GEOGRAM

Fall 2014

GEOGRAPHY, GEOLOGY, METEOROLOGY, GIS

A LEADING AMERICAN UNIVERSITY WITH INTERNATIONAL REACH

The Annual Newsletter of the Department of Geography and Geology at Western Kentucky University

Dear Friends,

The Department of Geography and Geology enjoyed another extremely productive academic year in 2013-2014. Highlights of the year's accomplishments included the following events and activities:

► Dr Rezaul Mahmood won both the Ogden College and University awards for Excellence in Research and Creative Activity.

►Drs Jason Polk and Leslie North led the inaugural Summer Toppers at Sea program, visiting Iceland, Scandinavia, and the British Isles, with the $100 Solution as the research umbrella.

► Geography, Geology, GIS, and Meteorology students received multiple awards at several annual local and regional conferences.

► The Kentucky Mesonet has 63 active stations across the Commonwealth (kymesonet.org).

► Two recent Geology graduates received an Honorable Mention as NSF Graduate Research Fellows in the latest national competition: Elaine Flynn, now a Graduate student at Washington University; and Michael Powers, now a Graduate student at Oklahoma State University

► Two GIS students received ESRI scholarships, the thirteenth year in a row for the Department.

► Faculty and student publications appeared in multiple highly ranked journals this past year, including *Tellus A, Journal of Applied Meteorology and Climatology, and Applied Geography*.

A Letter from the Department Head

► The Reynolds Foundation generously donated additional funds to grow the Reynolds Geological Laboratory for advanced student research, thanks to Dr Mike May.

► Graduate student and CWR Staff member Jonathan Ogelsby continued research in Niger, West Africa, with the Songhai people.

► Students and faculty led by Drs Jason Polk and Leslie North worked closely with the Corvette Museum in the aftermath of a catastrophic sinkhole collapse inside the museum that destroyed several cars.

► Dr. David Keeling lectured for the American Geographical Society on expeditions to Eastern Europe (October) and Cape to Cape (January)

► Dr John All escapes death after falling down an ice crevasse during research in the Himalayas.

► WKU Stormchasers, led by Dr. Josh Durkee, experience another successful summer forecasting program on the Great Plains.

► Fifteen students participated in departmental study abroad/away programs to Ireland (Summer 14) and Hawaii (Winter 14) led by Erin Greunke and Amy Nemon. Other field trips included the Mojave Geology Field Trip (led by Dr. Wulff) and annual field trips around the southeast region.

► Students and faculty from WKU's Department of Geography and Geology attended the annual meeting of the Geological Society of America (GSA) (Oct. 27-30) in Denver, CO.

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Faculty and students excelled again in scholarship, research, and professional development, convening and/or participating in myriad professional workshops and presenting 52 papers at local, regional, national, and international conferences. Faculty also engaged significantly with the local community, continuing to serve on committees and task forces, participating in WKU-sponsored community outreach events such as the *Far Away Places* series at Barnes and Noble, sharing geoscience expertise on WKYU-FM's Midday Edition program, and giving talks and presentations at schools, churches, community organizations, and for service groups.

Faculty served as editors or co-editors of professional academic journals or book series, eight faculty reviewed manuscripts for academic journals or publishers, and geography and geology faculty research articles appeared in such diverse journals as: *Tourism Geographies; BAMS; Geographical Review; Science; Material Culture; Inorganic Chemistry; Water, Air, & Pollution; FOCUS;* and *Applied Geography,* among others. Approximately forty faculty research articles or book chapters are either currently in review, revision, or awaiting publication, several co-authored with undergraduate or graduate students, an exceptional level of productivity indeed.

In May 2014, the Department recorded 140 majors in geography, meteorology, and GIS; 60 in geology; and 75 total minors. The Department graduated 32 undergraduates and 13 Master's students from its programs during the year and it has a target of 50 new majors each year to maintain and grow the programs. Thirty graduate students are currently enrolled in the MS Geoscience program.

The students, staff, and faculty of the Department of Geography and Geology again have recorded many outstanding achievements this past year. We have each and every one of you to thank for helping to build the Department into what it has become--the best in the state and one of the most engaged in the broader region. We look forward to hearing from you this coming year.

Best Wishes,
David J. Keeling
Department Head

*** HOMECOMING ***

Saturday, November 8, 2014

**** Special Event: Homecoming Tailgating**
Time: 11 a.m. - 2 p.m.
Location: TBA - Join us at the ***Ogden College tent and look for the Geography and Geology faculty and banner***.
Note: The new DSU building is open and worth a visit, but look for your Geography and Geology faculty, staff, students, and alumni on the main lawn, come and enjoy some good food and beverages, and catch up with old and new friends.

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Visit http://www.wku.edu/geoweb/

The Department website homepage contains updated and detailed information about its faculty, students, and programs. There is always fresh material, new links, updated pictures, and more information about majors and minors. In addition, the GIS, Meteorology, and Geology programs have their own websites with information about the major options, faculty research, student opportunities, and other information. GIS Director Kevin Cary, Dr. Greg Goodrich, and Dr Aaron Celestian are the webmasters respectively and you can view these pages at: http://www.wku.edu/gis/ - www.wku.edu/geology - www.wku.edu/meteorology.

Archived information about the Department's news announcements (by month and year) and other publicity can be found on the departmental website. Also, there are links to news reports archived by calendar year. Visitors to the website can also view details of faculty and student publications. Just go to http://www.wku.edu/geoweb/facpubs.php and you will find recent publications listed alphabetically by faculty, with a link to another page that lists faculty publications by rank. There is also a link to the student theses and other publications page, where you can see the breadth and depth of student research activities.

We love to receive updates from our alumni! Please take the time to fill out the alumni update form attached to this GEOGRAM or send the department head an email (david.keeling@wku.edu) with details.

Outstanding Geography and Geology Students, 2013-14

The Department of Geography and Geology takes pride every year in the quality of its graduating seniors and, each year, the Department recognizes its outstanding seniors at a public presentation by presenting them with awards and certificates. Recipients of the Department's highest honors also receive recognition at the annual Ogden College Awards Ceremony.

For the 2013-14 academic year, Beth Tyrie received the Outstanding Geoscience Graduate Award, presented by Dr Leslie North. Travis Garmon received the Judson Roy Griffin Outstanding Senior in Geology Award. Karissa Grammer received the Ronald R. Dilamarter Outstanding Senior in Geography Award. Austin Boys received the L. Michael Trapasso Outstanding Senior in Meteorology Award, presented by Dr Greg Goodrich. Preston Dallas received the annual award for Outstanding Graduating Senior in GIS, presented by Kevin Cary.

Other awards included scholarship recognition, service awards, and research awards.

Beth Tyrie (left) received the Outstanding Geoscience Graduate Award and Karissa Grammer (right) received the Outstanding Geography Senior Award from Dr Leslie North

Austin Boys (left) received the L. Michael Trapasso Award for Outstanding Meteorology Major from Dr Goodrich.

Preston Dallas (right) received the Outstanding GIS Senior award from Kevin Cary, GIS Center Director.

W. Travis Garmon (right) received the Outstanding Geology Senior award from Dr Jason Polk.

Department of Geography and Geology
GEOGRAPHY GEOLOGY METEOROLOGY GIS

Congratulations to ALL our Outstanding Students!

Announcing

Our Newest Faculty Member:

Pat Kambesis Comes Back to WKU

Pat Kambesis left WKU in 2010 to pursue a Ph.D. in the Earth and Atmospheric Sciences section of the Department of Geoscience at Mississippi State University under the direction of Dr John Mylroie, and the Department is delighted to welcome her home as an instructor in GIS and geography. She spent a significant portion of the 2013-14 academic year completing her dissertation, which she defended in March 2014 (dissertation title: "Influence of Coastal Processes on Speleogenesis and Landforms in the Caribbean region"). Despite the weight of the dissertation monkey on her back, she was still able to participate in several scientific meetings, presenting her dissertation research. Kambesis attended the International Congress of Speleology in Brno, Czech Republic, in Summer 2013, and presented her research on atmospheric monitoring in Coldwater Cave, Iowa. She participated in the International Cartographic Salon, winning the best-of-show award for Three-Dimensional Representation of a cave. In October, 2013, she presented a poster at the GSA in Denver, CO, on using fractal indices to differentiate cave types, and was invited to submit a paper on that topic for a special GSA publication on karst to be published in 2015. In November, 2013, she gave a presentation on touristic development of show caves in Haiti at the National Cave and Karst Management Symposium in Carlsbad, NM.

In February, 2014, Kambesis was invited to present her dissertation research on Yucatán caves at the Karst Waters Institute-sponsored Hypogene Cave Development Conference, held on San Salvador Island, Bahamas, that featured invited speakers from around the world to discuss the classification and characteristic of hypogene caves. She spent a week in July in Huntsville, AL, at the National Speleological Society's annual convention, where she chaired the American Exploration Session and presented papers in International Exploration (Haiti reconnaissance work) and in the Geology Section meeting (Fractal analysis of cave morphologies).

Completion of the dissertation allowed time for teaching activities that included teaching a week of Introduction to the Physical Environment during WKU's Maymester and a week-long class on Cave Survey and Cartography at WKU/Mammoth Cave Karst Field Studies Program. She also co-taught a workshop on cave survey techniques at the National Speleological Society's Annual Convention in Huntsville, AL.

Kambesis continues to pursue her other avocation as an avid cave explorer/mapper and cartographer. She organized a 10-day expedition to Isla de Mona, Puerto Rico, with a group of Puerto Rican and American speleologists to continue documenting the caves and karst features of the island. This is an ongoing project that started in 1998 and, to date, the group has mapped over 70 kilometers of passage within 200 documented caves. The project members collaborated with a group of British archeologists who are studying rock art of the Caribbean region. Isla de Mona is one of the richest sites in the Caribbean in terms of historical and prehistorical in-cave rock art.

In July she travelled to Arizona to map earth cracks at Wupatki National Monument. This is part of a biological monitoring project to document cave life and diversity within the earth cracks. These features are not dissolutional caves but rather tectonic caves that have formed due to extensional forces associated with tectonic activity in the region. In August, Kambesis worked with cave ecologists from the Cum-

berland Piedmont Network of the National Park Service to make base maps of Russell Cave, at Russell Cave National Monument (located in northeast Alabama) for future biological monitoring.

She spent the middle weeks of August in the hot steamy jungles of Quintana Roo (northeast Yucatán Peninsula) working with American and Mexican speleologists on the documentation of the vast network of coastal caves of the region. The Yucatán caves were another part of her dissertation research and she was invited to present research results in order to help educate local land developers about the impact of touristic development on the cave systems of the region (and the impact of cave systems on touristic development!)

Of course, all good scientists and cave explorers publish the results of their work. Kambesis co-authored two chapters in a book on karst landforms published in 2013 – her chapters addressed cave development in Barbados and geologic controls of cave development in the Yucatán. She provided the cornerstone paper on cave development in the Tennessee/Alabama/Georgia region for the 2014 NSS Convention Guidebook. This is in addition to a number of other guidebook and journal articles on her cave and karst research and cave exploration exploits nationally and internationally.

Kambesis successfully bid for the 2015 National Cave and Karst Management Symposium on behalf of the Cave Research Foundation in collaboration with Mammoth Cave National Park and WKU. The symposium will be held in October, 2015, and will feature the caves and karst of the Mammoth Cave Region. She spearheaded a new project to develop a GIS for the Southeastern Cave Conservancy, one of the largest cave conservancies in the US.

Kambesis is delighted to call the Department of Geography and Geology at WKU her home base for teaching and as a launch pad for exciting new research projects on caves and karst development, and to continue to pursue international and U.S. cave exploration projects. She greatly looks forward to teaching and doing collaborative research with old and new colleagues at WKU.

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Leading Journals Publish Research by Department Faculty and Students

A central mission of student engagement in the Geography and Geology Department is to engage students in faculty-supervised research that leads to publication. This past year, faculty and students in our various programs, as well as alumni, again have been successful in bringing collaborative research to publication in leading national and international journals.

Kortney Craft (Geoscience M.S. 2011) co-authored *Drought and Corn in Kentucky* with Drs Mahmood, Goodrich, Yan, and King (Agriculture), published in the *Applied Geography* journal. In the same journal, undergraduate geography major (B.S. 2004), Travis Keeling published *Did irrigation impact 20th century temperature in the High Plains aquifer region?* with Drs Mahmood, Foster, and Hubbard (Nebraska-Lincoln). Undergraduate geology majors Michael Powers (B.S. 2013) and Shelby Rader (B.S. 2012)

published *In situ Raman spectroscopic study of transient polyhedral distortions during Cesium exchange into sitinakite* with Dr Celestian in the *American Mineralogist* journal.

During the first half of 2014, M.S. Geoscience student (2014) Jesse Winchester, with co-authors Drs Durkee, Degu, Hossain, Mahmood, and Chronis published *Investigating the Effect of Land between the Lakes on Storm Patterns* in the *Journal of Applied Meteorology and Climatology.* Dan Nedvidek (M.S. Geoscience 2014) published *Getting Revved up about Sinkholes* with Drs North and Polk in the summer issue of *FOCUS on Geography*. More than a dozen excellent Master's theses were also completed during the academic year.

Other recent peer-reviewed publications by faculty and students include, among many others:

- Dr Katie Algeo (2013) Underground Tourists/ Tourists Underground: The Bransford Hotel and African American Tourism to Mammoth Cave. *Tourism Geographies* 15(3): 380-404.
- Dr David Keeling (2014) A geopolitical perspective on Argentina's Malvinas/Falkland Claims, Chapter 17 in Foster R., Johnson, M., and Edward, M. (eds.), *The Crisis of the Twenty-First Century: Empire in the Age of Austerity*. London: Routledge.
- Dr Rezaul Mahmood and 18 co-authors (2014) Land cover changes and their biogeophysical effects on climate *International Journal of Climatology* 34(4): 929-953.
- Dr Michael May and Brackman, T.B. (2014) Geophysical characterization of karst landscapes in Kentucky as modern analogs for paleokarst reservoirs. *Interpretation* 2(3): SF51-SF63.
- Dr Leslie North and Dr. Jason Polk, with Van Aken, M.W., Harley, G.L., and Dickens, J.F. (2014). A GIS-Based Modeling Approach to Predicting Cave Disturbance in Karst Landscapes: A Case Study From West-Central Florida. *Physical Geography* 35(2): 123-133.
- Dr Peggy Gripshover (2014) Born to Run: Kentucky Derby Winners' Foaling Locations in Kentucky, 1875-2013. *FOCUS on Geography* 57(2): 54-83.
- Dr Xingang Fan and Dr Mahmood with Ma, Z., Yang, Q., and Han, Y. (2014) Land use/land cover changes and regional climate over the Loess Plateau during 2001–2009. Parts I and II: interrelationship from observations. *Climatic Change* (online issues).
- Dr John All and Dr Aaron Celestian with Schmitt, C.G., Cole, R.J., and Arnott, P. (2014) Linking remote and in-situ detection of black carbon on tropical glaciers. *Photogrammetric Engineering & Remote Sensing* 80(5): 385-390.

A full listing of current and recently published articles by faculty and students (as well as former students) can be found on our website at:
http://www.wku.edu/geoweb/stupubs.php (students)
http://www.wku.edu/geoweb/facpubs.php (faculty).

Students, Faculty Attend Geological Society of America's Annual Meeting

Several students and faculty from the Department attended the annual meeting of the Geological Society of America, with *Celebrating Advances in Geosciences* the theme of the 125th anniversary meeting, held Oct. 27-30 in Denver. WKU students and faculty engaged in several activities, including poster and oral presentations, moderating sessions and hosting a departmental expo booth. Students also attended paper sessions, explored graduate school and postgraduate career opportunities and learned more about the professional side of the geoscience discipline. Dr. Leslie North co-chaired a session on *Sustainability in the Geosciences*.

The expo booth showcasing the Department and its programs was a great success, with dozens of prospective students and collaborators visiting it throughout

the meeting to get information and to enter applications for scholarships offered by the Hoffman Institute's Karst Field Studies program and Crawford Hydrology Lab.

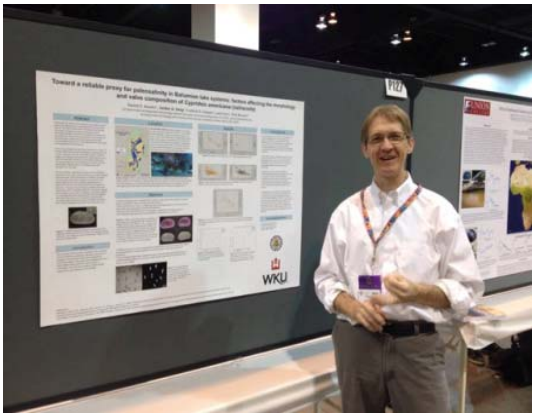
Several students and faculty from the Hoffman Environmental Research Institute also attended the annual Friends of Karst meeting that is held at the GSA, where discussions on current and new directions of research in the discipline of cave and karst studies were led by some of the world's top karst scientists.

Presentations and posters by WKU faculty and students included:

- *Geochemical and Mineralogical Analysis of Cave Deposit to Reconstruct Climate Change in Barbados for Water Resource Management*, a poster by undergraduate geology major Lowell Neeper, Dr Jason Polk, former Geoscience graduate student Gilman Ouellette, Dr Aaron Celestian (WKU Advanced Materials Institute Director), and Drs Yemane Asmerom and Victor Polyak of the University of New Mexico.
- *Using Cinder Cone Morphology to Constrain Age (San Francisco Volcanic Field Reu)*, a poster by undergraduate geology major Sarah Zibark, Emma Gleeman of Brown University, Dr Mattia Michieli Vitturi of Istituto Nazionale Di Geofisica E Vulcanologia, and Drs Fabrizio Alfano, Amanda Clark, and Rob Dekko of Arizona State University.
- *Sustainable Practices in Geotourism at Show Caves: An Investigation of Interpretation and Management Approaches in the USA and Europe* by Dr Leslie North, Geoscience graduate student Beth Tyrie, and Dr Jason Polk.
- *Techniques to Better Understand Complex Epikarst Hydrogeology and Contaminant Transport in Telogenetic Karst Settings* by Dr Jason Polk, Dr Chris Groves, former Geoscience graduate students Benjamin Miller and Sean Vanderhoff, and Dr Carl Bolster of the USDA-ARS.
- *Evaluating the Effectiveness of Regulatory Stormwater Monitoring Protocols on Groundwater Quality in Urbanized Karst Regions*, a poster by Geoscience graduate student Dan Nedvidek, Dr Jason Polk, Tim Slattery of the City of Bowling Green Public Works Department, and Dr Leslie North.
- *Riverine Dissolved Inorganic Carbon Isotope Origin and Exchange Dynamics in a Kentucky Karst Landscape* by Geoscience graduate student Kegan McClanahan, Dr Jason Polk, Geoscience graduate student Laura Osterhoudt, and Dr Chris Groves.
- *Characterization of Belize Cave Sediments to Examine Paleoenvironmental Implications for Socio-Environmental Changes During the Maya Collapse*, a poster by undergraduate geology major Aaron Holland, Dr Jason Polk, Lowell Neeper, Kegan McClanahan, and Benjamin Miller
- *Deconvolving the Controls of Landscape Evolution of the Ethiopian Plateau in a Continental Rift Setting* by Dr Nahid Gani, and Prabhat Neupane of the University of New Orleans.
- *Diagenetic Compartmentalization of a Late Mississippian Reservoir in Warren and Butler Counties, KY,* a poster by Geoscience graduate student Kort Butler and Dr Michael May.
- *Using Eye-Tracking Techniques to Evaluate the Effectiveness of Visual Stimuli in 2-D Karst Visualizations: Seeing Through the Complexities of Karst Environments,* a poster by Geoscience graduate student Beth Tyrie and Dr Leslie North.
- *Addressing Water Resource Issues in Barbados from an Isotopic, Mesoscale, and Synoptic Characterization of Precipitation Variability,* a poster by Geoscience graduate student Veronica Hall, Dr Jason Polk, and Gesocience alumnus Gilman Ouellette.
- *Structural Deformation of the Rough Creek Graben within the Stable Craton Of Central North America* by undergraduate geology major Evan Crowe and Dr Nahid Gani.
- *Toward a Reliable Proxy for Paleosalinity in Bahamian Lake Systems: Factors Affecting the Morphology and Valve Composition Of Cyprideis Americana (Ostracoda)*, a poster by graduate alumna Rachel Bowles, undergraduate geology major Jordan Seng, Dr Fred Siewers, and Dr Lisa Park Boush of the University of Akron.

Students attending the GSA meeting included: Lowell Neeper, Ellen Barringer, Aaron Holland, Kegan McClanahan, Evan Crowe, Kort Butler, Dan Nedvidek, Beth Tyrie, Jeremy Simmons, Jordan Seng, Sarah Zibark and Jonathan Oglesby. WKU faculty members in attendance included Drs Michael May, Fred Siewers, Nahid Gani, Leslie North and Jason Polk. For many of the student attendees, this was their first GSA meeting or first time attending as a graduate student, including WKU Geoscience graduate student

Jeremy Simmons. "Attending GSA was a great experience for me," Simmons said. "I attended lectures, visited poster presentations, met aspiring WKU students interested in our program, and networked with colleagues at the annual Friends of Karst Meeting. The most valuable thing I got out of the experience was new ideas to incorporate into my thesis research." Simmons, who was introduced to the WKU Geoscience program at the 2012 GSA meeting, is completing a thesis on climate change from cave sediment analysis in Belize under Dr. Jason Polk.



Dr Fred Siewers presented a poster with geology undergraduate Jordan Seng.

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WKU Geoscience student continues water literacy project in Africa

During July 2014, WKU Center for Water Resource Studies staff member and Department of Geography and Geology graduate student Jonathan (Joneo) Oglesby made his way back to Niger, West Africa, to continue his thesis research among the Songhai people. This trip marked Oglesby's fifth to the region and focused on the use of eye-tracking in the evaluation of image-driven water education, which utilizes cultural- and gender-appropriate images designed to foster visual storytelling. "When you have a cultural group who, for the most part, can't read or write, information is passed through conversations and storytelling. I worked hard to use simplistic imagery in an effort to improve comprehension and recall of key concepts," Oglesby said.

Images developed for this research focus on water pollution, sanitation and hygiene protocols, and personal water-treatment techniques. Oglesby carried Tobii eye-tracking equipment, used in the eye-tracking laboratory of Dr Leslie North, to 12 rural villages, conducting a total of 464 eye-tracking trials and nearly 24 hours of recorded audio interviews. Eye tracking uses specialized equipment to measure and record quantitatively where a person's eyes are looking, the order in which they look at an image, and how long an observer gazes upon areas of interest.

The use of eye-tracking technology for this project allows for the collection of quantitative data about how West African culture groups view and interact with the newly developed water education materials. This is one of (and perhaps) the first studies of its kind to investigate effective visual learning design with eye-tracking in rural villages of Africa. Oglesby worked in bush maternity wards, medicinal depositories, and mud-brick homes during the research expedition. Nine culture groups were tested that included Songhai, Zerma, Hausa, Kutay, Gourmanche, Fulani, Kado, Mori and Tamachek.

"My research is gender specific, focusing on women, who are the primary water fetchers and users in Sub-Saharan Africa. The work has taken me to over 23 villages so far," Oglesby said. "It's impossible to do this without support from WKU, the Department of Geography and Geology, my advisor, Dr Leslie North, and tremendous support from national partners within the region. Translation, logistics and ground support are critical for success and I am extremely grateful for all those who help me. Few have done more than Mark Phillips, who lives in Niger and has worked with me since the very beginning."

Care packages, valued at US $5, were given to each participant, and included ½ liter of cooking oil, 1.5 kilograms of rice, 10 bouillon cubes, 2 cans of tomato paste and 2 packages of pasta. "We wanted to give back to the people who took time out of their day to assist in this research," Oglesby said. "We bought the care packages from a business man in the capital city who has a small side shop. I think it goes without saying, a little here goes a very long way."

Each day, 33 children die from diarrhea caused by unsafe drinking water and improper sanitation in the West African country of Niger. More than 80 percent (14 million people) don't have access to proper sanitation. Nearly 50 percent (8 million people) don't have access to safe drinking water. Almost half of the coun-

try's population lives in extreme poverty on less than US $1.25 per day. Seventy-one percent of the adult population (15 years and older) can't read or write. By using science-driven water literacy visual communication techniques, Oglesby is striving not only to educate through the use of images, but also to contribute to the wider community about informal science education and visual learning.

"Science doesn't always give you the answers you want. But that's why you do it," Oglesby said. "I believe we can overcome the hurdles of illiteracy and cultural barriers to educate hard-to-reach culture groups about water, sanitation and hygiene. By pushing the imagery as far as we can in our research methods, we are attempting to create a new way of approaching education. Visual communication will never be a panacea, but why not get as close as you can using all the tools and creative technologies available?"

At a mud brick home in the village of Kakassi, Oglesby recalled meeting a lady he had interacted with on an earlier research trip. "We were going through the interview portion of our eye-tracking trials when I asked the question: 'Do you know of any way that the sun can purify your water?' The lady responded, 'Yes,' almost immediately. I was quite taken aback, because routinely people would firmly answer 'No, I've never heard of that' when I inquired. I immediately asked, 'How do you know this?' She responded, 'You showed me how the last time you were here and I've been doing it ever since.' This type of positive reinforcement that the learning tools work and have longevity in the community, rather than being temporary fixes, is exactly what the goal of this project is all about."

Beyond the research aspect of Oglesby's trip, deep in the bush, outside of the village of Toure, a small community of families was equipped with the resources they needed to start their own solar disinfection system. "We had this idea where we would buy local materials in the market and set up a simple solar disinfection system for a small group of people and train them on how to use it. Then, periodically, Mark would check back in with them to see how it was performing."

The team spent a total of US $12 on materials that included 16 1.5 liter clear plastic bottles for $1.50, one funnel for $1, five bricks for $4, one 4' x 4' sheet of reflective metal for $3.50, and two 25-liter "Jerry Cans" for water fetching and storage for $2. By buying local materials, they helped five small businesses. But the ability to empower a group of individuals with education and materials to perform their own solar disinfection proved priceless.

"Seeing the look on the face of a man we taught how to treat his own water with the very images we've been using in our research was so exciting," Oglesby said. "He immediately understood and taught it back to us. He was so thrilled that he now had the ability to treat his own water. He was empowered." "I feel so blessed and humbled to be a part of this research project," Dr North said. "Jonathan's passion for water resources and the culture groups of Niger inspires those of us who know him to come to work every day and invest our time into doing good things for people. His research illustrates how thoughtful hard work and applied science can help make a meaningful and positive impact in the world. I fully believe he is touching the lives of those he is working with in the region through not only this research project, but also his personal humanitarian efforts. Through this research we hope to be able to contribute to the scientific community and humanitarian groups with the information they need continually to maximize the effectiveness of educational materials." For information about this research project or eye-tracking, contact Jonathan Oglesby at jonathan.oglesby@wku.edu or Dr Leslie North at leslie.north@wku.edu.

Oglesby also has created a non-profit organization called Fofo Hari to continue his work in the region even after the research portion is complete. Visit www.fofohari.org to learn more

A Fulani woman in the village of Kakassi shared what she was taught by Jonathan during an earlier research trip to West Africa.

WKU Storm Chasers take Annual Expedition across the Great Plains

Each year during WKU's May term, Dr Josh Durkee, Associate Professor of Meteorology and Climate Science, chooses a group of eight students for his Field Methods in Weather Analysis and Forecasting course with the aim to forecast and document severe convective storms across the Great Plains. Since its inaugural year in 2010, WKU storm chasers have traveled 32,000 miles and documented nearly 30 tornadoes, along with numerous damaging hail and windstorms, and floods.

The award-winning and internationally recognized summer program runs for four weeks, with two spent by students who will venture across the Plains analyzing and determining where the most dangerous weather will occur, and traveling to those locations to document the outcomes of their predictions. The final week is spent back at WKU organizing the collected data and developing research questions surrounding the events that unfolded. This year's trip took place from May 20 to June 3.

"The purpose of this course is to provide a capstone learning experience for students studying meteorology at WKU," Dr Durkee said. "Ultimately yes, we are chasing storms but there is so much more to it than that. Students gain daily practical skills in forecasting, weather map, radar, and satellite analysis, road navigation, written and oral communication, data collection, and research reanalysis, among others. And to go a couple steps further, I bring the data and outcomes back as learning materials in various courses I teach, and students often present findings from research and analysis of these events at various conferences. In that sense, this course provides a well-rounded learning experience throughout the entire academic year."

Students who participated in the 2014 course were: Mallory Schnell of Louisville, Brian Urbanic of Louisville, Tyler Binkley of Ashland City, Tenn., Michael Flanigan of Pewee Valley, Zachary Leasor of Georgetown, Melissa Moore of Evansville, Ind., Jordan Bailey of Burlington and Cail Knight of Hopkinsville. You can follow Dr. Durkee's storm chase group as they document each day at http://meteorology.blog.wku.edu/, on Twitter at https://twitter.com/wkustormchase and on Facebook at https://www.facebook.com/wkumetclimsci

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WKU Geography Team Investigates Agritourism Changes in Sicily

A team of researchers from the Department spent a week in southern Sicily at the beginning of July to investigate changes in the agritourism landscape. Led by Associate Professor of Geography Dr Peggy Gripshover, and accompanied by Dr Thomas Bell (adjunct Professor of Geography), University Distinguished Professor of Geography Dr David Keeling, Mammoth Cave National Park Senior Ranger Chuck Decroix, Office Manager Wendy Decroix (studying agritourism as part of an independent study abroad course), and WKU-Navitas instructor DJ Urquhart, the group explored recent socio-economic changes in local landscapes, resources, culture and the environment.

The group stayed at a working olive plantation in order to gain first-hand experience of the olive-oil production and marketing process, and to understand more clearly the strategies engaged in rebranding the regional terroir (a French term for the geography, geology and climate characteristics that influence the

production of agricultural products). Sicily has long struggled as a regional economic backwater of Italy, with the landscape littered with abandoned farm buildings and constrained by limited transportation infrastructure to move people and goods around. Well-known for its famous Hellenic, Roman and Arabic cultural infrastructure, as well as for one of the world's more active volcanoes, Mt. Etna, Sicily has significant potential for agritourism development, but requires significantly more infrastructural investment than it currently receives. The group aims to present its findings at the upcoming Conference of Southeastern Geographers and to publish the results in a peer-reviewed journal.

Table grape production under protective netting near Agrigento, Sicily.

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WKU Professor Served on Climate Panel: Says Kentucky Can't Afford Complacency

Dr Mahmood who served on the panel behind the recently released national climate change report says Kentucky hasn't been as impacted by climate change as several other states. But Dr Mahmood says that could change in the coming years. The WKU Geography and Geology Professor is one of about 60 members of the National Climate Assessment Development and Advisory Committee. The group's 1,100 page report, released Tuesday, says the impacts of climate change are being seen across the country.

While Kentucky hasn't seen the degree of temperature change that some western and east-coast states have experienced, the WKU Professor says policy makers and residents in the commonwealth shouldn't be complacent. "If changes in other regions happen, that will eventually impact Kentucky," Dr Mahmood said. "For example, if watersheds in other states are getting lots of rain, or not enough rain, eventually our water supply is going to be affected."

Dr Mahmood says one way Kentucky has been proactive about climate change has been the creation of a comprehensive drought plan that coordinates efforts at the state and local levels. "If there is a drought five years from now that is linked to climate change--or not--we can activate those steps and procedures, so that we can minimize the impacts."

Dr Mahmood says he and his fellow authors did not deliberately write their report in a way to shock the public. He says the group was simply focused on communicating the potential impacts of climate change.

Department of Geography and Geology

Designed by Jonathan Oglesby

Back issues of GEOGRAM online

Visit http://www.wku.edu/geoweb/geogram.php to view previous issues of the GEOGRAM alumni newsletter.

ADVENTURES IN GEOSCIENCE

Summer Field Geology Course - 2014

Upper-class geology majors again participated in a geology field course this past summer, along with students and faculty from seventeen other universities. There were a total of 22 women and 19 men, including WKU students Brad Stanley, Brandon Thomas, and DJ Green, who earned the top grade for the Toppers. The group studied the geology of South Dakota, Montana, and Wyoming for six weeks from May 13 through June 21.

The Field Camp Setting!

Dr Andrew Wulff again taught the final three weeks, as the geology emphasized igneous and metamorphic terrains. The course is a capstone experience for geology B.S. majors at WKU and it emphasizes field-mapping techniques to develop geologic maps, construct geologic cross sections, and address some of the practical applications of these maps. Students also compose detailed rock descriptions, measure and construct stratigraphic sections, and write reports and abstracts of their work. Projects include mapping exercises in the Bighorn Mountains, Badlands, Black Hills, Citadel Peak, and the Absaroka volcanics, which immerse students in a wide range of geologic structures, depositional environments, and rock types. Additional trips to Yellowstone Park, Devils Tower, various mining operations, and other areas of geologic interest were led by national experts, extended the geological experiences, and built context for the projects. The weather this year was generally dry and very pleasant, although we did have the chance for our (almost) annual snowball fights in the Beartooth Mountains! This year we were joined by seven students from Saudi Arabia, who were really thrilled by the snow (for a short time)! This group was characterized by a strong *esprit de corps*, helped by good weather and a really fun set of students. It seemed that everyone knew each other pretty well before the course started, through our Facebook page. The course was challenging, as usual, but it was an exceptional, fun, and intense experience. A new crop of field geologists is ready for their careers, armed with amazing but true field camp stories!

The Department has sent sixty geology students to various summer field-based geology opportunities over the past eleven years, but this may

DJ Green being a fold axial generator for Brandon Thomas.

be the final year that students go as a group to a summer field course. Changes in the curriculum have moved the summer field course from a required to an optional course, although many other options for field experiences are now available. These summer field courses, and an array of shorter field-based courses and experiences during the se-

mester, are absolutely necessary for setting the field context for both coursework and for professional success. These field experiences, and the analytical expertise learned from coursework, have opened up many exceptional opportunities for REUs (see elsewhere in this GEOGRAM), internships and, most importantly, career opportunities! We surely appreciate the financial support of alumni that allows for such important experiences. Thank you!!

GETTING THE CLASSROOM OUT OF MY BLOOD

By Dr Michael Trapasso
Geography Professor Emeritus

It has been well over a year since I retired, but in some ways I remain a professor of climatology/ physical geography wherever I go. I still think about gathering maps, data, and especially photographs for classroom use. Though classrooms are no longer in my schedule, I still shoot photos with various lecture topics in mind. With that mindset, there are always interesting Earth and atmospheric phenomena to discover, rediscover, and analyze. On a recent trip through southern California, there were a few incidents and locations that amused me and, I thought, worth mentioning. If I were still a professor, my students and colleagues would hear about them. But I'm not, so I have no choice but to "let loose" on you alumni.

DUST: Anyone following climate trends around the U.S. knows that drought has California in a stranglehold. The present conditions continue to smash previous records. "Exceptionally Dry" conditions (defined by the U.S. Drought Monitor) dominate the state, and wildfires have swept through parts of northern and southern California. Sadly enough, a heavy downpour could easily manifest itself as a flash flood and inflict more damage of its own. That would be the worst way to try to break this drought. A long duration of light to moderate rain is what those folks really need, so let's hope for the best. Having set the stage, let me continue.

While driving north of Los Angeles towards the city of Bakersfield, I took an interesting photo of a dead, dried-out vineyard in the foreground and a dust storm in the background. It wasn't the most dramatic of storms - I've seen worse in the Middle East - but there was enough dust in the air to demonstrate the point. It would have made an excellent classroom example of drought plus wind, and how easily dry, agricultural topsoil can become airborne.

Photo 1. This dust storm was seen north of Los Angeles heading to Bakersfield, CA

Here is the interesting part. After spending the night in Bakersfield, I walked through the parking lot toward my rental car to see distinctive sets of hand prints and finger prints. They marked whereever I had touched the car the day before. I first thought, "Were my hands dirty enough to leave that mess behind?" On closer examination, I noticed the finger prints were absolutely perfect, just as if a crime-scene investigator had just dusted for prints! Anyone with clear cellophane tape could easily have lifted a perfect set of my prints. Then it hit me … my classroom discussions explaining that airborne (and waterborne) sediments follow a definite "extinction function," in that particle sizes diminish with distance from the sedi-

ment source. Therefore, the distance from the storm site to the Bakersfield parking lot was far enough that only very fine dust particles were still airborne and adhered to the fingerprints I left behind—just like the crime lab fingerprint dust would do. I had never seen such a perfect set of MY fingerprints on any surface before. It's a good thing I'm not a criminal on the lam. The dust storm would have ratted me out!

VASQUEZ ROCKS: North of the city but still in Los Angeles County lies Vasquez Rocks. This is a very famous rock formation named after the outlaw bandit Turburcio Vasquez, who used these rocks as a hide-out from the "gringo" lawmen. Comprised mainly of interbedded sandstones and conglomerates, these layers are dipping somewhere between 45 and 50 degrees. Formations of this type are sometimes called "hogback ridges." This formation stands as a sharp monument to sedimentation and differential erosion.

Photo 2. Vasquez Rocks: a famous backdrop for Sci-Fi Movies and Westerns

The fun part … Vasquez Rocks form a recognizable background scene for many movies and TV shows. This jagged formation can pass as a perfect backdrop for one of two film genres: "the rugged West," where cowboys and indians can ambush each other, or "an alien planet" where science fiction plots can run amok. At least two "Star Trek" episodes[1] were shot there, with the Star Trek IV movie and Planet of the Apes (2001) filmed there as well, not to mention several sci-fi films of the 1950s and 60s. Cowboys galore, including the Lone Ranger, have "shot it out" among these rocks. Recently, I saw them in the background of Mel Brooks' "Blazing Saddles" and they even make an appearance on an episode of "The Big Bang Theory." The list goes on. For years I had wanted to find this "rock star," but its exact location always escaped me. However, for this trip I did my research and some map work, and I nailed it, resulting in a very enjoyable hike and photo shoot. Geography, geology, and film making is a hard combination to beat!

SAN ANDREAS FAULT: My teaching load was always dominated by climatology and meteorology classes, so my occasional section of Physical Geography would allow me to come down to Earth's surface as a pleasant change of pace. Earthquake lectures were always fun. When discussing transform (or strike-slip) faults, one of the more (in)famous examples, of course, is the San Andreas Fault, which runs roughly 1,300 kms (810 miles) through California.

This gash in the Earth's crust occurs along the line where the North American Plate slips SSE as the Pacific Plate slides NNW. Unfortunately, the best views of this rift can only be seen from the air. The classic textbook photos of the feature are taken by aerial photography above the Carrizo Plains in central California.[2] Unfortunately, driving across these Plains does not provide the same viewpoint. However, while approaching the fault line, certain oddities emerged. Some of the landscape was so "wrinkled' by tectonic forces, that one road resembled a giant washboard. It was better than a carnival ride! Right beside the Mission of St. John the Baptist, there was a very distinctive drop in landscape like descending a short but

steep slope … a slope that extended to the horizon. The Mission is on the upper level and is part of the Pacific Plate; at the bottom of the slope is the North American Plate (Photo #3). But perhaps the most interesting perspective was found within the city of Hollister, California. This city sits atop the unstable fault line and shows distinct displacement through parts of town. Streets where the sidewalks and curbs are split and displaced … stone walls that have bowed and broken through time … zig-zag driveways … and houses whose foundations have been cracked and visibly moved. This was an "up-close and personal" way of looking at the fault. What is it like to live with the San Andreas as your neighbor? It was sort of disturbing … and kind of cool.

Figure 3. The Mission of St. John the Baptist lies on the San Andreas fault line

SMOG! For decades I've asked my classes, "When you think of the word smog ... what American city comes to mind?" Those who were conscious, and somewhat sentient would chime out, "Los Angeles!" From there I would explain the triple whammy associated with L.A. and this concoction of SMoke and fOG. They are: 1) the topography, dictated by hills and mountains surrounding a shallow basin, and an over-populated basin at that; leading to 2) countless automobile exhaust pipes that crisscross this basin daily; and 3) temperature inversions that stabilize the air and trap that photochemical soup within the basin. Mercy! The L.A. air can get pretty thick. When driving on the freeway system, you need all the visibility you can get. Smog is a serious problem no matter how you look at it.

My only shortfall in an otherwise perfect classroom discussion was my lack of a good photo of L.A. smog in all its glory. I would substitute photos of other cities, or try to sketch an image on a chalkboard. On this trip, I discovered the hilltop in Griffith Park where the famous Observatory stands; it affords a spectacular, and strategic view of downtown L.A. … the skyscraper-studded L.A. So on this trip I finally got those great smog shots (Photo #4). Ironically I really don't need that perfect scene any more, "but for the record" I did get some spectacular shots. This brings us back to the drought … which is caused by a stable atmosphere, and that aggravates the smog issue. 'Twas a terrible time in "Tinsel Town!"'

So what can I conclude from this tale of four cities? Well, geography, geology, and climatology are everywhere - there's no getting away from them. I will never escape them, and I really don't want to anyway. Moreover … I still love to tell stories to elaborate various concepts. I guess you can take the professor out of the classroom, but you can't take the classroom out of the professor. Thank you for being my surrogate classroom.

[1] It is where Captain Kirk defeated the Captain of the Gorn ship (if that means anything to you).

[2] My last textbook, *Physical Geography* 9th Edn., by Gabler, Petersen, Trapasso, and Sack, Cengage Publishing, p. 399, Figure 14.35, shows a typical Carrizo Plain photograph.

Photo 4. The Los Angeles basin immersed in smog

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Geology Majors REU Research

Two undergraduate Geology majors were involved this summer in nationally-competitive Research Experience for Undergraduate (REU) programs, funded primarily through the National Science Foundation.

Michelle Foley

Michelle's REU started much earlier than the others generally do, as she first ventured into the field in January! She has been examining evidence for the timing, extent, and petrogenesis of the Peach Springs Tuff, a well-known stratigraphic marker ash bed found throughout the southwestern U.S. Michelle has been working with faculty at Vanderbilt University and her January adventure was designed to provide some early experience in how to identify different types of volcanic erupted products, when the desert southwest is more hospitable than in the summer! Her early summer field research included learning firsthand the complex stratigraphic relationships typical of large volcanic eruptions and edifice collapses. She collected samples with her team and will be using whole-rock geochemistry, mineralogy, and petrography (including SEM and microprobe), along with isotope compositions, apatite and zircon saturation thermometry, and other techniques to explain in detail a specific trachytic outflow unit. Michelle will be presenting "Dynamics of destabilization: pumiceous evidence of reheated, remelted, and remobilized cumulate from the base of a supervolcano magma chamber" at the upcoming national GSA conference in Vancouver, BC. Michelle also spent her spring break with the WKU field geology course in Death Valley and the greater Mojave Desert, returned yet again in the early summer for more field work, and went back to California in July for more!! Can't get enough of the desert!!

Jacob Hughes

Jacob Hughes travelled to the Ruby Ranges in Montana for the fieldwork portion of his REU through the Keck Consortium. He will be working on characterizing Banded Iron Formation (BIF) of a supracrustal suite of rocks that underwent significant uplift, folding, and metamorphism associated with the 1.8-1.7 Ga

Big Sky orogeny, an arc-continent collision that occurred along the northern flank of the Wyoming province during the growth and consolidation of ancestral North America. Goals of the project include the characterization and interpretation of meta-BIF samples collected from a number of locales in the Ruby Range in order to better understand the sedimentary environment of deposition, conditions of formation, and to constrain more tightly the maximum temperature and pressure regimes involved at the time of metamorphism. His Keck supervisors are Drs Tekla Harms (Amherst College) and Julie Baldwin (University of Montana), and his WKU supervisor will be Dr Andrew Wulff. Jacob has collected samples and made polished thin sections, and will be using the PLM, SEM-EDS, Raman Microscope, and (it is hoped) EMP to characterize the mineralogy and textures. He also plans to obtain whole-rock major and trace element analyses using XRF and LA-ICP-MS. He will present his research findings at the annual Keck Consortium in late spring.

Remember, both Michelle and Jacob will be presenting their research at the upcoming national GSA in Vancouver, BC. Jacob will be on Monday, Oct. 20 and Michelle will be on Tuesday, Oct. 21. Come by and encourage them!!

All the students will be continuing work on their research with geology faculty at WKU, and are now part of a growing body of WKU Geology REU veterans, numbering eighteen in the past ten years!! Other summer opportunities include working on- and off-campus in analytical labs, internships, and continuing research projects from prior semesters. Undergraduate research has grown tremendously, in large part due to the increased analytical capabilities in the Department and new courses with a focus on Analytical Techniques and Field Techniques.

You (and your companies) have a chance to be a part of this excitement!! Please contact the Department if you have internship, research opportunity, or job possibilities. Financial support helps defray the costs associated with training and use of analytical instrumentation, making this training available for all students. Thank you!!

WKU Karst Expertise Highlighted at Museum Sinkhole

The Department of Geography and Geology prides itself on providing hands-on, real-world experiences for students through courses taught by faculty members who are experts in their fields. When a massive sinkhole at the National Corvette Museum's Skydome swallowed eight Corvettes on the morning of Feb. 12, geoscience faculty and students put their education, training and expertise to work. "As sinkholes go it really wasn't that different or uncommon, it was just where it was and the fact that it had Corvettes in it that made it unique," said Dr Jason Polk, assistant professor in Department of Geography and Geology.

Drs Polk and Leslie North were among the first WKU geoscience faculty members on the scene Feb. 12 and have been at the museum almost daily since then as they continue to assess the sinkhole from a karst science point-of-view and make plans for outreach efforts related to sinkholes. "Our role now is basically to try and help with some information about the collapse feature, some information and ways to remediate and fix it, and also assist with sinkhole expertise with regard to safely getting in and retrieving the Corvettes," Dr Polk said. WKU faculty and students have been assisting National Corvette Museum officials in assessing the sinkhole and developing plans to remove the cars.

In the hours after the sinkhole opened, engineers, geologists and others worked to assess the sinkhole, identify the structural integrity of the Skydome, develop a plan for how to proceed and

how to assemble a team to remove the Corvettes and repair the damage. "We worked with WKU Engineering and students came out with the quadcopter to film footage of the sinkhole," Dr Polk said. "It was much safer to have them use that device rather than us go down and look at it. It's really great technology and development," he said. "We are proud of the students and what they achieved with that type of collaboration."

While crews continue their work inside the museum on a plan to remove the Corvettes, WKU faculty members will continue their work to educate WKU students and the public on southcentral Kentucky's karst landscape.

Drs Polk and North expect to keep talking about the sinkhole and about how one of Bowling Green's top tourist attractions remains a safe place to visit. In the next few weeks, Dr North will be coordinating workshops for adults and children at the Corvette museum to explain sinkholes and the area's karst features. "WKU is really glad to help with part of that," Dr Polk said. "We want to let people know it's safe to come out here." WKU also has partnered with the City of Bowling Green on a karst and groundwater awareness website. Find out more about what's Under BG at http://www.underbgky.org/

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GIS Faculty and Students Attend Annual GIS Conference

Each year, Kentucky's mapping professionals meet at a Geographic Information Systems (GIS) conference to share ideas and discuss innovative technologies and solutions in GIS for disseminating geospatial data.

This past year the group, which includes GIS students, faculty, staff and alumni, met Sept. 30-Oct. 2 at the Galt House in Louisville. The Kentucky Association of Mapping Professionals (KAMP) hosted the conference and has been the primary host for the past few years.

Geoscience graduate student Luke Miles and Kevin Cary, WKU GIS Director and certified GIS professional (GISP), presented *WKU GIS, the Kentucky Mesonet, and Web Maps.* Their presentation discussed displaying live Kentucky Mesonet data in various web map forms in an Internet browser on both desktop and mobile devices powered by GIS technologies. Web maps are dynamic maps displaying many map layers and various levels of detail on demand for any area of interest at different map scales. These types of maps open doors for on-the-fly spatial analysis and serve as a portal for gathering additional information about a particular location or area. Web maps discussed in the presentation were created using Adobe Flex, Microsoft Silverlight, and Java Script.

Scott Dobler, Instructor of Geography and Co-Coordinator of the Kentucky Geographic Alliance (KGA), presented *Engaging the K-12 Esri Site License*, and *Call for Interested Professional Help for 2013/2014.* Dobler has been very active with the KGA over the past few years and has been pivotal in making Esri's GIS software available to Kentucky's primary and secondary schools. He also spoke during the conference lunch on opportunities for GIS professionals participating with Kentucky's schools.

Josh Montgomery, GIS Specialist with WKU Planning, Design & Construction (PDC), Thomas Woodall, Campus Infrastructure and Data Specialist with Facilities Management, and Kevin Cary presented *Partnering with Academics to Utilize and Maintain a University Enterprise GIS.* Both Montgomery and Woodall are graduates of WKU's GIS program majoring in GIScience. Woodall is a geoscience graduate student.

Also in attendance at the conference were Taylor Berzins, a junior majoring in GIScience, and James Austin Boys, a WKU meteorology major and GIS minor, who was recognized at the conference as the recipient of a $500 scholarship from KAMP. There was also a huge presence of WKU

graduates at the conference who have gone through WKU's GIS programs, including the GIS Certificate and GIS Minor. Many are employed in various levels of state government agencies and GIS industries.

"GIS analytical techniques are changing the way that we interact with our surroundings in myriad innovative ways," noted Geography and Geology Department Head David Keeling, "and WKU's GIS program and facilities have set the standard for GIS training in the state of Kentucky and surrounding regions."

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Geoscience group attends International Congress of Speleology

Several Geography and Geology faculty, staff, students and alumni attended the International Congress of Speleology, the largest meeting in the world for those who study speleology and related topics such as the study of caves, sinkholes, groundwater and karst features. Held once every four years, the international meeting hosts researchers, cavers, professionals, students and many others to gather and share the most recent advances in the field of speleology. The summer 2013 event, held in Brno, Czech Republic, included oral and poster presentations, business meetings for international organizations (such as the International Union of Speleology), local fieldtrips, demonstrations of new equipment and technology, mapping and cartography salons, vendor display booths, and many opportunities for social interaction and networking.

Participants from the Department were Dr. Leslie North, Dr. Jason Polk, Lee Anne Bledsoe (Crawford Hydrology Lab Manager), Benjamin Miller (Hoffman Institute Environmental Research Associate), and Geoscience graduate students Nick Lawhon, Dan Nedvidek, and Gilman Ouellette. Also in attendance was Spring 2013 Master's Geoscience graduate Sarah Arpin.

The WKU attendees presented several oral and poster presentations, including those listed below: *Under Your Feet: Developing and Assessing Avenues for Promoting Karst Groundwater Awareness and Sustainability through Community-Based Informal Education.* Dr. Leslie North, Jonathan Oglesby, Dr. Jason Polk and Dr. Chris Groves of WKU, and Tim Slattery of the Bowling Green Department of Public Works

Karst Hydrogeology of The Haney Limestone, South-Central Kentucky. Sarah Arpin and Dr. Chris Groves of WKU

Case Studies of Fluorescent Groundwater Tracing in Recent Cave Research. Benjamin Miller, Dr. Chris Groves and Dr. Jason Polk of WKU, and Dr. Robert Lerch of USDA-ARS

Complex Epikarst Hydrologeology and Contaminant Transport in a South-Central Kentucky Karst Landscape. Dr. Jason Polk, Sean Vanderhoff, Dr. Chris Groves and Benjamin Miller of WKU, and Dr. Carl Bolster of USDA-ARS

A Multiproxy Approach to Reconstructing Paleoenvironmental Conditions from Speleothems in Barbados to Address Groundwater Vulnerability. Gilman Ouellette and Dr. Jason Polk of WKU

In addition to presenting, the team also hosted a booth to recruit new students and promote WKU's cave and karst program, the Department of Geography and Geology, the Crawford Hydrology Lab, and the Hoffman Institute. The booth was heavily visited by meeting attendees and many alumni, which is a true testament to the international reputation of WKU in the field of speleology.

For many of the student attendees, this was their first international conference experience, which proved to be quite an educational and broadening experience. "This was my first international conference and I really got a new perspective on how my research fits into a broader context," said graduate student Dan Nedvidek. "It was helpful to get feedback on my thesis work and has improved my research from this experience." Working with Dr. Jason Polk, Nedvidek is completing a thesis on stormwater quality monitoring regulations in karst areas like Bowling Green.

Geography and Geology Department Head Dr. David Keeling noted that "presenting research at international conferences not only raises the profile of WKU but also provides faculty and students the opportunity to interact with their peers from across the globe."

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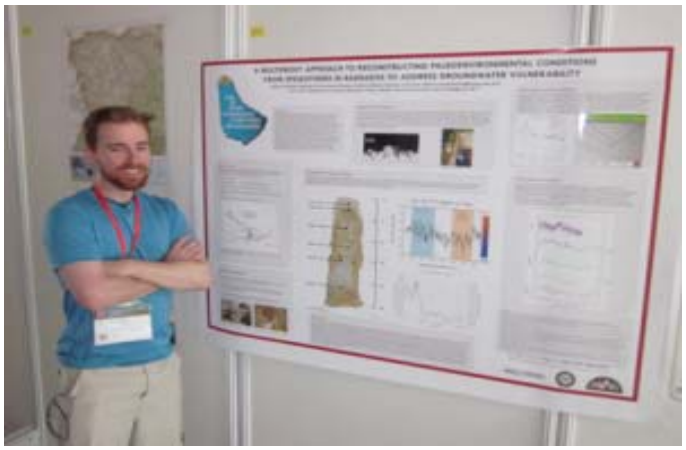
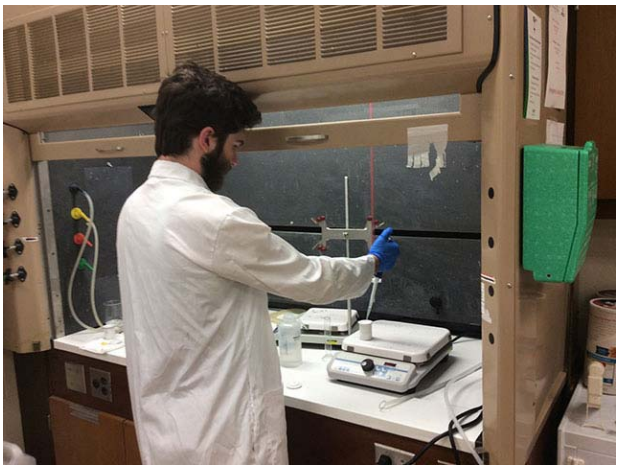


During the International Congress of Speleology, WKU student Gilman Ouellette presented his graduate thesis work on Paleoclimate in Barbados.

Members of the WKU group attended the ICS closing banquet.

Dr. David Keeling represented WKU and the American Geographical Society on a 25,000-mile Cape to Cape expedition that included visits to Cape Town (above left, from the top of Table Mountain in South Africa) and Cape Horn (above right, monument at the end of South America).



Student working in the AMI Lab

FACULTY ACTIVITIES

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KATIE ALGEO continues to enjoy teaching and research at WKU. She welcomes new graduate student Collins Eke and looks forward to working with him on a collaborative venture analyzing out-migration from the Mammoth Cave area as the national park was created. World Regional Geography and Geographic Information Systems rounded out her teaching schedule this year. On the research front, she continues working on a new book, "The Mystery of the Mammoth Cave Mushroom Company," and she was part of an interdisciplinary team initiating a natural resources condition assessment of Mammoth Cave National Park. Other team members include Drs Chris Groves and Cate Webb, and geoscience graduate student (and geology alumnus) Justin Cave. Dr Algeo continues as treasurer of PAS-APAL, the Pioneer America Society - Association for the Preservation of Artifacts and Landscapes, and welcomes colleague Dr Peggy Gripshover to the board of that organization. She also continues to serve on the Board of Friends of Dumont Hill, which will be hosting its second annual *Sounds on Dumont* music festival on September 12th. Come out to view the latest in park trails, interpretive signage, and enjoy the sounds of Rhonda Vincent & the Rage, The 23 String Band, Farewell Drifters, and Red Ember.

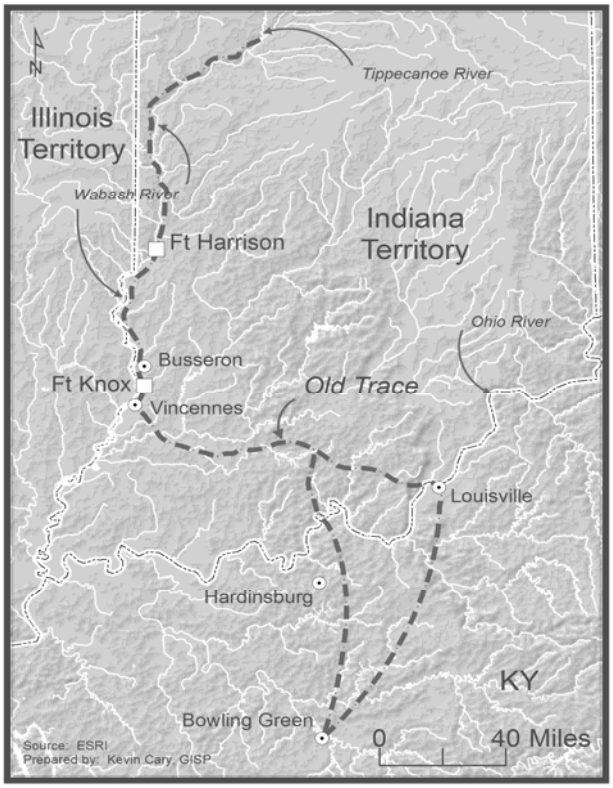
JOHN ALL reports that the past year was incredibly productive but also very tragic. While teaching his normal environmental geography classes - including Global Environmental Change, Environmental Law, Resource Management, Environmental Planning, Biogeography, and Environmental Ethics – John was also preparing for major research expeditions to Mt. Everest and Peru with the American Climber Science Program (ACSP), where he serves as the Executive Director. The ACSP is an organization dedicated to collaborative mountain research and especially to providing resources for students (www.climberscience.com). These expeditions were funded by over $140,000 in grants from USAID, NSF, and WKU-OSP, and were incredibly successful from a science standpoint - several manuscripts are already in preparation from the work. Unfortunately, not long after the team arrived at the Everest basecamp, an avalanche spawned from the melting of a glacier high on the mountainside hit a number of climbers, including part of John's team. Asman Tamang, John's climbing partner, was killed in the avalanche. Asman left behind a wife and a nine-month old daughter. Much science gear was lost in the avalanche but, while all the other expeditions left the mountain, Dr All's team shifted to a nearby peak because it felt the science was important enough to continue on, in spite of the heartbreak. The warming that had loosened the ice above the climbers on Everest was also melting the rest of the Himalaya (climbers died on nearly all of the major peaks this year in an especially tragic season), and this led to a second accident as a hidden crevasse swallowed Dr All on Mt. Himlung. He broke 11 bones but, thankfully, he was able to climb to safety.

Fortunately, things turned around dramatically in Peru. Leading scientists and students from seven universities, including several in Peru, Dr All's ACSP team collected data and conducted stakeholder workshops throughout the Cordillera Blanca region. Working with archeologists from Vanderbilt, John's team found numerous high-elevation tombs that will lead to a Ph.D. dissertation on the effects of elevation and skull calcium density. Water quality was measured in seven valleys and tied to interviews with local grazers and villagers to examine resource management strategies. Several cattle exclosures were built to examine climate-change impacts on vegetation versus grazing. Glacier snow and ice samples were also gathered and a Geoscience Master's student is working with the data for her thesis. In spite of the tragedy, the year provided positive science outcomes and John faces the new academic year with renewed enthusiasm.

JILL BROWN transferred into the Department of Geography and Geology after seven years as a full-time faculty member in the Department of Liberal Arts and Sciences, which was housed at WKU's South Campus. The 2014-2015 academic year will be her first full year in the Department of Geography and Geology. The main focus of the classes at South Campus is to help underprepared,

nontraditional, and international students get ready for the demands of the larger classes on the main campus. The classes offered at South Campus are smaller general education classes, which allow students more individualized time with the teacher. Jill taught World Regional Geography, Introduction to the Physical Environment, and University Experience at South Campus.

Geography Awareness Day at South Campus in the third week of November is planned by Jill. It is a yearly event associated with WKU's International Education Week, as well as Geography Awareness Week, which is celebrated around the world. Geography Awareness Day is organized as a type of "teach in," whereby guest speakers are scheduled during class times and all presentations are related to geography. South Campus classes of various disciplines attend the presentations, and the presentations are open to anyone on campus or from the community. The presentations this year included an interactive trivia game called Geography Around the World, An Overview of South America, made up of satellite and space station images, and a Study Abroad information session. Student research projects from the South Campus geography classes are also on display. Last year marked the sixth annual Geography Awareness Day.



The highlight of the spring 2014 semester was Jill's involvement in the first Zuheir Sophia Endowed International Faculty Seminar (ZSEIFS) through the Office of International Programs. The seminar involved meetings throughout the semester and culminated in a faculty trip to Ecuador in May. Eleven WKU faculty members from various disciplines were selected to participate. The trip to Ecuador included interactions with University of San Francisco, Quito, faculty members, a much-anticipated trip to the Equator, a visit to the edge of the jungle, as well as a tour of a flower production plant. Can you believe the flowers from Ecuador make it to the United States within 24 hours of being cut? Now there's a lesson in globalization that can be used in her World Regional Geography classes! Acceptance in the program involves a commitment to scheduling events for the International Year of Ecuador (IYO) for the 2014-2015 academic year. Additionally, Jill has committed to create a faculty-led study abroad trip to Ecuador. This coming academic year, Jill plans to include an Ecuador presentation at the South Campus during Geography Awareness Day.

KEVIN CARY writes that it was another busy yet great year. He spent another week in San Diego this past summer at the Education and International [GIS] User Conference hosted by Esri, made a quick trip to Louisville for an American Society for Photogrammetry and Remote Sensing Conference, attended an annual meeting here at WKU in January for the Cumberland Chapter of URISA, conducted a GIS workshop on "Sinks, Streams and Watersheds: Prehistoric Worms are eating my Car!" for the Kentucky Association of Mapping Professionals (KAMP) at WKU-Owensboro, and participated in another Kentucky GIS Conference. Kevin also notes that WKU's initial push last year to implement a campus-wide enterprise GIS will become a reality soon. Over the summer, he produced a series of maps for Emeritus Professor Glen Conner's upcoming book on Kentucky's involvement in the War of 1812, which is scheduled to be released later this year.

This academic year also saw the launch of the first-

ever Hilltopper GIScience Club! Check out the club on FaceBook or simply go to http://www.wku.edu/gis and like the club's FB page. Kevin says that the Hilltopper GIScience Club welcomes those in GIS to come back and be a guest speaker at one of the club's meetings!

At this year's Esri conference, Kevin presented a paper on "ArcGIS Providing Opportunities for WKU's Kentucky Mesonet." The "meat and potatoes" of this paper is actually spelling out details on how to implement an ArcSDE geodatabase for live update feeds into ArcGIS for servers, because it seems that this appears to be "top secret" information and Kevin is letting it be known to others! If you want to know more about how this is accomplished, check out his paper in Esri's conference proceedings online at:
http://proceedings.esri.com/library/userconf/educ14/papers/1384_565.pdf

There is a lot of valuable information in this paper especially for those already in transition to an enterprise GIS environment and who want real-time updates that are centralized for disseminating geospatial data. You can also access a web map showcasing these data at http://gisapps.wku.edu/wkymesonetgps.html. Check it out on your desktop browser and on your smart phone too. The web map has a built-in geolocator (or GPS) included to show where you are currently located on the web map application (written in JavaScript).

This past spring marked the first time that our Department hosted an annual meeting for the Cumberland Chapter of URISA. Members of this chapter are those using GIS as a tool or in GIS as a profession and living in Kentucky and Tennessee. Kevin showcased our GIS programs during this meeting. URISA is a great way to get involved in the GIS community at the regional and national level, especially for those starting out as young GIS professionals. According to http://www.urisa.org/about-us/vanguard-cabinet/, "The Vanguard Cabinet (VC) is a URISA initiative (which debuted in 2011) to engage young GIS practitioners, increase their numbers in the organization, and better understand the concerns facing these future leaders of the GIS community." To become a member, visit http://www.urisa.org/chapters/cumberland-chapter/

In March of this year, he participated in a workshop hosted by KAMP, the first offering of a series of statewide workshops for the price of $25 per person, which included a year's membership with KAMP. Kevin's title of this workshop was simply silly by making a reference to the recent sinkhole collapse at the Corvette Museum. His workshop included using DEMs to delineate streams and watersheds. During the process, sinkholes were identified. His workshop instructions are available at http://www.wku.edu/gis/giservices.php.

Kevin continues to be a reviewer of GISP applications for the GIS Certification Institute (http://www.gisci.org/) and adds that, next year, the GISP application process will now include an exam. Also next year, he will renew his GISP certification for the third time - the GISP credential must be renewed every five years. Kevin continues to serve as the Director of GIS for WKU's Center for GIS and is also WKU's Esri Site License Administrator, while teaching undergraduate and graduate courses in our GIS programs. Ongoing GIS projects include service and research with the Baker Arboretum, WKU Facilities Management (FM), WKU Planning, Design, and Construction (PDC), Kentucky Mesonet, Kentucky Climate Center, William G. Reynolds Geological Resources Lab, Logan Economic Alliance for Development, and the Hoffman Environmental Research Institute. Our department now has GIScience interns working with WKU FM, WKU PDC, Baker Arboretum and Bowling Green Storm Water Management.

These days, Kevin spends his extra time running and floating on his kayak with his son. Last year, he started running in 5K events and this year in October he is planning on running in the Medical Center 10K Classic here in Bowling Green for team WKU! Wish him luck!

AARON CELESTIAN writes that it's been a busy year in the Crystal Kinetics Research Group! Dr Celestian presented a summary of the group's latest work on synthesis and ion exchange in nanoporous materials at the 2nd Annual Kentucky Nanotechnology Symposium as well as the international Goldschmidt Geochemical Conference in California. He also co-chaired at

Goldschmidt dedicated to the advancement of neutron scattering covering scales from nuclear to planetary.

Former group member Michael Powers won a prestigious National Science Foundation Graduate Research Fellowship, which essentially guarantees funding for his Ph.D. project at Oklahoma State, Boone Pickens School of Geology. We also welcome new members to the CK Group, undergraduate Caleb Chappell and new graduate student Justin Cave. Justin will focus work on time-resolved synthesis and ion exchange in nano materials toward applications in petroleum sciences.

Dr Celestian was also awarded an NSF-EPSCoR grant to build and develop a new environmental chamber where lasers and X-rays that can probe the atomic structure during crystal growth. The idea is to take a genomic approach to fully understand the steps during the growth of minerals. Much like how the biological genome has greatly advanced medicine, the mineral genome will help better understand mineral properties that can be manipulated for improved industrial performance – a "gene therapy" for minerals.

More research projects are developing in collaboration with several Engineering and Petroleum science companies in the Bowling Green area. Student centered research projects that took place this past summer lead to significant improvement of metal and polymer physical and chemical properties for these companies. Their studies will be incorporated to current and future design elements. Good work!

As Director of the Advanced Materials Institute, Dr Celestian has seen tremendous growth of the facility as well as a huge increase in student users. The AMI is open to all WKU faculty and students who have research projects that are related to materials development, production, and characterization. This state-of-the-art central facility provides student training, research project development, and access to Kentucky's materials community. The AMI's increasing industrial partnerships means more facilities, more projects, and more job opportunities awaiting current students and recent graduates.

Sunset Crater, a cinder cone near Flagstaff, AZ.

JENNA COLE returns for a third year as an instructor, splitting her time between the Geology program, Dept. of Folk Studies and Anthropology, and the Honors College. She continues African paleoclimate research aimed at correlating dust mineralogy to changes in radiogenic isotopes and trace element concentrations in terrigenous samples from sites off the NW coast of Africa. This work is in collaboration with Justin Cave (B.S. 2014), Mollie Pope (current Gatton Academy student), and Dr Aaron Celestian, as well as researchers at Columbia University. Justin and Mollie each presented posters on their work at the WKU Student Research Conference and the National Conference on Undergraduate Research, respectively, in spring 2014.

Another project develops U-Pb dating of sedimentary carbonates for application to younger samples and different sedimentary contexts, currently focusing on Pleistocene deposits from Olduvai Gorge, Tanzania, and multiple localities in Turkey. Jenna traveled to Rutgers University and Stony Brook University during fall 2013 to meet with collaborators, present colloquium talks, and collect data. She returned to Stony Brook again in July 2014 to scan many samples with laser ablation ICP-MS to determine uranium to lead ratios quickly, a key indicator for dateability. She is also comparing trace element geochemistry with the carbonate petrography to better understand the environments in which these samples formed.

This past summer, the Cole-Celestian family drove more than 8,000 miles in the U.S., making

trips to Arizona, North Carolina, New Jersey, and New York. They visited Sunset Crater and Grand Canyon in Arizona, and multiple beaches along the Atlantic Ocean. The family had fun climbing mountains, searching for shark teeth, and playing in the saltwater.

MARGARET CROWDER writes: Hi, you have reached Margaret Crowder's voicemail. She is not available right now because she is:
a. Having a great discussion with students in her introductory geology class about '1000 ways to die you never knew existed before;'
b. Working with students in her SMED 360 class on their research methods inquiry topics.;
c. Wondering why everyone doesn't love the Geosciences as much as she does;
d. Interacting with her colleagues to solve the world's problems (or at least her office hall's);
e. Working to get a couple of papers submitted for potential publication;
f. Developing carpal tunnel from too much typing at her computer;
g. Designing student-centered activities to use in her various courses;
h. Meeting with an advisee regarding next semester;
i. Creating an agenda for the next Senate Executive Committee (SEC) and/or Senate meeting;
j. Trapped in a vat of dilute hydrochloric acid in a dissolution experiment gone horribly wrong;
k. Running an SEC or Senate meeting;
l. On the phone, "putting out a fire" prior to an SEC or Senate meeting.
m. Emailing the "faculty-all" list to request volunteers for yet another university committee;
n. Playing a recurring role in the drama called "NCUS: Western Kentucky University" (no, that has nothing to do with naval investigations, but instead stands for Never Chair the University Senate);
o. Regretting being the University Senate Chair;
p. Contributing to the final project report on an NSF grant;
q. Wondering what it would be like to be tall;
r. Wondering what it would be like if, as a teacher, she could just focus her efforts on teaching;
s. Considering writing seven more of these to fill out the alphabet….;
t. And deciding to end with the letter "T," which rhymes with "P," and that stands for Preponderance (What were you thinking it stood for? Pool?) Ahh, the Music Man.
If you would still like to leave a message for Margaret, please deposit 100 dollars in unmarked US bills, and wait for the beep. Have a nice day! *BEEP*

SCOTT DOBLER has completed his thirteenth year at Western Kentucky University. This fall, Geography 216 will be his seventeenth course preparation for the Department. The class, titled Geotechnologies in a Global Community, is designed to teach computer cartography in a general education course. Many majors from across the

university are engaged in learning how to map data associated with their area of interest.

Scott has continued as the co-coordinator of the Kentucky Geographic Alliance (KGA) (http://www.kga.org). The KGA has been funded by an ongoing grant from National Geographic to support the development of geography awareness in and outside of the classroom. The ongoing results of the grant have created a stronger relationship between the government, public and private sector, public schools, and higher education in regards to geographic literacy. During this fall the KGA has partnered with KAMP (Kentucky Association of Mapping Professionals) to train K-12 educators on the integration of GIS in their K-12 classroom. Esri products were used to provide GIS software to schools free of charge. Future plans include implementing a state-wide GIS training program that will be delivered simultaneously at a number of selected sites.

A Kentucky atlas project has been completed, and currently we are seeking sponsors to print it in order to deliver a copy to each school in Kentucky. We are still developing lesson plans that work with each of the maps included in the atlas.

The KGA is also searching for additional funds to create an endowment for the Kentucky Geographic Alliance. This revenue, when established will help to continue the development of geo-ducational products and teacher training. If you have any ideas or suggestions (or money), please contact Scott.

JOSH DURKEE completed his sixth year with the earning of tenure in the Department. In addition to teaching introductory sections of Physical Geography, regular and honors sections of Meteorology, and upper-level classes including Weather Analysis and Forecasting, Josh introduced a new course on Satellite and Radar Meteorology. As far as the annual WKU Storm Chase class goes (which is pretty far!), this year Dr Durkee, along with Dr Grady Dixon and eight students, traveled 8,311 miles across 16 states (Kentucky, Mississippi, Illinois, Indiana, Missouri, North Dakota, South Dakota, Montana, Wyoming, Nebraska, Kansas, Texas, Colorado, New Mexico, Arkansas, and Tennessee) to apply various forecasting techniques with regard to severe weather, and to analyze and document the hazardous outcomes as they unfolded. After yet, another successful year, the group documented up to three confirmed tornadoes, along with a number of damaging hail and wind events, and flash floods. Plans for the 2015 WKU Storm Chase adventure are currently underway.

Additionally, Josh was actively involved in various activities including student chapters of the American Meteorological Society and National Weather Association, the WKU Storm Spotter Network, and a couple of Meteorology workshops at the Cumberland Trace Elementary School here in Bowling Green, KY. Furthermore, Josh has revamped the old College Heights Weather Station under the new moniker, College Heights Atmospheric Observatory for Students or simply, the CHAOS Lab! The acronym, CHAOS, stems from chaos theory, given that chaos is the number one issue that plagues weather forecast predictions. Renovation of this new WKU weather monitoring and forecast laboratory is currently underway, with plans to couple our new WKU Weathercam, located on top of Van Meter Hall, with our new automated weather station on the roof of the Environmental Science and Technology building, in order to present these data live on a new website. The CHAOS Lab will also serve as an out-of-classroom conference space for inclement weather briefings and research activities. Lastly, Josh has recently delved into the use of

modern drone technology to monitor real-time severe storms and post-storm damage assessment. He is especially excited to see what new perspectives this innovative technology will bring to the table.

Speaking of research, Josh published an article with co-authors Dr Rezaul Mahmood and graduate student Jesse Winchester, along with other colleagues at Tennessee Technological University and the University of Alabama-Huntsville, in the *Journal of Applied Meteorology and Climatology*. This article explores the land-surface/atmosphere interactions and overall possible influence of Land Between The Lakes in Kentucky on local thunderstorm and precipitation patterns. Josh also continues to research thunderstorms and precipitation variability across South America and high-wind events across North America.

Josh Exploring the Jökulsárión Glacial Lagoon in Iceland

Aside from his own research endeavors, Josh has collaborated with a number of undergraduate students, which resulted in numerous professional conference presentations at the national, regional, and local levels. To cap off this great year, Josh followed up the Storm Chase trip with a month-long adventure that started in Toronto, followed by treks and stops across Iceland, England, France, the Alps, Italy, Greece, Turkey, and Ireland.

STUART FOSTER was faced with challenges and pursued opportunities as president of the American Association of State Climatologists (AASC) and director of the Kentucky Mesonet. "Over the past year, the AASC's membership passed a restructuring plan that implemented an institutional membership structure that will significantly increase revenue to help support the hiring of an executive director," Foster said. He completed his two-year term as president of the AASC, and will now serve a fourth year on the executive board in the capacity of past-president. "During my final year on the executive board, we look forward to locating a home for the national office of the AASC and then selecting an executive director to help lead our association."

In an effort to achieve sustainability of the Kentucky Mesonet, Dr Foster continued to work with the Kentucky County Judge Executive Association (KCJEA) and local government officials and stakeholders throughout the state. Following an invited speaking engagement at the KCJEA Fall Retreat, he reached out to judge/executives in counties that are home to Kentucky Mesonet stations in an effort to gain local support for a bottom-up, cost-share funding model. During the spring, Dr Foster made formal requests for funding at a number of county fiscal court meetings. "Building strong relationships at the local level requires a commitment to reach out and engage face-to-face with local officials and stakeholders," said Foster. "While I never imagined that my career would take me down this path, it has been a wonderful experience, and I have met some great people who care about their communities."

Over the past year, Dr. Foster was invited to speak at a number of venues, including meetings hosted by the Kentucky Agribusiness Association, the Kentucky Stormwater Association, the Association of American State Geologists, and the Kentucky Transportation Cabinet and Federal Highway Administration. In his role as state climatologist, Stuart participated in a regional climate services meeting and a meeting of mesonet operators at the Midwestern Regional Climate Center.

NAHID GANI writes that life at WKU is moving along wonderfully and that her second year in the Department of Geography and Geology (G&G) has been very busy and productive with lots of teaching and research activities, and departmental and community service. She notes that G&G's Landscape Geodynamics (LeGo) Lab setup has been completed during this past summer, with new equipment including a high-resolution 3D imaging Stereo Microscope for thermo-chronologic sample isolation and analysis to continue her on-going research, teaching, and collaboration. She has also managed to secure a MOVE software grant (in-kind contribution, but with a retail value of $3.7 million) donated to WKU from Midland Valley Exploration Ltd., which is the world's leading company in structural-tectonics modeling.

Dr. Gani explores kinematic indicators within the Caledonian in Bedruthan Steps, Cornwall, England

In other notable news, Dr Gani was recently awarded a prestigious and nationally competitive ACS -PRF UNI grant to continue her research on the Ethiopian Plateau in the East African Rift System from the integration of apatite (U-Th)/He and $^{4}He/^{3}He$ thermochronometry. The timing of erosion is critical in understanding the temporal probability of reservoir vs. organic-rich source rocks in the development of Nile petroleum, particularly in the Mediterranean Sea. This study will constrain tectonic models of the northeastern East African Rift, including the formative mechanisms and dynamics of rift faults likely linked to the paleotopographic evolution of the Ethiopian Plateau. This grant will support two to three geology undergraduate students, for education and training through cutting-edge tools and techniques that will promote the critical thinking necessary to evaluate scientific data and solve complex earth-science problems. Students will gain a robust understanding of how the earth system works as a feedback loop.

She was busy training a group of motivated graduate and undergraduate students in her research group. Nathaniel Blackburn, a second semester Geoscience Master's student, is working on his thesis entitled 'Thermal modeling of the Ethiopian Plateau from thermochronologic data' that is funded by an RCAP-I grant. Recently he has been awarded a competitive Geological Society of America (GSA) 'On to The Future (OTF)' scholarship to attend and present his research at this year's GSA annual meeting in Vancouver, Canada. Evan Crowe, a geology senior, has successfully completed his FUSE-funded research through giving four presentations at local, regional, and national conferences. Currently, he is working on a manuscript as a co-author with Dr Gani involving his research results for a peer-reviewed journal. LeGo Lab alumnus Naomi Kellogg, a Gatton Academy student, has graduated last semester to start her undergraduate studies at Indiana University, Bloomington. Naomi has received a Heim -Hutton Scholarship and an Edward L. Hutton Scholarship within the 2014 Wells Scholars Program that ranks among the most competitive and prestigious awards offered by any American university. While in the LeGo Lab, she received a collegiate grant to present her geology research on Himalayan unroofing at the 2014 National Conference on Undergraduate Research.

Another alumnus, Stuart Kenderes, has accepted a Teaching Assistantship to study for his M.S. in Geology at the University of Missouri. He was also awarded a WKU Graduate Student Research Fellowship for his M.S. study under Dr Gani, but decided to attend UM instead. Honors geology senior Brittiny Moore has successfully completed her honors

augmentation project on structural modeling using MOVE. Congratulations to all of these students for their hard work! Brittiny is going to start her undergraduate research on East African climate-tectonics interaction this coming academic year. Bradford Stanley, a new group member, is excited to start a FUSE-funded project on shale gas play and fracturing. He is planning to conduct fieldwork in the Pine Mountain Thrust to gather data during Fall, 2014. Geology senior Cody Meservy is starting his research on the tectonics of the Nepalese Himalayas funded by an RCAP-I grant. Both Brittiny and Cody will be analyzing rock samples that Dr Gani collected when conducting fieldwork in Ethiopia and Nepal. This summer, Dr Gani conducted fieldwork in Uinta Basin, Utah, to initiate a new collaborative project on fracture network analysis from field observation and LIDAR data for tight-gas reservoir modeling. She is looking forward to continuing her local, regional, and international research to generate new results and publications in the coming academic years.

Three of her research manuscripts are under review in peer-reviewed journals and two more are in preparation for publication. She presented her East African research at the 2013 GSA annual meeting. In June, 2014, she travelled to Cornwall, England, to present an invited talk at the 4th annual Blue Mind conference. This invitation, which came with a generous travel grant, is part of Dr Gani's collaborative research on early human evolution published in the journal *Nature Communications*. The Blue Mind Conference, which was held in Cornwall this year, is a prestigious, inter-disciplinary conference that was a partnership between the California Academy of Sciences and the University of Exeter Medical School in the United Kingdom. The goal of Blue Mind is to continue exploring the cognitive benefits and services provided by waterways through collaboration between researchers and practitioners who usually do not interact. During her stay in Cornwall, she took the opportunity to explore the structural geology of the European part of the Appalachian Mountains (i.e. Caledonide Mountains) exposed along the beautiful Cornwall beaches.

On the teaching front, she has been equally busy and has fully enjoyed the courses she taught this past year – structural geology, tectonics, and introductory geology. She implemented several new teaching strategies and pedagogical approaches (e.g., experimental deformation modeling in structural geology) in her classes through student engagement. Geology and Geography majors were excited to implement these experimental models of structural deformation for the critical "hands-on" experience necessary to bridge the gap between textbook concepts and the practical world. In structural geology, she successfully helped to run a two-day Appalachian fieldtrip for the second time in collaboration with Dr Wulff. She has also received some teaching grants, including an HFEG to enhance teaching materials and student involvement. Dr Gani is indeed looking forward to her productive fourth year at WKU where she can continue to devote time to teaching, research, and various departmental activities that will support WKU's teaching and research missions.

On a personal note, her life partner and scientific collaborator, Dr Royhan Gani, who is also an adjunct faculty in WKU's Department of Geography and Geology, has recently been awarded tenure and promotion to associate professor at the University of New Orleans. Exciting! Congratulations Royhan! The Gani's two daughters are growing fast and restlessly, and have enjoyed fieldwork this summer in Utah. They were also excited to explore the spectacular landscapes in Zion, Bryce, and Grand Canyon, while tagging along with their parents, who are, no surprise, geologists!

GREG GOODRICH continued to lead the Meteorology Program in 2013-14, now in its seventh year of existence. The program has grown from 40 students in 2008 to nearly 70 students in 2014. The biggest source of growth in the program has come from transfer students, who have arrived from universities from several states in the Southeast. Alumni of the WKU Meteorology program have found outstanding success in the job market, with nine graduates working for the National Weather Service or other government agency, two graduates working for private meteorology companies, an Air Force Weather Officer, two TV broadcast meteorologists, and six graduates currently in graduate programs. Since 2009, over 80% of our graduates have found employment or have continued

their education in meteorology.

Dr Goodrich continued to work with a number of undergraduate students on research projects. He is working on a manuscript with recent graduate Ashlan Clark that investigates nocturnal tornado risk in the Mid-South. They found that nocturnal tornadoes were significantly stronger than daytime tornadoes in the Mid-South and that winter was the season with the greatest risk for nocturnal tornadoes, primarily due to the longer nighttime hours. In Tennessee, nocturnal tornadoes had nearly three times as many fatalities as daytime tornadoes. Dr Goodrich is also working with Tyler Binkley on a climatology of QLCS tornadoes in the Mid-South. Since QLCS events have a much shorter warning lead time than supercell tornadoes, and are much more likely to occur at night when people are sleeping, it is important to quantify the risks associated with QLCS tornadoes in the Mid-South. Tyler found that QLCS tornadoes are most common in spring, with the majority occurring at night, although fatalities are still more common with the more dangerous supercell tornadoes. Like Ashlan the year before, Tyler won first place in his section at the WKU Student Research Conference, proving once again that people love tornadoes! Dr Goodrich also collaborated with Drs Mahmood and Yan to complete a manuscript related to former graduate student Kortney Craft's thesis research on the influence of drought on soybean production in Kentucky. The manuscript was submitted to *Ambio* and is a follow-on to a manuscript published in *Applied Geography* the previous year that investigated drought's influence on corn.

In the classroom, Dr Goodrich once again kept students busy with his sections of Dynamic Meteorology I and II, as well as Graduate Research and Literacy. Despite the pain of those classes, several students admitted that they weren't as difficult as they anticipated. Dr Goodrich also taught sections of University Experience, Intro to Meteorology, and Intro to the Physical Environment. Over the summer, he took his family to Disney World to celebrate his daughter Aurora's first birthday.

MARGARET "PEGGY" GRIPSHOVER successfully fulfilled her duties in 2013 as the State Geographer for the Commonwealth of Kentucky without incident. Well, at least without any reported incidents. But, even though her term as State Geographer has expired, her desire to do geography in Kentucky has not! She recently published an article titled "Born to Run: Kentucky Derby Winners' Foaling Locations in Kentucky, 1875-2013," and will be presenting her equine research in person at the 2014 meeting of the Southeast Division of the Association of American Geographers. Peggy is also developing a research project on the late 19th and early 20th century specialized equine breeding and marketing complex for mules and Saddlebreds in south-central Kentucky. She will also be leading a field trip on the Bluegrass Thoroughbred landscape in Lexington in November for the Kentucky Academy of Sciences.

When she is not horsing around, "Dr. G." is busy with other Kentucky-based research projects on Bowling Green neighborhoods. She is working on several local topics including African American contributions to Bowling Green's urban identity and landscape, and a material culture project documenting what she is calling "basket weave stone fences" in the Bowling Green area. Peggy is also working with Clemson University geographer Christa A. Smith to identify what they are calling "hidden houses" (structures that were built as residences but were converted to commercial use), and how these architectural resources can offer new insights into the dynamics of landscape change.

Not all of her research is based in Kentucky, however, and Dr G. continues to develop her book project on Chicagoan Charles H. Weeghman, the man

who built Wrigley Field. Over the past year, Dr G. has presented her research at several conferences, and gave an invited lecture on local innovations and patents to the Allen County Rotary Club in Scottsville, KY. Peggy, along with husband and co-conspirator in life Dr Thomas L. Bell, continues to serve as co-editor of the international journal, *FOCUS on Geography*, a publication of the American Geographical Society. Peggy serves the department as the Cultural Geography Program Leader and, over the past year, taught classes in Honors World Regional Geography, Cultural Geography, Geography of Kentucky, Economic Geography, and Urban Geography. When she is not spending hours squirreled away in dusty archives or surreptitiously photographing horses, houses, and landscapes, Peggy enjoys playing tennis and traveling blue highways and the friendly skies. Over the past year she added many miles to her car's odometer with trips to Florida and Pennsylvania, and some frequent flier miles with a trip to Sicily.

CHRIS GROVES continued to move along on research and other projects with students and colleagues through the past year. A significant accomplishment, which he had been putting off for some time, was finally to take and happily pass both sections of the National Association of State Boards of Geology (ASBOG) exam for Professional Geologist registration in October. This test isn't all that much fun to take, and once was plenty! Geology professors who spend their time with teaching and research are exempted form having to take the test, but Groves' efforts with the Crawford Hydrology Lab meant that that getting registered was probably a good idea to stay on the correct side of state regulations. The Lab continues to thrive under the excellent management of Lee Anne Bledsoe, and a number of interesting projects were completed during the year. Probably the oddest were dye tracing efforts for the military at Ft. Knox and Ft. Campbell to study groundwater movement in the firing ranges of the bases, which are large, forested areas where bombs and bullets from training land. A certain number of these bombs don't go off and many of these have accumulated through the years. If the shells rust and the explosive chemicals leak, they can impact groundwater quality. All fieldwork into the areas requires the field crew to wind single file, sometimes for a half mile or more through the woods to the site and then back again, close behind an "unexploded ordinance technician." This makes for an exciting twist!

Groves stayed closer to home this year, with one nice if brief foreign trip in late May to Ankara, Turkey, where he and colleagues organized and held the "Workshop on Sharing Experiences in Karst Water Resources of the Middle East." This effort was associated with his responsibilities as a co-leader of the UNESCO project IGCP 598: Environmental Change and Sustainability in Karst Systems. Participants in the workshop represented 11 countries, including Iran, Lebanon, Jordan, Morocco, Palestine, Algeria, and Turkey. There were a variety of fascinating conversations. After hearing a hydrogeologist describe a karst spring in Jordan contaminated with waste from olive oil production, discussion showed that, in fact, this turns out to be a fairly common problem around the Mediterranean countries. Participants also were astounded to learn that in Morocco and other dry countries high water-demand produce such as oranges and tomatoes are grown with costly irrigation and then shipped to water-rich countries in Europe, essentially equivalent to exporting "virtual water" from parched desert regions.

Closer to home, Groves embarked on a multi-year effort with Kate Webb, Katie Algeo, and Pat Kambesis to conduct a Natural Resource Condition

Assessment for Mammoth Cave National Park. He is largely working on the sections about the Park's extensive underground resources, as well as water quality. They are being joined in the project by visiting postdoctoral scientist Jia Yanan from China's Southwest University, who is at WKU working with Groves for a year, and who will be working to analyze trends of water quality analysis for the National Park. Groves also continued service in conservation efforts as member of Kentucky's Board of Trustees for The Nature Conservancy.

Two of Groves' graduate students wrapped up programs this year, including Bruce Hatcher and Laura Osterhoudt, who both worked on geochemical studies involving CO_2 dynamics, for Bruce in Mammoth Cave and Laura in the Green River. Groves has also been focusing more effort in publishing a backlog of research efforts, with papers submitted with Jason Polk and a number of other colleagues, including two manuscripts to *Earth Surface Processes and Landforms*, and one to *Hydrogeology Journal*.

At home, Leah is now 7 and Lillian is 11 and has now shipped off to Bowling Green Junior High. Both seem to spend more time on the soccer field than at home, especially Lillian who now plays both for the SKY community league as well as the Junior High. As it works out, Deana and Chris will help coach Leah's team, with both of them hoping a combination of years on the sidelines watching their daughters play and youtube soccer coaching videos will help them figure out how to do this!

DAVID J. KEELING writes that his twentyfirst year in the Department, and thirteenth as Department Head, continued to generate expected and unexpected challenges, excitement, multiple international trips, a couple of informative conferences and workshops, and lots of hard-working students to keep him extremely busy.

Travel across the planet, of course, remains the highlight of Dr Keeling's year! The early summer kicked off with a short trip to Portland, Maine, for some coastal landscapes and, of course, lobster! At the beginning of June, 2013, he joined colleague John Dizgun, co-director of the KIIS Chile program, for a ten-day visit to Santiago and surroundings, and enjoyed meeting KIIS and local students and faculty. A quick trip to Brooklyn, NY, for the annual AGS council meeting in late June was followed in mid-July by a trip to Scotland to barge along the canals around Edinburgh and experience the spectacular Falkirk Wheel. A week along the French Riviera in Vence (near Nice) provided an opportunity for some serious culinary and wine explorations after the tea-and-scone experience of the U.K.. For three weeks in October 2013, he served as the American Geographical Society lecturer on a TCS-led program called Beyond the Age of Empire, with visits to Sweden, Corsica, Serbia, Belarus, Turkmenistan, the UAE, Bulgaria, Kosovo, Croatia, and Montenegro. A unifying theme of his lectures on this expedition was how infrastructure, especially transportation, is a critical element of social and economic development. A particular highlight proved to be a visit to the Silk Road site of Merv, long since eroded in the desert, but a reminder of how important trade and transportation routes were even 1,000 years ago! The calendar year closed out with a 10-day exploration of the southeastern coast of Spain, known as the Tropical Coast but more aptly named the Plastic Coast for its vast stretches of plastic-covered agriculture.

January, 2014, provided another expedition lecturer opportunity with the TCS Cape-to-Cape adventure. Starting in London, this expedition visited Madeira, Burkina Faso, South Africa, Namibia, Brazil, Argentina, Chile, and Nicaragua. Stops at both the Cape of Good Hope and Cape Horn (the latter as part of a three-day cruise through the Magellan Strait) anchored the expedition, and Keeling's lectures again focused on the socio-economic challenges of

development without adequate accessibility and mobility. The academic year was rounded out by quick trips to Laguna Beach and Sacramento (CA) over Spring Break, Scarsdale (NY) for a teacher workshop, and a late May trip back to Lincolnshire to complete fieldwork on that county's rail renovation project.

Within the community and on campus, Dr Keeling remains active through service on multiple college and university committees. As a University Distinguished Professor of Geography, he represented Ogden College at various events, including regular meetings with WKU's president. He gave a talk at the Noon Rotary club about the long-term impacts of the Balkan wars in the 1990s, and continued as Editor for the Americas of the international *Journal of Transport Geography.* Dr Keeling also continued to serve as a National Councilor for the American Geographical Society (visit www.amergeog.org).

As Department Head, Dr Keeling still attends way too many meetings during the year, but managed to contribute to a number of college and campus-wide committees and initiatives, and to international education on campus. Moreover, he continues to publish the results of research, with several book chapters and articles in print or in press as the year came to an end. His article on the Malvinas/Falklands conflict appeared in a special volume on critical territorial issues, after appearing in a new journal on global issues. Dr Keeling contributed two short essays for the *FOCUS on Geography* "A Picture is Worth a 1000 Words" section, one on Odessa (Summer, 2014), and the other on Vladivostok (Winter, 2013). His "Annotated Websites" contributions appeared in the *Journal of Latin American Geography,* and two new chapters for the 7th edition of the Blouets' Latin American Geography textbook (a new chapter on transportation and a completely restructured chapter on the Southern Cone) are scheduled for an October publication date. Currently, he is working with colleague Dr John Dizgun on a book chapter about Argentine national identity, wrapping up work on the Medellín project started some years ago, and hoping to complete the Lincolnshire rail project article in the next few months. He also found the time to review 60 different manuscripts, a book proposal, and one book on American Railroads for a number of publishers and academic journals during the year.

Finally, he served on a number of graduate committees in the Department, and served as the official "College Thesis Reader" (to the horror of quite a few students) for the academic year, reading and approving 14 graduate Geoscience theses. Congratulations to all of our program majors and graduate students who left the Hill this past year with degrees safely in hand and great career opportunities in front of them—stay in touch!

As always, Dr Keeling encourages past, present, and potential students to come by and share travel stories, information, and geographic tidbits. He can be reached easily in cyberspace at: david.keeling@wku.edu or by phone at (270) 745-4555. Also, visit the Departmental homepage on the World Wide Web— just enter:
http://www.wku.edu/geoweb

REZAUL MAHMOOD has enjoyed another productive year. He continued to contribute to departmental teaching, research, and service goals. He taught courses in Meteorology in the Fall and Spring, supervised graduate theses, along with several independent study courses. Rezaul has continued to expand his research in meso-scale weather and climate observations, impacts of land-cover change on weather and climate, soil moisture and land surface-atmosphere interactions, and modeling of gaseous emissions and transport. Four graduate and six undergraduate students have participated in these research activities and gained hands-on learning experiences. Rezaul mentored four students who presented papers and posters at the 94th Annual Meeting of the American Meteorological Society in Atlanta, GA. He also co-organized several special paper and poster sessions and presented research at the 2013 Annual Fall Meeting of the American Geophysical Union in San Francisco, CA. In addition, he was invited to present at the Department of Geography, Texas A&M University, and in the Department of Earth and Environmental Sciences at Vanderbilt University.

Rezaul has published his research in a number of peer-reviewed journals, including *Tellus A: Dynamic Meteorology and Oceanography, International Journal of Climatology, Journal of Applied Meteorology and Climatology, Climatic Change, The Bulletin of the American Meteorological*

Society, and the Journal of Environmental Science and Technology. He continued to serve as editor of the journal *'Earth Interactions'* and also serves on the editorial board of *Geography Compass*. Rezaul attended annual Editor-in-Chief's meetings of the American Meteorological Society (AMS) in Boston, MA, and completed service on the National Climate Assessment Development and Advisory Committee (NCADAC). Rezaul is pleased to report that the Third National Climate Assessment report was published and has received significant attention from the national and local media. This led to Rezaul giving interviews with NPR, local TV stations, and the Louisville *Courier-Journal*.

Rezaul and Dr. Stuart Foster have continued work with the Kentucky Mesonet. As reported previously in the GEOGRAM, this is a world-class, research-grade operational network for weather and climate monitoring. This is only the second network of its type in the world. Currently, 65 stations in Kentucky are operational under this network. Live data can be viewed from: www.kymesonet.org.

Rezaul continued his research on gaseous emissions from concentrated animal farming operations (CAFO) and their transport. The United States Department of Agriculture (USDA) funds this research. Rezaul's research also led to submissions of more than half a dozen large proposals to several entities (at least four to the NSF). Several of these proposals have received funding. These proposals also allowed him to collaborate with colleagues from NASA, Vanderbilt University, and the University of Colorado.

In recognition of Rezaul's many contributions, he was recognized as the WKU and OCSE 2014 Research and Creativity Award winner, the institution's highest annual award for research.

MICHAEL MAY continues to enjoy his work with several graduate students who are generally attempting to link outcrop and subsurface geology in much of the southern Illinois Basin. His grad student cadre, known as the Illinois Basin Group, are working on various topics related mostly to oil and gas, and asphalt rock projects in both carbonate and siliciclastic rocks. Over the past academic year, Jeremy London, Linda Baizel, Kort Butler, Ryan Hart and Steven Devine were all directed by Dr May on their thesis topics. Jeremy London completed his M.S. thesis in early May, 2014, and immediately began work with a Denver-based oil company and he, along with fellow grad student, Andy Reeder, opened a Bowling Green office for the Denver company. Drs JunYan and Ken Kuehn (retired) were other committee members on Jeremy's thesis. Mr. London's thesis is entitled *Geologic Factors Affecting Hydrocarbon Occurrence in Paleovalleys of the Mississippian-Pennsylvanian Unconformity in the Illinois Basin.* Jeremy integrated GIS as a strong research tool for identify prospective oil areas in Illinois, Indiana, and Kentucky. A new incoming grad student is Tyler Bodine, who taught high school science in the Dominican Republic prior to moving to Bowling Green earlier this year. Tyler did his undergrad geology degree at Sewanee, the University of the South in Tennessee, and has an interest in petroleum geology topics.

Dr May, along several other G&G faculty, traveled with a group of graduate students to the exciting 125th Anniversary celebration of the Geological Society of America at its national meeting in Denver, CO, in October 2013. A primary goal of attending the conference was to present a poster session related to heavy oil research in Kentucky, but it was also exciting to partake in the drinking of a beer specially crafted for the 125th anniversary by Left Hand Brewing Co. of Colorado called "Field Assistant." Mike and Kort Butler presented *Diagenetic Compartmentalization of a Late Mississippian Reservoir in Warren and Butler Counties* at the Denver Convention Center.

Petrophysics and Well Logs was one of the new courses taught by Mike this past academic year and the other courses continue being delivered for environmental geology, aqueous geochemistry, and sedimentation and stratigraphy. It was a busy year for the Geology Program overall and Mike was quite involved with getting his grad students working on their theses, as well as being on several other grad

committees and working with faculty from both biology and chemistry on honor theses for undergraduates and FUSE grants. Mike also continues to attend the Petroleum Technology Transfer Council's (PTTC) short courses and workshops on Illinois Basin oil and gas topics. In March, 2014, he participated in one notable workshop in Evansville, IN, on re-evaluation of Mississippian lime oil and gas plays in the Illinois Basin. It seems that with new technology in formation treatment and stimulation, what was old is considered a new, wide-open opportunity today. These are exciting times in the oil patch!

Other interests that Mike has cultivated are related to near-surface geophysics and characterization of karst and similar sites. He has worked with Thomas Brackman, an instructor at NKU, on several projects and has also integrated under-graduate students into this effort of surveying anything from alluvial bottoms, collapsed sinkhole ponds, to foundations of buildings using Electrical Resistivity Tomography (ERT) and refraction microtremor (ReMi). Mike and Thomas have also challenged students to take their physics, chemistry, and math earlier so they will have the proper "toolbox" for successful careers. They published an article entitled "Tools of the Trade" in the American Institute of Professional Geologists' official journal, *The Professional Geologist* in the Winter 2014 issue. This was a special thematic volume on "advice to students" that chronicled the need for physical science and math as foundational for geology students. Work over a series of years and involving a number of students taken to the Green River Preserve culminated in submission of a manuscript by Mike and Thomas in the fall of 2013. This work as of this writing was just published (see details on p. 6 of this GEOGRAM).

Mike is also working on a summary paper on the geology of fossil fuel bearing strata in Kentucky, which is to be released later this year as part of a thematic volume on Nonconventional Energy to be published in the magazine *Sustain – A Journal of Environmental and Sustainability Issues*, Fall-Winter issue 2014-2015, Kentucky Institute for the Environment and Sustainability Development, at the University of Louisville.

Mike is also happy to report that the Geology program is making great use of materials donated by Bill Dost (B.S. 1979 WKU), which included tens of feet of well documented and analyzed cores, replete with reports, geophysical logs, and photographs. Students in Petrophysics and Well Logs and similar classes have stated that such a collection of materials is invaluable to their learning much about oil and gas reservoir analysis. Mike also has been busy serving as a reviewer for both *Interpretation* and *Earth Interactions*, having reviewed several manuscripts for these two journals over the past year. He invites all to drop by the Department when they can and keep in touch!

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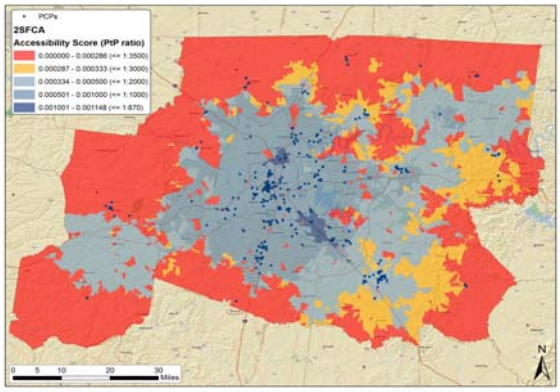
AMY NEMON writes that Fall 2014 marks the start of Amy's tenth year teaching for WKU. 2014-2015 will be an exciting year for Amy and geography students that participate in any of the three study away/study abroad programs she will be involved in during this academic year. When not on a trip, Amy will continue to provide services to distance learners through online courses and to the regional campuses of WKU-Glasgow and WKU-Elizabethtown/Ft. Knox. This academic year Amy has increased her teaching load of courses on the main campus mainly in the area of Geographic Information Science.

Amy continues be active on a number of committees that provide geographic support to the community. These include the Kentucky Geographic Alliance's (KGA) steering committee and the Kentucky Geographic Names Committee (KGNC). This past year, Amy was the new state geography bee coordinator for the National Geography Bee. The 2014 competition brought ninety champions, from around the Commonwealth, to compete at the state

level this past April 4th. The young winner, an eighth grader from Corbin, Kentucky, went on to compete with the other state champions in Washington, D.C., this past May. This annual event could not happen without the support of the Department's geographers who volunteer to participate as moderators and judges. This team is rounded off with volunteer 'time and score keepers' from the Department's geoscience graduate program and the pre-service social studies teachers from the Department of Education. The 2015 competition will be held on Friday March 27th, 2015, at the Knicely Conference center in Bowling Green.

This past July, Amy participated as a co-leader on a two-week adventure through Ireland with fellow geographer and Department graduate, Erin Greunke. The two led a group of WKU students, along with a couple of Gatton Academy students, on a geographic exploration of the supernatural landscapes of Ireland. The trip was a great success and will be available again as a study abroad program in July, 2015. During the upcoming January term, Amy will co-lead a study away program to Hawaii. Participants will study the cultural and physical geography of Hawaii first hand, for two weeks, on the islands of Hawaii and Oahu. Professors from the WKU-Glasgow campus have teamed up to teach a one-week study away called the Kentucky Experience during spring break 2015. Students will have the option of taking a geography or history of Kentucky course and have an opportunity to see the varied landscapes of Kentucky. For some students, this will be their first trip away from home and we hope to inspire them to continue. These adventures are also open to non-students.



Amy's research interests are still strongly geared towards the environmental side of geography that stem from her years as a young camper in the woods of Northern Michigan and fifteen-plus years as an Interpretive Park Ranger and Environmental Education Specialist at Mammoth Cave National Park. Amy is currently working on lab manuals for the Department's Global Sustainability and Environmental Science and Sustainability classes. If time permits this year, Amy would like to look at the characteristics and motivations of populations most likely to utilize curbside recycling in Warren and Barren counties. She would also like to put into motion two internet GIS ideas that would track the sightings of the diminishing Monarch butterfly populations in the US, and an online GIS that would list and locate all small, local, green businesses making it easier for the consumer to support local businesses in their community.

JASON POLK kept busy last year as he continued to enjoy the journey of his academic career, spending time advising students, traveling, and engaging in some exciting new research projects! Dr Polk taught several courses this past year, including a Geomorphology course that focused on landscape processes and included a fieldtrip to the Ozarks to learn about geomorphic processes in different regions. He also taught a new course that was well received, Climate Change, which was a precursor to teaching the Semester at Sea "A Climate Change Challenge" course in early June. The spring semester course was taught as a broad interdisciplinary introduction to climate change and its related topics, and was quite relevant, given the attention on the recently published National Climate Assessment. The voyage in the summer expanded on this, and included courses from across WKU that focused on themes of climate change in Northern Europe and Scandinavia. In addition, he helped to finish up several graduate students in the program, including Nick Lawhon, Kegan McClanahan, Dan Nedvidek, and Veronica Hall.

Dr Polk continued to be involved in various research and scholarly activities, including advising the Green River Grotto student organization, which has been very active recently in local cave survey and exploration. Over the past year, Dr Polk and his students also gave more than 20 conference presentations at local and national meetings, including the Geological Society of America, Kentucky Academy of Science, and the Association of

American Geographers. Dr Polk also spent a week in the U.K. conducting research on cave management, and he traveled to Jamaica several times to host workshops on hydrology and isotopes.

This past year, Dr Polk also engaged in myriad other research and outreach activities, including several collaborations with colleagues involving water, climate, and karst landscape research. He has submitted several proposals with colleagues from the University of Utah, USGS, Vanderbilt University, Louisiana State University, and the University of Southern Mississippi on projects ranging from isotope studies of carbon flux through the northern hemisphere to climate change issues in the Caribbean. Currently, he is working with colleagues in Iceland on a new climate and environmental initiative to develop research in the North Atlantic. He hopes these efforts will pan out to provide new and exciting opportunities to engage students in research, and also to enhance the international research profile of the Department. Lastly, Dr Polk stayed busy thanks to the National Corvette Museum sinkhole that opened up in February, engaging his students with several other collaborators to help in documenting and exploring the collapse.

Dr Polk is very proud of several publications this past year on water, climate, and karst topics, as he continues to focus his research on these areas and begin to expand on some big data initiatives with colleagues around the world. He also has several other manuscripts accepted for publication or underway for submission, and is actively working to develop new research projects for his students. Next summer, he will be co-leading a study abroad to Iceland and Belize, and working to further extend WKU's international reach!

Now entering his sixth year, Dr Polk is excited to apply this year for tenure and promotion in order to refocus on his continuing contributions to the department, while continuing to delve into new research projects and engage his students for another fun and productive year. He is excited to continue the projects already underway and work with new students eager for adventure and science. He looks forward to strengthening collaborations and contributing to the Department's overall success and productivity. He is excited for the upcoming year and wishes everyone well in his or her endeavors!#

ERIC RAPPIN has continued to improve the Kentucky Mesonet Forecasting System, which uses Kentucky Mesonet near-surface data to improve forecasting accuracy by nudging the model solution toward the observations for an improved initial condition. In addition, he has advanced the graphical suite that displays the forecast products used on the Kentucky Mesonet website, which is being developed by Andrew Quilligan and Dex Wood.

Dr Rappin has expanded his research and proposal writing with Drs Mahmood and Fan, with collaborators from Vanderbilt and NASA. Research was presented in the spring of 2014 at the 31st Conference on Hurricanes and Tropical Meteorology that looked at the role of upper-atmospheric influences on tropical cyclones. Specifically, he considered how evolving conditions in the upper troposphere impact the low-level inflow of warm, moist air and the subsequent modification to the storm structure and intensity. In addition, he has conducted research on the role of land-cover change on the evolution of the West African Monsoon and its component parts. In particular, how does deforestation and desertification in West Africa impact the strength of the monsoonal flow from the equatorial Atlantic, the strength of the African Easterly Jet, the production of African Easterly waves (which are the precursors to Atlantic hurricanes), the distribution of mesoscale convective systems, and the resultant distribution of precipitation in the Sahel region?

Dr Rappin has also proposed a first-of-its-kind study to explore the role of climate change on precipitation. Using a novel approach to approximate potential future thermodynamic states of the atmosphere, the research utilizes high-resolution

cloud-resolving models as opposed to global or regional climate models, which need to parameterize the effects of convection. The research considers precipitation changes due to a decrease in large-scale water-vapor transport and the subsequent increase in local evaporation from the surface. He is also engaged in work on the coupled roles of atmospheric warming and moistening, sea level rises, and land-cover degradation on the impacts of tropical cyclone landfall in Bangladesh.

FRED SIEWERS had an interesting year that featured some new directions in teaching and research. On the teaching front, Dr Siewers taught his usual mix of courses in Earth History, Field Techniques, Paleontology, and Professional Preparation. The Professional Preparation course was particularly noteworthy due to the large number of program alumni that returned to share their work and life experience since graduating from WKU. This year's alumni presenters included David Doyle ('91), Cody Munday ('10), Jake Schmitz ('01), Matt Dycus ('09), Kriss Leftwich ('10), Ron Taylor ('04), and Laura DeMott ('03). Their varied experiences gave the Pro Prep students great insight into the range of career paths available to those with a geology degree. Dr Siewers also advised two undergraduate research projects: one involving sedimentary microanalysis of ostracodes shells from the Bahamas; the other a GIS-based project involving petroleum geology and subsurface analysis. Both projects resulted in presentations at professional meetings (national GSA and KAS).

One new direction related to his teaching efforts was Dr Siewers' involvement in national initiatives to reform Geoscience Education. He attended an NSF sponsored summit on the Future of Undergraduate Geoscience Education and he participated in a NAGT workshop focused on broadening access to the geosciences, particularly among minority and underserved communities. Dr Siewers is excited to bring the lessons learned in these workshops to WKU geology, which continues to adapt and respond to national employment trends and the evolving needs of WKU students.

Dr Siewers continued his work with the Illinois State Geological Survey to create workshops and educational experiences focused on geological carbon sequestration. This effort was funded through a subcontract from the ISGS and the Department of Energy. Dr Siewers is be bringing these educational experiences to WKU geology through a new course offering focused on the connections between energy, fossil fuel emissions and climate change.

Dr Siewers always loves hearing from program graduates. Feel free to contact him at any time (fred.siewers@wku.edu) or to "friend" him on Facebook. Thanks!

ANDREW WULFF continued to develop undergraduate research opportunities, be involved at a high level in field-based geology research and learning, and augment the analytical side of "hard rock" geology at WKU. Andrew and his students were active at professional meetings, as they combined for eight research presentations at regional to national scientific conferences. Andrew is currently supervising undergraduates working on projects including the geothermobarometry of metamorphic rocks from the southern Appalachians, characterization of ore suites, and the petrogenesis of lavas from a frontal arc volcanic complex in Chile. Having good analytical facilities leads to so many exciting research experiences for our students!

Andrew had one article accepted for publication in the *Journal of Geology* with colleagues from Illinois State, Columbia University, and MacAlester College titled "Constraints on the Emplacement Age of the Heart Mountain Slide, Northwestern Wyoming, USA." This team is finishing another manuscript tentatively titled "Origin of Allochthonous Volcanic Rocks at Squaw Peaks, Wyoming: A Distal Remnant of the Heart Mountain Slide?" Andrew will submit another paper to Journal of Geoscience Education, and is working with two Argentinian volcanologists on the Descabezado Cerro Azul (DGCA) volcanic complex in Chile, and is excited about returning to work that has been dormant for several years.

Jacob Hughes was awarded a FUSE grant of $4,500 to complete his research with Dr Wulff,

evaluating Mississippi Valley Type (MVT) Pb-Zn ores from the Sellersburg quarry in southern Indiana, using fluid inclusions to estimate timing and composition of mineralizing fluids. Travis Garmon also researched MVT-type deposits, using the same techniques as Jacob, but from the area around Burkesville, KY. Both were able to travel to the University of Missouri, along with Stuart Kenderes, to use their fluid inclusion facilities, and Stuart has returned there for graduate work with Dr Martin Appold!! Travis graduated and is now at the University of Arkansas pursuing an M.S. degree – looking at MVT deposits!! Darrin Green worked on characterizing a REE-enriched carbonatite from near Gunnison, Colorado, using whole-rock and mineral chemistry, and comparing these odd rocks to other carbonatites from Arkansas. DJ is currently awaiting acceptance of a job working in gold exploration. Go DJ!!

Several other students have initiated research on molybdenite deposits in Alaska and fluorite in western Kentucky. These students have laid the groundwork for a growing research group in economic geology, and Andrew will be chairing a session at the upcoming Vancouver GSA on "Undergraduate Research in Economic Geology." Hope to see you there!Jacob and Michelle Foley also were accepted in summer REU projects (see elsewhere in the GEOGRAM) and will be working with Dr Wulff to bring their projects to completion.

Student interest in mining and resource exploration is strong, as evidenced by these undergraduate research projects. All the students modeled exploration techniques by characterizing ore samples from different locales, and studied models of ore paragenesis. If you have access to ore samples, please consider sending them to us for analysis in the Economic Geology course. Several alums have already sent boxes of ore from various locales that have been amazingly useful – Thank you!

Andrew again taught three weeks of the summer field geology course with students from a number of other universities (see story and photos in this edition). Once again, students unraveled the geology of Montana, Wyoming, and South Dakota – and braved the usual snow, sleet, wind, dense fog, and – lots of amazing beautiful weather this year. In short, it was a typical great field camp, with WKU Geology majors again representing the program well. Strong performance in the field course leads to great "door-opening" opportunities elsewhere. Thank you to all who have been financially supporting our many field-based opportunities, which develop our students so that they can earn such great recognition - and get a jump-start on professional careers!

Dr Wulff is committed as ever to bringing more earth science to the K-12 classrooms in the area, and he and five geology majors contributed many "contact hours" with students (primarily 4th and 5th graders) at schools in the greater Bowling Green area and northern Tennessee this past year. Andrew continued to train geology majors to help present aspects of geology to students at area elementary and high schools and become more involved in the community. Topics included the wonders of rocks and minerals, aspects of structural geology, geological hazards, maps, earth resources, groundwater, and limestone dissolution.

Andrew enjoys the challenges of identifying rocks and minerals brought to the department by folks from all over the area, which this year included proposed meteorites, sedimentary iron deposits, carbonates of all sorts, fossils, artifacts, and various ores. If you have samples or questions – bring them in! He continues to be involved in the community as a certified Community Emergency Response Team (CERT) member, giving interviews on radio and TV, giving presentations on earthquake preparedness, and radon analysis and mitigation. He was also a featured singer at two WKU concerts. His daughter left home to start at Wellesley College in Boston and dad is not doing well without her. But his son is playing several sports, playing cello and blowing sax (as dad blows

his trumpet), and staying active with many activities to keep Dad running – and young (or so they say!).

JUN YAN was on sabbatical in Fall 2013 and he worked on a project examining the spatio-temporal dynamics in the U.S domestic airline market. Overall, more than 160 million records of airline tickets (10 years, 2003-2012) were down-loaded and processed from the Airline Origin and Destination Survey Database (DB1B) Market Table maintained by the U.S. Bureau of Statistics Transportation (BTS). All these tables, added up together, are more than 20GB. These individual tickets were then aggregated to the level of city pair directional markets. In the end, there are close to 200,000 city pair directional markets operated by 40 domestic airlines. Currently, Dr. Yan is exploring these data using data mining and geovisualization techniques.

In addition, Dr. Yan had a very productive academic year in publishing his works. A paper, titled *Detect Traffic Accident Clusters with Network Kernel Density Estimation and Local Spatial Statistics: an Integrated Approach*, was published in the Journal *of Transport Geography*. Another paper coauthored with a former Master's student, Kortney Craft, and Drs. Mahmood, King and Goodrich titled *Drought and Corn in Kentucky* appeared in *Applied Geography*. He is currently working on several more papers in the fields of public health, social studies, and atmosphere modeling. Dr Yan advised several Master's students and two of them successfully defended their theses this year. Yan Chen's thesis investigated the spatial distribution of different types of fatal automobile crashes in the Greater Nashville area, while Frank Aryee's thesis assessed the services of GoBG public transit in Bowling Green from a geographic perspective.

In Spring 2014, Dr Yan returned to teaching and taught two upper-level GIS courses: GIS Programming and Geoscience Statistical Methods. In the GIS Programming class, student learned in-depth the advanced geoprocessing techniques with both ArcGIS ModelBuilder and Python scripting in ArcGIS 10.1, while in the Geoscience Statistical Methods class students applied advanced spatial quantitative methods to a number of real-world projects. Through these projects, students gained invaluable hands-on experiences. Dr Yan is very proud of his students' accomplishments.

Scott Dobler promotes the Hawaii Study Away program

Dr. Jason Polk (right) assists BBC documentary host Dr. Iain Stewart with a harness to descend into the void below during filming of "Swallowed by a Sinkhole" in Florida. (Photo by Tom Turner)

ALUMNI CONTRIBUTIONS

Contributions to the Department of Geography and Geology Development Fund in 2013-2014 stayed steady during the year, a reflection of the tough economic times we face. The number of individual contributions to our Fund exceeded the 100 mark! Thanks to everyone for helping us achieve our goals this year; we were able to support several students attending conferences, conducting research, and participating in study abroad and study away (U.S.) programs. Your generous contributions go a long way to ensuring that we have sufficient supplies and equipment for student use. When you receive a call from students, or whenever the spirit moves you, make a contribution to the Department and to the University. Be sure to specify that the money be designated for use by the Department of Geography and Geology. Our profound thanks to our contributing alumni. We gratefully acknowledge gifts from:

Janet G. Bemiss
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GEOGRAM

Fill out the Alumni Information sheet on the following page and email it to the Department today. We want to know how your career and life are progressing. You can also attach a small passport-sized picture of yourself, if you like, that we can publish alongside your news.

ALUMNI NEWS

Callihan, Jeremy (GIS, 2013) won the department's GIScience award in May 2013 and worked with Jim Adams and Associates, Land Surveyors, in Bowling Green. Jeremy wrote that he has found a position with a GIS "contractor" for the Boeing Company and will be working in St. Louis., MO .

Flynn, Elaine (Geology, 2013) received an NSF Graduate Research Fellowship honorable mention in the national competition. Elaine is currently a graduate student at Washington University.

Garmon, W. Travis (Geology and Geography, 2014) accepted a graduate assistantship at the University of Arkansas.

Goldsmith, Jeremy (Environment, 2008) was accepted into the Graduate School at Monterey Institute of International Studies. Jeremy will be studying Natural Resource Management and Sustainability through the International Environmental Policy Department .

Graham, Mark Ph.D. (M.S. Geoscience 2004) co-authored with Dutton, W.H. (2014) a book titled *Society and the Internet: How Networks of Information and Communication are Changing Our Lives.* Oxford, UK: Oxford University Press. Mark works at Oxford University in its internet research center.

Hall, Chris (Geology, 2001) is a senior geologist with SM-Energy in Oklahoma and has been instrumental in helping WKU geology students find internships with the company. Chris has also been extremely generous in his financial support of our students, enabling them to attend conferences and engage in field opportunities.

Hitt, Ashley Littell (Geoscience, 2007) is Director of GIS Services at Connected Nation, Inc., Louisville, and recently celebrated 10 years with **Adam Hitt** (Geography, 2006) - they "met officially" 10 years ago on a departmental study abroad trip to the British Isles!

ALUMNI NEWS

Lewis, Robert (Geography-GIS, 2007) is now a platoon leader with the 350th combat engineers reserve unit in Bell, CA. Later this year, he will go to officer engineers school at Ft Leonard Wood, MO.

Marklin, Scarlett (Geography, 2012) has been accepted into the Ph.D. program for Statistics at Florida State University with full funding starting Fall 2014.

Powers, Michael (Geology, 2013) received an NSF Graduate Research Fellowship honorable mention in the national competition. Michael is currently a graduate student at Oklahoma State University.

Stiles, Crystal Bergman (Geoscience , 2009) completed her Ph.D. at Nebraska, married Josh Stiles, and was appointed as an Applied Climatologist at the High Plains Regional Climate Center in Lincoln.

Tyrie, Elizabeth (Geoscience, 2014) has taken a position with Fruit of the Loom in Bowling Green where she has the opportunity to use her formidable GIS skills.

Robert Lewis

GEOGRAM is designed, edited, and produced for the Department by Dr David J. Keeling.
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http://www.wku.edu/geoweb
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GEOGRAM 2014

Contribution Form (copy and fax)

Contributions to the Department of Geography and Geology play an important role in helping our programs succeed. Your gift of any amount will help support Department initiatives in scientific education, research, and other important student activities.

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Department of Geography & Geology
1906 College Heights Blvd #31066
Western Kentucky University
Bowling Green, KY 42101-1066

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Alumni Information

Name of Graduate _____
(include maiden name)

Major_____ Year of Graduation _____

Current Address _____

City _____ State _____ Zip _____

Occupation _____ Employer_____

NEWS: _____

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Mail to: Dr. David J. Keeling, Editor
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