the ice, and the sliding motion of the ice sheet. When meltwater reaches the base of the ice, it can lift the ice, reduce friction, and accelerate the sliding of the ice. However, models of the processes behind these links remain relatively poorly constrained by data. To examine these

links in the field, they will measure water levels within the moulins, discharge within the meltwater streams that feed the moulins, and use GPS units to record the motion of the ice.

In preparation for work in Greenland this summer, the team has been refining their protocols for discharge measurement within the meltwater streams. They will make these measurements by injecting known quantities of a harmless fluorescent dye (Rhodamine) and measuring concentrations of that dye downstream using field fluorimeters.

As part of their preparation for summer field work in Greenland, the team took part in a 2-day Glacier Travel course at the [International Mountain Climbing School](#) in North Conway, New Hampshire. In the course, our team learned the basics of roped glacier travel and crevasse rescue.



Thomas Paradise, part of a team whose research in Petra, Jordan is spanned more than 25 years, is the focus of a May 1 special on the Smithsonian Channel. The special, [Secrets: Riddle of Petra](#) was filmed and produced by Blink Films Pictures in London, as a multi-part series for the [Smithsonian Channel](#), an international science documentary channel.

Paradise, one of the leading researchers on the ruined city of Petra, has worked as a consultant for a number of production firms including NOVA, Discovery Channel, NatGeo, NBC and CBS-TV. His current research on the possibility of a catastrophic flood that may have inundated the city in the 4-5th century is a focus of this documentary.

Because Paradise has training in geology, architecture, geography and cartography, he was asked to work in the on-air commentary, script work, cartography, imagery, and fact-checking of this extensive project, making him part of the project and filming from beginning to end.

"I'm delighted to see how in-depth the producers and directors took this script and production. Rather than focus on the well-known attractions of Petra, they decided to elaborate on the science and archaeology that is transforming our knowledge of this magical place," Paradise said.

"At a time when television often lacks critical and scientific inquiry, it was a pleasure to see such in-depth investigation and analysis done for mainstream television today," Paradise said. "As tourism in Petra reaches nearly 500,000 visitors this year, scientific research of this nature will only help in its protection and heritage management for generations to come."

Paradise joined us in 2000 and has published more than 60 articles, reports and chapters on Petra, Jordan for publications including the *Journal of Physical Geography*, *American Journal of Archaeology*, *Geomorphology*, *Conservation*, *Geografiska Annaler*, and *Zeitschrift für Geomorphologie*.

STUDENT NEWS—Hunter Manlove, B.S. Geology and B.S. Earth Science (with honors), minor Geography, 2017, has accepted an internship with the Bureau of Land Management at the Cleveland Lloyd Dinosaur Quarry in Price, Utah.

ARKANSAS ACADEMY OF SCIENCE

Faculty and students from multiple universities across the state met April 1-2, 2016 on the University of Arkansas campus for the **100th meeting of the Arkansas Academy of Science**. The academy works to promote science and the dissemination of scientific information in Arkansas.

Student oral and poster presentation competitions were held as part of the event and U of A students performed well, placing in nearly every category of competition.

Our GEOS undergraduate student winners and their respective categories were:

- Julie Cains, second place, geosciences (oral), art and geology major, presented *Lower Mississippian Chert Development, Southern Midcontinent Region*

The U of A graduate student winners and their respective categories were:

- William Travis Garmon, first place, geosciences (oral), master's student in geology, advised by Adriana Potra, presented *Sourcing Diagenetic and Mineralizing Fluids of Mississippi Valley-Type Ores along the Cincinnati Arch*
- John Philbrick, second place, geosciences (oral), master's student in geology, advised by Gregory Dumond, presented *Comparison of the Elemental Geochemistry of the Boone Chert on the Arkansas Novaculite*

Others who presented:

Malcolm Cleaveland; *Plain Facts about Global Climate Change and Global Warming*

Matthew Ruggeri and Chris Liner; *Near-Surface Seismic Investigations of Mississippian Outcrops at Pedro, Arkansas*

Van Brahana and others; *Geochemical Processes and Controls Affecting Water Quality of the Karst Area of Big Creek Near Mt. Judea, Arkansas* and *What's in the Water? Results from E. Coli Investigations from Selected Tributaries of Big Creek, Newton Co., Arkansas*

Elvis Bello and Walter Manger; *Paleozoic Sandstone Record, Southern Ozarks Region: Depositional Character and History*

Forrest McFarlin; *Lithostratigraphic Succession and Depositional Dynamics, Lower Mississippian Succession, Southern Ozarks, Northern Arkansas and Adjacent Areas*

Daniel Moser; *3D Seismic Interpretation of Subsurface Eastern Arkoma Basin Below the Mississippian-Pennsylvanian Boundary in Conway County, Arkansas*

Sean Kincade; *Sequence Stratigraphy of the St. Joe and Boone Formations, Lower Mississippian (Kinderhookian-Osagean), southern Ozark Region*

Joshua Blackstock and Phil Hays; *Boron and Chloride Ratios through Time in the Taupo Volcanic Zone, New Zealand: A Case Study in Continual Monitoring for Assessing Development Impacts in Hydrothermal Systems*

Daigo Yamamura and Celina Suarez; *Assessing the Authenticity of Stable Isotope Compositions in Vertebrate Skeletal Remains: Implications for Paleoclimatic Interpretation of the Upper Cretaceous Kaiparowits Formation, Southern Utah*

Kevin Jayne, Angela Chandler and Walter Manger; *Depositional Dynamics and Early Cementation History of the Short Creek Oolite Member, Boone Formation (Osagean, Lower Mississippian), Northern Arkansas*

Victor Roland, Asher Sampong, Erik Pollock and Phillip Hays; *Toxic Effects of Metals on Microbial Organic Carbon Transformation and Nitrate Removal*

Max Cooper and Matt Covington; *A First Step in Modeling Cave Formation in Turbulent Flow*

Obiora Ezewudo Dalu and Walter Manger; *Establishing the Age and Correlation of the Moorefield Shale (Mississippian) in its Type Area, Northeastern Arkansas.*

Students Look Forward to Interviews—This fall, as for many years now, Devon, EOG and Southwestern Energy will be visiting our campus and competing to offer our students internships and jobs. Their faithfulness over the past several years has benefited the students in our department, resulting in over 50 of our students gaining experiences and employment. Thank you!

Imperial Barrel Award

Five Master of Science geology students — Julie Cains, Stephen Denham, Riley Dickson, Sean Kincade, and Sidney Mahanay — placed third at the 2017 University of Arkansas Imperial Barrel Award (IBA) Regional Competition against eight other teams from Oklahoma, Kansas and Missouri. The UA team was hosted in Oklahoma City by alumnus Bill Coffey (M.S.'82 geology) who is exploration manager for Devon.

The **IBA program** is offered every year by the American Association of Petroleum Geologists, who adopted it in 2007 from the Imperial College in the United Kingdom. This is now an international contest and allows participation from students around the world.

The UA IBA team was advised by adjunct faculty members Steve Milligan (B.S.80 geology) and Jamie Woolsey (B.S.04 geology, M.S.07 geology). "In the face of current oil prices, it is even more important toward furthering their careers," Milligan said. "The skills acquired by IBA team members are used in oil and gas exploration, and are also valuable for all other venues of employment options when they graduate."

IBA teams have only eight weeks to process, evaluate, and present an industry-donated dataset that includes 2D or 3D seismic and well data. Team members divide duties to evaluate this data and prepare a prospect that has the greatest potential for producing oil or gas. The presentations propose and defend a drilling location inside the data area and are equivalent to what will be expected in the petroleum industry. Team presentations are judged by an industry panel on use of science and technology, teamwork, creativity and style. The judges are members of the American Association of Petroleum Geologists with long industry experience.

"The IBA was one of the best experiences in geology for me so far" said team member Stephen Denham. "I gained valuable friends, knowledge, and skills that will continue to benefit me long into the future. Our success was a combination of hard work, the amazing advising staff, and the team. The competition showed me once again that Geosciences at the University of Arkansas is one big family, and I am happy to be a part of that."

Added team member Julie Cains, "This competition takes us beyond academic exercises and exposes us to real-world petroleum exploration using real data, allowing us to apply fundamental geologic concepts to completely unfamiliar places and complete a technical evaluation down to the prospect level. I learned more in those short eight weeks than I ever could have imagined."



Doctoral Student Finds Syrian Refugees Fleeing to Turkey Face New Obstacles



Bradley Wilson's study site in Southeast Turkey is home to two of the deadliest earthquakes of all time and accommodates about 60 percent of the country's refugee settlement. "The migration patterns, in

relation to the existence of fault zones and earthquake activity, is quite striking," said Bradley Wilson, a geosciences doctoral student. "Much of the migrated refugee population is settling in areas with long histories of deadly earthquake activity."

Since the Syrian civil war began in 2011, nearly three million Syrian refugees have fled to Turkey for safe haven. However, research shows these migrants are fleeing in-to areas of Turkey which are rife with earthquake activity.

One of the major problems his research has unveiled is that the refugee population is not accounted for in population models used for earthquake risk assessments in the region. In response, Wilson created his own population model. He started with the most recent Turkish census and then used refugee data to manually disperse refugees throughout his study site. When using the refugee-inclusive population scenario in earthquake casualty estimations, he found 25 percent increases in fatalities in regions with high refugee populations, decreasing to zero percent in areas without significant migrated populations. "If you have a 25 percent increase on an earthquake that's estimated to kill 4,000 people, that's potentially 1,000 extra casualties. If you're thinking about distributing aid to a region, that's a pretty significant number to be missing."

Only 10-15 percent of the refugees in Turkey live in formal camps. Wilson, advised by [Thomas Paradise](#), said this is unique compared to other Middle Eastern countries. And it presents challenges for his research. Refugee data is only available at the province level, but since refugees are allowed freedom of movement, their precise location within their provinces of registration is unknown, and there is a lack of information about refugee housing conditions.

In the larger scheme of things, Wilson said his research is just a small portion of the continued understanding of how refugees in the area might be affected, and affected differently than local citizens. He also acknowledges refugees have more pressing needs than their relation to earthquakes. "I'm not trying to diminish the more immediate needs

of refugees in the region, but that shouldn't come at the expense of thinking about how they impact natural hazards. We have the ability to include them in our forecasts."

Wilson's research is funded by a [National Science Foundation Graduate Research Fellowship](#) and a University of Arkansas Distinguished Doctoral Fellowship.

Wilson won the J. William Fulbright College of Arts and Sciences [Three Minute Thesis](#) competition and will compete in the university-wide Three Minute Thesis final on Friday, Feb. 10. The event serves as the capstone to the university's [Graduate Education Week](#).

Grant Awarded to Conduct Middle East Community Rock Art Research



Kaelin Groom, M.S. Geography 2012, Ph.D. ENDY 2017, has been awarded a \$98,000 research grant from the [U.S. Agency for International Development](#).

The grant will support training local volunteers in rock art stability assessment techniques in Wadi Rum, southern Jordan.

Groom's research will provide Wadi Rum residents the opportunity to actively participate in the documentation and conservation of the valley's numerous rock art resources and to develop valuable skills applicable to other cultural resources across Jordan and the Middle East region.

Spanning the 2017-18 academic year, the grant will include multiple field seasons in Wadi Rum to establish research agendas, management plans and conditional baseline analysis to be used in longer-term conservation policies at the [United Nations Educational, Scientific and Cultural Organization](#) World Heritage Site. Groom hopes her project will empower, inspire and educate rural communities in southern Jordan about the protection and research of their tangible stone heritage and cultural resources.

Groom's research is part of the [Sustainable Cultural Heritage Through Engagement of Local Communities Project](#), which is a long-term program supported by the U.S. Agency for International Development and the [American Center of Oriental Research](#). She is advised by Thomas Paradise.

Middle East Studies Student Wins Nationally Competitive Scholarship to Study Arabic in Oman



Christopher Cowan, a senior honors undergrad, earned a nationally competitive scholarship to take part in the Summer Arabic Language and Media program in Manah, Oman. Cowan is one of just

24 applicants selected from a pool of hundreds.

Originally from Kansas City, Cowan is an International Studies and Middle East Studies double major, with a minor in Arabic, in the J. William Fulbright College of Arts and Sciences. He first became interested in the Middle East in high school for its longstanding geopolitical relevance and rich historical and cultural traditions. This interest was reaffirmed once he enrolled at the University of Arkansas, taking courses in Arabic and other Middle East-related subjects. He plans to continue his study of the region as a graduate student in geography, beginning fall 2017.

"Chris is an enthusiastic student, and a promising scholar in Middle East Studies," says professor Thomas Paradise, former director of the King Fahd Center for Middle East Studies. "He has an amazing capacity for learning, and has been an energetic participant of the MEST program, helping to revive extracurricular programming for students like the Arabic Conversation Table and the Al-Bisat Middle East Discussion Group." Cowan is also the president of Gamma Theta Upsilon, the geography honors society, and is an active member of Students for Refugees, an RSO that focuses on refugee resettlement advocacy.

The Summer Arabic Language and Media program is a fully-funded intensive Arabic language scholarship program administered by the Sultan Qaboos Cultural Center, an organization established in 2005 by the Sultanate of Oman dedicated to promoting mutual respect and understanding between the United States and Oman. Participants in the SALAM program studied at the Sultan Qaboos College for Teaching Arabic Language to Non-Native Speakers from July to August 2017, and will develop a deeper knowledge of Arabic, while becoming familiar with Omani history and culture.

Photo by Nani Verzon.

SUMMER CAMP IN MONTANA—2017

Another successful UA geology field camp is in the books with much learning from all involved. This year we were a smaller group, 23 students, 4 TA's and 2 faculty at any point in the camp, which at least allowed for a lot of individual attention to students. This year, travel-blizzard 2017 in Colorado kept us from our beautiful campground along the Colorado River near Radium Springs. After many weather updates from **Andrew Lamb** and **Ralph Davis** back in Fayetteville, we quickly diverted north on I-25 towards Wyoming. **John Shaw** was fast on his phone and we secured a campsite in Buffalo, WY. Unfortunately, that required twice as much driving as we expected, but the TA's Stephen Denham, Sean Kincade, Amanda Whaling, and Bryan Bottoms performed brilliantly despite iced over windshields. A quick stop at an O'Reilly's Autoshop and windshield wiper changes near the CO-WY boarder, and we were back in business and arrived in our campsite at 9 pm in Buffalo, WY. This diversion allowed us to see some geology that we don't typically get to see. We drove through Ten-Sleep Canyon, WY. Through this beautiful canyon we observed Cambrian to Pennsylvanian limestones, shales, and sandstones. We stopped at Ten Sleep Canyon Brewery to observe a really nice fault (Tensleep fault trace) between the Triassic Chugwater and Jurassic Gypsum Springs formations and the Cretaceous Frontier, Mowry, and Thermopolis Formations. The Brewery was so nice as to open up for us to eat our lunch and have a cold one! Since we were so far north and wanted a cheap place to stay, we decided we would primitive camp on BLM ground near the world-famous Polecat Bench. This bench of badlands is famous for exposure of the continental deposits of the Paleocene Ft. Union Formation and the Eocene Willwood Formation and the expression of the Paleocene Eocene Thermal Maximum. This is a short-lived global warming event that many have studied to compare to modern climate change. We had a beautiful night in the badlands by the campfire free of

charge courtesy of our wonderful public lands.

We arrived in Dillon to fairly nice weather and rested up for our first mapping project. We had Matthews Hall again and everyone was happy with their accommodations provided by the great folks at the Montana Western University. Weather was great for our mapping projects, with the rattlesnakes out to greet us at Frying Pan and Big Hole. The only biters were the cacti of course. As the mapping projects proceeded the weather got warmer and warmer culminating with our hottest days at one of our greatest elevation gains at Timber Hill mapping area. With most of the mapping behind us we headed to Yellowstone and the Tetons. Despite changing ownership recently, Elkhorn Hot Springs has retained its rustic but idyllic charm and has continued to be welcoming to our department. After long days in the field, the soothing waters of the hot springs were enjoyed nightly by both the students and instructors.

We got the traditional snow storm. Students got a solid experience in working under challenging field conditions (see photo of students gaging Elkhorn Creek in the snow). A small group of hardy students opted to walk back to Elkhorn on our second day and summited a snowy Comet Peak along the way (see photos). After the projects at Elkhorn Hot Springs had culminated, we made the trip up to Glacier National Park to see some beautiful U shaped valleys, Precambrian stromatolite mounds, and a world class exposure of the Belt Supergroup, before making the long drive back to Arkansas. On the return trip, overnight stops were made at Sun River Canyon, Devil's Tower, and the Sand Hills of Nebraska.

Minus some minor van troubles (the poor guys are getting up there in mileage) we returned to Fayetteville, safe and sound and hopefully we all gained lots of great experiences and learned many new skills.

Contributors: Celina Suarez, Adriana Potra, Matt Covington, and Bryan Bottoms



Tradition: the 2017 participants at the Geology Field Course in Montana.



Spring 2017 Commencement: Walter Manger and Celina Suarez with their Ph.D. students, Daigo Yamamura and Elvis Bellow.



Spring 2017 Commencement: Chris Liner and M.S. Geology student Riley Dickson.



Faculty and Grad Students, Fall 2017

ORGANIZATIONS HIRING UA GEOSCIENCE GRADUATES

AECOM
 Arkansas Department of Environmental Quality
 Arkansas Geological Survey
 Arkansas Department of Transportation
 Arkansas Natural Resources Commission
 Arkansas Parks and Tourism
 Anadarko Petroleum Corporation
 Beaver Water District
 Bureau of Land Management
 Burns and McDonnell
 Chesapeake Energy
 City of Springdale
 Conoco Phillips
 Core Laboratories
 Denbury Resources
 Devon Energy
 ExxonMobil
 EnSafe
 Environmental Defense Fund
 Environmental Services Associates
 ESRI
 Fayetteville Public Schools
 FTN Associates
 Garver Engineering Planning and Environmental Services
 Haas Hall Academy
 Halliburton
 Hunt Oil Company
 Kinder Morgan
 Marathon Oil Company
 Bureau of Ocean Energy Management
 Newfield Exploration Company
 Noble Energy
 NOAA National Weather Service
 North Plains Groundwater Conservation District
 NWA Community College
 NWA Regional Planning Commission
 PGS
 Pure Earth Resources
 Rogers Public Schools Schlumberger
 SCS Engineers
 Shell
 Sierra Club
 Stephens Production Company
 SWN
 UNESCO
 US Army Corps of Engineers
 US Bureau of Reclamation
 US Census Bureau
 USDA Natural Resources Conservation Service
 US Environmental Protection Agency
 US Fish and Wildlife
 US Forest Service
 US Geological Survey
 US National Park Service

The links to all of the above can be found at: <http://geoschaircorner.blogspot.com/2017/07/geos-jobs.html>

STUDENT ORGANIZATIONS

Association of American Petroleum Geologists (AAPG) 

Society of Exploration Geophysicists (SEG) 

Sigma Gamma Epsilon (SGE) 

Rock bag sales raise money for the awards banquet every spring.

Gamma Theta Upsilon (GTU) 

Geography Student Honor Society

National Association of Black Geoscientists (NABG) 

Traveled to New Orleans last September for national meeting. Heading to Atlanta this year.

Association of Women Geoscientists (AWG) 

Held a spring 2017 fund-raiser /auction to raise money for scholarship.

ALUMNI UPDATE

Amanda Keen-Zebert has received a lab tech support grant. It is a five-year grant that will allow her to expand the lab capacity and work on turning the lab into a training facility for luminescence dating. The MRI is for a lab based gamma spectroscopy system that is now on site and will be installed soon. It will measure U, Th and the decay products to evaluate for disequilibrium in the decay chain. This will allow conducting all parts of luminescence dating in-house and produce rigorous results. It will also be calibrated to measure 210Pb and 137Cs that will allow the expansion into measure 210Pb erosion rates and do sediment fingerprinting with 137Cs.

Spring 2017 Sigma Gamma Epsilon Awards:

W.A. Tarr Award

Laynie Hardisty

Outstanding Faculty

Adriana Potra

Outstanding Teaching Assistant

Kirsty Morgan

**Available from SGE:**

\$5 Bottle Coozie
 \$6 Coffee Mug
 \$6 Pint Glass
 \$1 Sticker
 \$20 T-shirt (shown)
 \$15 "Geologist Crossing" t-shirt

Prices are a suggested donation. For how-to-order information, contact the department by calling 479-575-3355 or emailing lmilliga@uark.edu





The Department of Geosciences Spring Awards Banquet was held on May 4, 2017 at the UARK Bowl on Dickson Street. Photos courtesy of Holly Young.



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To be good stewards of the taxpayers money, we have sent an abbreviated version of this newsletter to our alums who have not supplied us with an email address.

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