



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 2012-2013. Highlights of the year's accomplishments included the following events and activities:

► Dr. Jason Polk, from the Hoffman Environmental Research Institute, led a research expedition to Belize in August as part of an ongoing project investigating the socio-environmental dynamics of drought and climate change on the collapse of the ancient Maya civilization many centuries ago.

► Dr Josh Durkee's annual summer "Field Methods in Weather Analysis and Forecasting" (severe storm chasing) class had another outstanding educational experience across the Great Plains.

► Geography, Geology, GIS, and Meteorology students received multiple awards at several annual national, local, and regional conferences (see featured stories).

► The Kentucky Mesonet now maintains 65 active stations across the Commonwealth (kymesonet.org).

► State climatologist Dr Stuart Foster, director of the Kentucky Climate Center and the Kentucky Mesonet at WKU, served as President of the American Association of State Climatologists

► Dr. Peggy Gripshover was named Kentucky State Geographer for 2013.

► Two GIS students received ESRI scholarships,

the thirteenth year in a row for the Department, with another student hired by ESRI.

► Dr David Keeling published an article in *Global Discourse* on the Falklands/Malvinas conflict, recognizing the 180th anniversary of British settlement and commenting about ongoing Argentine claims.

► In February 2013, Hoffman Environmental Research Institute staff member and graduate student Jonathan (Joneo) Oglesby journeyed to Niger, West Africa, to conduct preliminary thesis research with the Songhai people.

► Several geography and geology students participated in a fieldtrip winding through the Ozarks, including the Salem Plateau and the St. Francois Mountain area of southeastern Missouri, as part of a Spring 2013 course in Geomorphology taught by Dr Jason Polk.

► Dan Nedvidek, a geoscience graduate student from Danville, was awarded a \$1,500 research grant from the nationally-renowned Cave Research Foundation for his thesis project titled "Evaluating the Effectiveness of Regulatory Stormwater Sampling Protocols on Groundwater Quality in Urbanized Karst Regions."

► Distinguished Professor of Hydrogeology Chris Groves traveled to Guilin, China, in April 2013, where he gave an invited keynote lecture at the International Symposium on Karst Water under Global Change Pressure.

► Students and faculty from the Department at-



A Letter from the Department Head

inside...

| | |
|--|-------------|
| Department Happenings | pages 4-12 |
| Adventures in Geography and Geology..... | pages 13-22 |
| Faculty Notes | pages 23-42 |
| Alumni News | pages 42-44 |

tended the annual meeting of the Geological Society of America (November 2012) in Charlotte, NC.

Faculty and students excelled again in scholarship, research, and professional development, convening and/or participating in myriad professional workshops and presenting nearly 70 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 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: *Global Discourse*, *EOS*, *FOCUS on Geography*, *International Journal of Climatology*, and *The Professional Geologist*, among others. Approximately twentytwo 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 2013, the Department recorded 130 majors in geography, meteorology, and GIS; 70 in geology; and 80 total minors. We graduated 38 students from our major programs during the year and have a target of 50 new majors annually to maintain and grow the programs. Thirty-two graduate students are 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 very best in the nation. We look forward to hearing from you this coming year.

Best Wishes,

David J. Keeling
Department Head

*** HOMECOMING ***

Saturday, October 26, 2013

**** Special Event: Homecoming Tailgating
Time: 11 a.m. - 2 p.m.**

Location: Main Lawn - Join us at the *Ogden College tent and look for the Geography and Geology faculty and banner.*

(Note: Because of DUC construction this year, space for tents is limited, so look for us inside the area where academic tents are clustered.) Enjoy good food and old friends. Meet the departmental faculty and current students.

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

The Department website homepage sports a new look, following the university wide revision of all website templates. There is always fresh material, new links, updated pictures, and more information about programs. In addition, the Geology and GIS programs have their own websites with information about the major options, faculty research, student opportunities, and other information. GIS Director Kevin Cary and AMI Director Dr Aaron Celestian are the webmasters respectively and you can view pages at <http://www.wku.edu/gis/> and www.wku.edu/geology.

Archived information about the Department's news announcements (by month and by year) and other publicity can be found on the website at <http://www.wku.edu/geoweb/newsarchive.php>. 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, 2012-13

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 2012-13 academic year, Gilman Ouellette received the Outstanding Geoscience Graduate Award, presented by Dr Jason Polk. Michael Powers received the Judson Roy Griffin Outstanding Senior in Geology Award. Ashley McCloughan received the Ronald R. Dilamarter Outstanding Senior in Geography Award. Evan Webb received the L. Michael Trapasso Outstanding Senior in Meteorology Award, presented by Dr Greg Goodrich. Jeremy Callihan received the second annual award for Outstanding Graduating Senior in GIS, presented by Kevin Cary.

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



Jeremy Callihan received the Outstanding GIS student award from Dr Jason Polk (left)



Michael Powers received the Outstanding Geology Student Award from Dr Michael May (left).



Gil Ouellette received the Outstanding Geoscience Graduate Award from Dr Jason Polk (left)



Ashley McLoughan received the Outstanding Geography Major Award from Dr David Keeling

Congratulations to ALL our Outstanding Students!

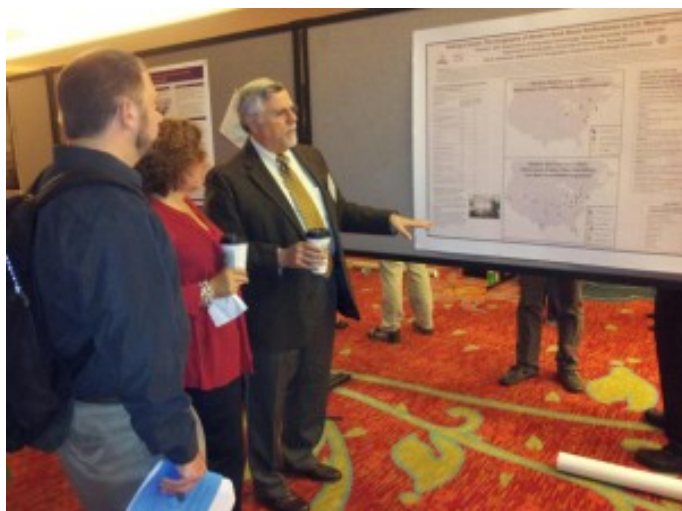


Dr Durkee's Annual Storm Chase Class Summer 2013



Geography faculty members present research at regional conference

The annual conference of the Southeastern Division of the Association of American Geographers (SEDAAG) convened in Asheville, N.C., this past weekend, with several faculty and students from WKU's Department of Geography and Geology in attendance. Kyle Mattingly of Owensboro, a graduate student at the University of Georgia, presented his WKU undergraduate meteorology honors thesis research, supervised by Dr. Josh Durkee, in a poster titled "Large, Long-lived Convective Systems Over Subtropical South America and Their Relationships with Atmospheric Teleconnections."



Dr Tom Bell explains the intricacies of urban rock music as part of a poster presentation titled "Making a Scene: The Geography of Modern Rock Music Performance in U.S. Metropolitan Areas."

Department Head Dr. David Keeling, Drs Peggy Gripshover, Leslie North and Tom Bell all participated in a panel presentation and discussion on "The Care and Feeding of Journal Editors, or Why your Manuscript was Rejected." Adjunct Professor of Geography Dr Tom Bell presented a poster titled "Making a Scene: The Geography of Modern Rock Music Perfor-

mance in U.S. Metropolitan Areas" with colleague Dr Ola Johansson. Dr Jason Polk with several co-authors presented "Understanding Drought and Water Resource Issues in Belize: Case Studies using Rural Karst Landscapes from Past to Present." Drs Leslie North and Jason Polk with several co-authors presented "Under our Feet: Avenues for Promoting Karst Groundwater Awareness and Sustainability."

In addition, Drs Peggy Gripshover and Tom Bell served on the conference program committee and also served on the World Geography Bowl Committee as judges and moderators.

Students, faculty attend annual meeting of the Geological Society of America

Students and faculty from WKU's Department of Geography and Geology attended the annual meeting of the Geological Society of America (GSA) Nov. 4-7 in Charlotte, N.C. *Geosciences: Investing in the Future* was this year's theme, focusing on training and sharing knowledge to build the future of geoscience disciplines. WKU students and faculty members engaged in numerous 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.

The expo booth showcasing the Department of Geography and Geology 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 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.

The following presentations by WKU faculty and students indicate the range of the department's geoscience research efforts as well as the numerous partnerships in which the department is engaged:

- In Situ Time-Resolved Raman and X-Ray Diffraction of Rare Earth Element Ion Exchange in Nanoporous Sitinakite by undergraduate geology major Michael Powers of Bowling Green, with Dr Aaron Celestian (WKU Advanced Materials Institute Director).
- Optical, Raman, and Morphological Characterization of Rock Thin Sections from the Arnold Pit Former Talc Mine Near Balmat, New York, for Asbestiform Minerals by Dr Aaron Celestian, undergraduate geology major Melinda Rucks of Glasgow, and Mickey Gunter of the University of Idaho.
- Under Our Feet: Avenues for Promoting Karst Groundwater Awareness and Sustainability by Dr Leslie North (Hoffman Institute Associate Director), Dr Jason Polk (Hoffman Institute Associate Director), Hoffman Institute staff member and geoscience graduate student Jonathan Oglesby, and Dr Chris Groves (Distinguished Professor and Hoffman Institute Director).
- Multi-Step Ion Exchange of Rare Earth Elements into Microporous Zorite by undergraduate Melinda Rucks of Glasgow and Dr Aaron Celestian.
- Mapping Karst Springsheds in Fillmore County, Minnesota: Increasingly Nuanced Interpretations, a poster by WKU geology undergraduate and REU participant Travis Garmon of Burkesville, Joseph Peters of Eastern Washington University, and Kelsi Ustapak and Dr Calvin Alexander of the University of Minnesota.
- Water Resource and Climate Variability in Barbados Reconstructed from Cave Deposits, a poster by geoscience graduate student Gilman Ouellette of Hawley, Pa., and Dr Jason Polk.
- Relationships Between Land Use and Water Quality of the Karst Aquifer Beneath Bowling Green, Kentucky, a poster by NSF REU undergraduate Emma Lord, Dr Chris Groves, and Tim Slattery of the City of Bowling Green Public Works Department.
- Using Cave and Carbonate Deposits for Paleoenvironmental Research in the Karst Landscape of the Vaca Plateau, Belize by Dr Jason Polk, Hoffman Institute staff member Benjamin Miller, and geoscience graduate student Nick Lawhon of Gallatin, Tenn.
- Capacity Building for Karst Water Resource Development in Southwest China's Karst Region through Training and Education, a poster by Drs Chris Groves, Yuan Daoxian, Zhang Cheng, Cao Jianhua and Lu Qian of the Karst Dynamics Laboratory, Institute of Karst Geology, China, and Jiang Yongjun of Southwest University, China, and Hoffman Institute faculty Drs Jason Polk and Leslie North.
- Influence of Karst Hydrology on Geochemistry of Muskeg Drainage and Spring Resurgences, Tongass National Forest, Alaska by graduate student Melissa Hedrickson of Presque Isle, Maine, Dr Chris Groves and Jim Baichtal of the U.S. Forest Service.

Students attending the GSA meeting included Kort Butler, Veronica Hall, Kegan McClanahan, Travis Garmon, Laura Osterhoudt, Dan Nedvidek, Beth Tyrie, Gilman Ouellette, Nick Lawhon, Melinda Rucks, Michael Powers, Emma Lord, and WKU faculty members Drs Chris Groves, Aaron Celestian, Leslie North, and Jason Polk.



For many of the student attendees, this was their first national scientific conference, including WKU geoscience graduate student Beth Tyrie. "GSA was a very productive conference for me," she said. "It gave me opportunities to develop eye-tracking and GIS concepts related to my thesis, attend talks pertaining to my thesis and WKU course topics, and allowed me to meet with PhD programs to find potential advisors." Tyrie is completing a thesis on the use of eye-

tracking to investigate learning outcomes of karst environment visualizations under Dr. Leslie North.

"The Department and Ogden College always provide strong support for faculty and students attending national and international conferences," noted Geography and Geology Department Head Dr. David Keeling. "Professional experiences like this are great training for students and they provide faculty with opportunities to network, build research relationships, and promote the outstanding quality and international reach of our geosciences programs."

Friends and colleagues remember the life of Debbie Kreitzer

Debbie Kreitzer was many things to WKU and the geography and geology department which she called home. She was once a student of geography at WKU herself, both as an undergrad and graduate student. She later became a part-time and then full-time professor in the subject. As an instructor, she was always laughing and always cheerful, her colleagues said. She was a hard worker who always went out of her way to help students. She was an advocate and enthusiastic leader of the Study Abroad program in the Department and represented the Ogden College of Science and Engineering on the faculty senate, where she served on the Senate Executive Committee.

But perhaps above all, Kreitzer was a member of a family of friends and colleagues who say she is irreplaceable. "We see ourselves as a family in the Department, we are all colleagues...but we are a family as well," David Keeling, the head of the Geography and Geology department, said. "Whenever a family member is gone, you miss that person's contribution to the group, to the family. She's irreplaceable from that standpoint."

Jun Yan, associate professor of geography and geographic information systems, described her as a close neighbor. Kreitzer's office sat right across the hall from his in the Environmental Science and Technology building. Yan said Kreitzer laughed often and always worked hard, regularly staying in her office late to prepare for class. "It just came as a shock," Yan said. "I just said goodbye to her Friday." Kreitzer died Sunday May 5th after attending a Kentucky Derby



party Saturday. She suffered a sudden heart attack at only 51 years old.

Mac McKerral, associate professor of news editorial journalism and chair of the SEC, said he was flattened by the news. The SEC met on Sunday and were informed of Kreitzer's passing. "There was silence," he said. "Nobody spoke. It lasted for a good amount of time until I had to adjourn the meeting." He spoke highly of her service on the committee. "She was a great committee member," McKerral said. "She didn't speak often, but when she did she made great contributions. Her seat was noticeably empty."

Keeling knew Kreitzer well. He served as Kreitzer's advisor on her graduate thesis project while she was still a student and taught her in several classes. He also went on numerous study abroad trips with Kreitzer and geography students around the world to places such as Australia, Africa, Argentina and Europe. She was always very excited about traveling and working with students," he said.

Lexington senior Tressa Root said she didn't know Kreitzer prior to being enrolled in her Geography 110 class this semester. However, Root said it was apparent Kreitzer will leave an indelible impression on many students, including herself. "I think she will leave a lasting mark here at WKU because of how

much you could tell she loved her subject," Root said.

Kreitzer led several Study Abroad groups since 2002, including taking WKU students to Slovenia in 2008 and Australia in 2002. Root said she enjoyed hearing about Kreitzer's travels in class and her passion for geography. "She always had interesting stories about her travels," Root said. "She really loved geography and it was evident."

Keeling said he will miss all the fun Kreitzer and the other members of the Department often had together. "She was a dear friend inside and outside the office," he said. "Quite a number of us get together outside the office on a regular basis and have a meal together, a few beverages, play cards and have fun. Those are the kinds of memories that we'll miss, not being able to do those things with her anymore."

Celebrating and having fun with her friends and colleagues was what Kreitzer was doing in her last moments. Geography and Geology colleagues held a Kentucky Derby party at a faculty member's house on Saturday, something Keeling said had become a bit of a department tradition. "She was there, full of life and looking forward to doing some teaching over the summer," Keeling said. Keeling said the department is planning on dedicating a classroom, as well as creating a Study Abroad scholarship in her name, and is currently accepting donations to go toward its creation.

Kreitzer is survived by her husband of 32 years, Tony Kreitzer, two sons, Nate Shaw and Michael Kreitzer, and her daughter Laura Kreitzer.



Dr Gripshover appointed Kentucky State Geographer

Dr Margaret M. "Peggy" Gripshover, associate professor of geography in WKU's Department of Geography and Geology, has been appointed as State Geographer for the Commonwealth of Kentucky by Gov. Steve Beshear. Dr Gripshover is the first woman to hold the position, which was created by the General Assembly in 1984. Her term will expire on Jan. 1, 2014.

"I am so honored to be named as the State Geographer for Kentucky and to represent WKU and the Department of Geography and Geology in this capacity," Dr Gripshover said. "This is a great opportunity to promote geographic issues and geographic education across the state."

In the past, the State Geographer has been called upon to consult with state officials and planning agencies on such issues a boundaries, mapping, land use, as well serve as a geographic resource for educators. Dr Gripshover joined the WKU faculty as a cultural geographer in 2009. She earned her Ph.D. in geography from the University of Tennessee, Knoxville, and her bachelor's and master's degrees in geography from Marshall University. Prior to coming to WKU, she was a faculty member at the University of Tennessee and Marshall University. While at Tennessee, Dr Gripshover received the Chancellor's Teaching Award, the University of Tennessee Alumni Association Outstanding Teaching Award, and an Excellence in Teaching Award from the Southeastern Division of the Association of American Geographers.

Known as "Dr. G." to her students, she teaches courses in the Geography of Kentucky, Geography of the South, World Regional Geography, Cultural Geography, Economic Geography, and Urban Geography. Dr Gripshover's research interests in Kentucky extend back to the 1990s when she was involved in historic preservation in eastern Kentucky and submitted a successful National Register nomination for the Frontier Nursing Service in Leslie County.

She is engaged in two research projects in Kentucky. Her first project is to develop a map of foaling locations for Kentucky Derby winners beginning in 1875, and use those locations to track land use changes in specialized Thoroughbred breeding regions in Kentucky. Her second project is centered on a histori-

cal geography of the Shake Rag neighborhood of Bowling Green, with a focus on contributions of African Americans to the city's cultural landscape.

Although Dr Gripshover was born just across the Ohio River in Cincinnati, her Kentucky roots run deep. Her father, Robert Bernard Gripshover, was born in Kenton County and descended from German immigrants who settled near Erlanger after the Civil War. Her maternal grandfather was from Owingsville in Bath County. She fondly recalls many trips to Kentucky while growing up, especially those to the Lexington area that included visits to famous Thoroughbred establishments such as Calumet Farm, one of the horse farms that, decades later, would become the focus of her research.



WKU Geoscientists Publish Research

Faculty and students in WKU's Department of Geography and Geology have been busy in recent months preparing and submitting manuscripts to national and international journals that report on several research initiatives.

Dr Nahid Gani, the department's newest Assistant Professor of Geology, has an article in the December issue of *Sedimentology* co-authored with several colleagues in Pakistan and England titled "Controls on large-scale patterns of fluvial sandbody distribution in alluvial to coastal plain strata: Upper Cretaceous Blackhawk Formation, Wasatch Plateau, Central Utah, USA." Their data-driven analysis indicates that alluvial to coastal plain stratigraphic archi-



ture reflects a combination of various allogenic controls and autogenic behaviors.

Dr Xingang Fan, Assistant Professor of Geography (Climate Science), has published research in the latest issue of *Journal of Tropical Meteorology* with colleagues from China titled "A Comparative Study of Two Land Surface Schemes in a WRF Model over Eastern China." The purpose of this study is to reveal the effects of land-surface changes on regional climate modeling in China.

Dr David Keeling, University Distinguished Professor of Geography, with colleagues Drs Holli Drummond, Associate Professor of Sociology, and John Dizgun, Assistant Director of the Kentucky Institute for International Studies (KIIS) and Adjunct Professor in Geography, published an article in the December issue of *FOCUS on Geography* detailing their research in Medellín, Colombia. Dr. Drummond and Dr. Dizgun worked with a local community organization, Sal y Luz, to conduct a detailed youth survey in one of the poorest neighborhoods of the city, while Dr. Keeling examined the new cable car system that has enhanced connectivity to the people who live up the southwestern slopes of the Andes mountains.

Dr Chris Groves, University Distinguished Professor of Geoscience and Director of the Hoffman Institute, published research with Chinese collaborators in the journal *Acta Geologica Sinica* titled "Carbon Fluxes and Sinks: the Consumption of Atmospheric and Soil CO₂ by Carbonate Rock Dissolution." The uptake of atmospheric/soil CO₂ by carbonate rock dissolution plays an important role in the global carbon cycle, being one of the most important sinks, and Dr Groves and his team continue to expand their research on this critical issue.

Dr Rezaul Mahmood, Professor of Geography (Climate Science) and Associate Director of the Kentucky Climate Center, published "Seasonal Variation in heat fluxes, predicted emissions of malodorants, and wastewater quality of an anaerobic swine waste lagoon" in the journal *Water, Air, and Soil Pollution* with several colleagues from the United States and Mexico. Their research found that, although improvements in the concentrations of wastewater malodorants may be due to catabolism by lagoon bacteria, evaporative losses that occurred as the lagoon warmed may also play a strong role.

Dr Jun Yan, Associate Professor of Geography (GIS), published an article titled “Bicarbonate Daily Variations in a Karst River: the Carbon Sink Effect of Subaquatic Vegetation Photosynthesis” in the August issue of *Acta Geologica Sinica* with colleagues from China. They found that HCO₃⁻ entering the river from karst underground streams was either consumed by plants or trapped in the authigenic calcite, thus constituting a natural sink of carbon for the Guancun, China, karst system.

Geoscience team tackles Caribbean climate change with international collaborators

At the beginning of January, a group of faculty from the Department of Geography and Geology visited Belize for a two-day meeting hosted by the Caribbean Community Climate Change Centre (CCCCC), which included members of Cuba’s meteorological organization INSMET (Instituto de Meteorología) and the Belize National Meteorological Service.

The CCCCC serves as the regional information clearing house and advisor for climate change policy and guidelines for the Caribbean Community Member States (CARICOM). The Centre is recognized by the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Environment Programme (UNEP), among other international agencies, as the focal point for climate change issues in the Caribbean.

The team included Drs Xingang Fan, Assistant Professor of Meteorology; Josh Durkee, Assistant Professor of Meteorology; and Jason Polk, Associate Director of Science for the Hoffman Environmental Research Institute and Assistant Professor of Geoscience. Collectively, the WKU group’s expertise ranges from paleoclimate reconstruction and extreme event forecasting to downscale climate modeling, all of which are necessary for creating a framework by which long-term climate change impacts can be studied and understood for real-world applications.

As a result of the meeting, the group agreed to work together to launch an exploratory climate modeling project that will cover Bahamas, Jamaica, Belize and the Eastern Caribbean using the Weather Research and Forecasting Model (WRF v3), a modeling

tool developed by the National Center for Atmospheric Research and the United States’ National Oceanic and Atmospheric Administration.

The use of WRF v3 to facilitate climate modeling in the Caribbean marks a major positive shift, according to Dr Ulric Trotz, Deputy Director of the Centre. He says WRF will allow for downscaling regional climate projections to regional resolutions as high as 9 x 9 and 3 x 3 km, compared to existing regional efforts that produce 25 x 25 km resolution modeling output and even more obscure global resolutions that are as low as 300 x 300 km.

The team says the higher resolutions will allow regional climate change modeling experts to better project the likelihood of extreme weather events, coastal and water resource vulnerability, food security and agricultural issues, and forestry management challenges. These projects will in turn provide a more solid basis on which to make policy recommendations and develop societal and engineering solutions.

The January meeting complements a previous meeting held in December, when Drs Leslie North, Associate Director of Education for the Hoffman Institute, and Jason Polk visited Belize to meet with the CCCCC regarding a collaborative education and outreach initiative to address communication and education about climate change in the Caribbean. Planned activities include an infographic, short video and several children’s activity books about climate change in the Caribbean and risk management. These projects complement future modeling efforts, which will inform what information is necessary to communicate to stakeholders and the general public with regard to future climate and weather scenarios.

The high-resolution modeling has evolved from previous research conducted by Dr Fan in conjunction with NASA, and illustrates the international recognition of research being conducted at WKU and the potential for future applications. “This modeling effort is innovative and WKU/CCCCC will be one of the first to attempt such high-resolution climate projections for the Caribbean,” Dr Fan said. “Having these model projections and applying them to real-world issues will help in policy- and decision- making efforts by stakeholders.”

Dr. Durkee added: “In addition, we will be using novel technology, like the Tropical Rainfall Measuring Mission (TRMM) satellite, to help verify the mod-

el simulations and predict extreme weather and climate events in poorly monitored areas, particularly over the ocean and isolated island nations.”

“Our continued international collaboration with the CCCCC and other regional partners provides us the opportunity to engage our students and faculty in projects that provide vital information in dealing with future climate change scenarios in the region,” Dr Polk said. “The CCCCC is a well-respected international organization, and it is a privilege to work with them to address such an important issue as the future well-being of the nations of the Caribbean in the face of climate change.”

Building this collaborative relationship with the CCCCC is a strong demonstration of WKU’s commitment to international reach and working to educate and engage its students in critical global issues, such as climate change and water resource vulnerability. The Hoffman Institute and Department of Geography and Geology continue to strive to provide applied research experiences for their students and faculty, and to develop cutting-edge research and international cooperation to address global issues.

Geography and Geology Department Head Dr. David Keeling noted “this is an excellent example of WKU’s growing international reach, with research by WKU geoscientists and collaborators on the cutting edge of ‘big’ science that will change people’s lives in positive ways.”



The team of colleagues that participated in a meeting hosted by the Caribbean Community Climate Change Centre.

Front row (from left): Chalsay Gill, Dr Kenrick Leslie, Kendra Clarke, Dr Xingang Fan; back row: Ronald Gordon, Dr Ulric Trotz, Carlos Fuller, Abel Cenfella, Harrison Cooper, Timo Baur, Dr Jason Polk, Arnoldo Bezanilla and Dr Josh Durkee.

Meteorology students present research at national conference

Students from the WKU meteorology program presented their research findings at the 93rd annual meeting of American Meteorological Society. Each winter, the American Meteorological Society hosts a research conference that brings in thousands of meteorologists, climatologists and weather enthusiasts. The meeting is among the largest in the world and, according to the AMS, “promotes the development and dissemination of information and education on the atmospheric and related oceanic and hydrologic sciences and the advancement of their professional applications.”

Taking Predictions to the Next Level: Expanding Beyond Today’s Weather, Water, and Climate Forecasting and Projections was the theme of this year’s meeting — held Jan. 6-10 in Austin, Texas. Out of 11 WKU meteorology students who attended the conference, three students, along with three WKU National Science Foundation-Research Experience for Undergraduates (NSF-REU) students, presented research findings.

During the summer of 2012, Drs Rezaul Mahmood, Xingang Fan, and Josh Durkee provided a 10-week research experience for undergraduate students from outside WKU as part of the university’s REU program. WKU’s Ogden College of Science and Engineering interdisciplinary NSF-REU program was hosted by the Department of Chemistry and Department of Geography and Geology (PI-Dr Cathleen Webb; Co-PI Dr Rezaul Mahmood). This was the sixth year for the research program.

Additionally, Dr Durkee hosted an summer undergraduate research seminar that offered six WKU meteorology students, parallel to the REU program, a hands-on, realistic inquiry-based research experience. Dr Durkee served as research advisor to two additional independent research endeavors for four WKU meteorology students during the fall 2012 semester. Together, these projects served as WKU’s contribution for dissemination of important research findings at the annual AMS meeting.

The WKU meteorology student research participants included: Andrew Dockery of Taylorsville; John Logan Thomas of Brentwood, Tenn.; Quentin Walker of Dixon; Ryan Difani of Pocahontas, Ark.; Tyler Binkley of Ashland City, Tenn.; Michael Flanigan of

Pewee Valley; Emily Yates of Brentwood, Tenn.; and Christopher Johnson of Bowling Green. The WKU REU researchers included Tami Gray of Cleveland, Miss., and Andrew Fultz of Starkville, Miss., both students at Mississippi State University; and Lara Schisler of Prescott, Ariz., a student at Embry-Riddle Aeronautical University. Gray received a third-place award for best overall research presentation.



WKU student Emily Yates presented her meteorology research at the conference in Austin, Texas.

Here is a list of presenters and their research topics:

- * Christopher Johnson, Emily Yates, Quentin Walker, Michael Flanigan and Dr Josh Durkee: A re-analysis of the 16 April 1998 record hail and urban tornado across south-central Kentucky and Nashville, Tenn.
- * Emily Yates and Dr Josh Durkee: A case study the 9 March 2012 record setting severe weather event over Oahu, Hawaii.
- * Andre Dockery, Ryan Difani, Quentin Walker, Michael Flanigan, Tyler Binkley, John Logan Thomas and Dr Josh Durkee: A case study of a rare long-track EF-3 tornado in eastern Kentucky.
- * Tami Gray and Dr Josh Durkee: A Hydroclimatology for the Green River watershed in west-central Kentucky during 1979-2010.
- * Andrew Fultz, Dr Rezaul Mahmood and Dr Josh Durkee: The impact of urbanization on daily precipitation trends across the Kentucky-Indiana Ohio River Valley.
- * Lara Schisler, Dr Rezaul Mahmood and Dr Xingang Fan: Modern urban impacts on regional weather of the central U.S.

Here at WKU, we continuously strive to provide professional research opportunities for our students to experience,” Dr Durkee said. “Our students are going to be leading professionals in the near future, so we offer these professional opportunities for them now in order for them remain competitive in the workforce and to hit the ground running upon graduation.” New research projects are under way as students and faculty prepare for the next annual AMS meeting, which takes place in Atlanta in February 2014.

“Supporting students at conferences and field-research sites is one of the cornerstones of our professional Meteorology program at WKU,” said Geography and Geology Department Head, Dr David Keeling. “There is no substitute for real-time experience in presenting research at professional conferences, as this builds critical skills for students as they prepare to embark on their careers beyond college.”

Keeling Lectures as Marsico Visiting Scholar at Denver University

Dr David Keeling, Geography and Geology Department Head and University Distinguished Professor, gave several lectures at the University of Denver last week as the 2013 Marsico Visiting Scholar. Visiting scholars engage both students and faculty in a variety of settings, such as classes, workshops, research projects, seminars, roundtables, performances, etc., all of which are designed to contribute to the intellectual vitality of the University of Denver. Dr Keeling lectured to an introductory human geography class on transportation and cultural identity in South America, followed by a roundtable discussion with geography graduate students about conducting research in Latin America.

He then presented “Life and Death in Medellín, Colombia: Geopolitics, Geonarcotics, and Cablecars in Comuna 13” in the Department of Geography and the Environment’s Spring Colloquium series. In the evening, he met with a group of undergraduates who had study abroad and research interests in Latin America. Dr. Keeling’s final presentation was in a graduate urban geography seminar, where he contributed to a roundtable discussion on doing fieldwork in Latin America.

"Scholarly exchanges like the Marsico Visiting Scholar program are wonderful experiences because they facilitate an exchange of ideas that derive from very different cultural perspectives," said Dr Keeling. "As a private institution, the University of Denver offers an educational experience that is quite different from one found at a public university. The visit to Denver to discuss Latin American research with a broad spectrum of students, from undergraduates to doctoral candidates, proved enlightening and stimulating in a number of ways."

Geoscience Students Present and Oil and Gas Conference

Three geoscience graduate students from WKU's Department of Geography and Geology gave presentations on June 19 related to their thesis research under the direction of Dr Michael May, Professor of Geology. The students made their presentations in Covington, where at least 200 oil and gas professionals convened for the 77th annual meeting of the Kentucky Oil & Gas Association (KOGA).

Kort Butler of Portage, Wis., presented Evidence for Diagenetic Compartmentalization of the Big Clifty Sandstone Reservoir in Warren and Butler Counties, Kentucky. Jeremy London of Bowling Green presented Geologic Factors Controlling Hydrocarbon Accumulation in Sub-Pennsylvanian Paleovalleys in the Illinois Basin. Andrew Reeder of Bowling Green presented Three Dimensional Subsurface Visualization of the New Albany Shale and Corniferous Production: A Joint ArcGIS and Petra Software Study.

The WKU students were invited to present at the conference as an effort to encourage outreach and communication between active oil and gas industry personnel and students at the Commonwealth's universities. The next KOGA meeting is scheduled for Sept. 12 in Bowling Green, where WKU will again play a vital role in technical presentations.

"This meeting was great for our graduate students to participate in because they were able to network with companies doing business in Kentucky," Dr May said. "We are becoming better known as a petroleum-based geology program, which surprised but also delighted many of the company leaders attending the conference."

Dr David Keeling, Geography and Geology Department Head, noted: "Dr May's leadership in developing resources and curricula redesign to meet the growing needs of the oil and gas industry has been impressive. With a state-of-the-art software lab and growing research opportunities in the 'oil patch,' the department and WKU are developing a strong reputation for excellence in geologic research, training and student placement."



Geo Alumna Victoria Alapo meets famed geographer Dr Harm De Blij



Department of
Geography and Geology

ADVENTURES IN GEOSCIENCE

Summer Field Geology Course

Upperclass geology majors again participated in a geology field course this past summer, along with students and faculty from several other universities, including Illinois State University, Eastern Illinois University, University of Wisconsin, San Francisco State, and Appalachian State University. Students Casey Pearce, Mitchell Read, Matt Burnworth, Jason Howard, Jeffrey Molloy, Jordan Seng, Lowell Neeper, Taylor Hancock, Zach Pennington, Zach Feinn, Aaron Holland, and Justin Cave studied the geology of South Dakota, Montana, and Wyoming for six weeks from May 14 through June 22.

This year, the faculty were very ably helped by two TAs, including WKU alum Shelby Rader, who is currently in the middle of earning a Ph.D. at University of Arizona. Thanks again, Shelby!! Zach Feinn, Justin Cave, and Taylor Hancock earned the top grades for WKU. Dr Andrew Wulff again taught the final three weeks, as the geology emphasized igneous and metamorphic terrains. The course, which is a capstone for geology B.S. majors at WKU, 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 included mapping exercises in the Bighorn Mountains, Badlands, Black Hills, Whitewood 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, and extended the geological experiences and built context for the projects. The weather this year was generally dry and very pleas-

ant, although we did have the chance for snowball fights in the Beartooths! This group was characterized by great congeniality, even to the point of several students getting tattoos of crossed rock hammers! 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 fiftyseven geology students to various summer field-based geology opportunities over the past ten years. These summer field courses, and an array of shorter field-based courses and experiences during the semester, 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 internships, RE-Us (see elsewhere in the GEOGRAM) and, most importantly, career opportunities! We surely appreciate the financial support of alumni that allows for such important experiences. Thank you!!



WKU Field Camp Participants

Casey Pearce, Dr Wulff, Mitchell Read, Matt Burnworth, Jason Howard, Jeffrey Molloy, Shelby Rader (TA), Jordan Seng, Lowell Neeper, Taylor Hancock, Zach Pennington, Zach Feinn, Aaron Holland, and Justin Cave

UNMITIGATED GAUL: FRANCE PUTS HOLLYWOOD TO SHAME

By Michael Trapasso

Last Christmas found me roaming through France. It was my second trip, and this time I was going to do a thorough job of it. Trains, buses, and a few weeks of freedom brought the country into focus. From the English Channel to the Mediterranean, from the Atlantic to the Alps, it was my time to examine closely this beautiful and fascinating country. While wandering around, one amusing thought kept tickling me over and over. I would think, "If I were going to shoot a movie about _____, this would be the perfect place to do it." Though my training is in physical geography, and climatology, anyone who knows me knows about my love of history. So, of course, the movies I could envision would be historic-period films. And the different genres could reach back through many centuries of time.

The Roman Province of Gaul was conquered by Julius Caesar from 58 to 51 BCE. If I were to direct a film based in the time of the Roman Empire, I could definitely shoot it in southern France. Open-country scenes could take place in front of the three-tiered Pont du Gard, bridge and aqueduct. This magnificent example of Roman engineering boasts a vertical drop in slope of only 17 meters along its 50 kilometer span

(that's about 1 in 3000). And the aqueduct is surrounded by the most picturesque landscapes. Roman street scenes could be shot in the southern city of Nîmes, which possesses a perfectly restored Roman Temple. Called the Maison Carree, this temple is now a museum displaying Roman artifacts. The city even has a Roman amphitheater. Best of all is the magnificently-preserved Arena of Nîmes, which is smaller than the Coliseum in Rome, but remains in excellent shape. Gladiator movies could be shot in this arena, or in the more famous arena in the nearby city of Arles. I could have my choice of two gladiatorial venues; either would do nicely.

Medieval period films could not want for better locations. Mont St. Michel is a monastery nestled within a walled city. Monasteries were once built like fortresses. Back in those days, it was not uncommon to sack churches and murder the monks ... they don't call them the Dark Ages for nothing! Other medieval cites complete with defensible gates, draw bridges, and encircling ramparts include: Rocamadour, Carcassonne, and St. Paul de Vence. Each one would comprise a perfect movie set. Just get rid of the commercial signage, cover the glass windows with shutters, and voila ... you're a thousand years back in time. Walking the narrow stone streets. I imagined knights in chainmail armor marching toward Jerusalem on Crusade ... or ox-carts full of dead bodies, the recent victims of the "Black Plague." My creativity went wild. These locations are a director's dream!

When I'd had enough with the Medieval Period, I could easily jump into the Renaissance. There exist some of the most marvelous chateaus (French for castles) scattered along the countryside. During the Renaissance, chateaus were used less for defense, and more to display wealth and status during the "period of rebirth." My favorite was the Chateau de Chenonceau, one of the most famous in France and is built on an arching causeway spanning the River Cher. This magnificent castle housed many of the French



Royals through the centuries. The interior rooms were exquisite, and truly worthy of kings. Then there were the Renaissance villages that encompassed this and other chateaus. Again, they were all perfect movie sets. And again, you could ditch the commercial signage, cover the windows with shutters, and the roads with dirt, and you will have a perfect location ready to shoot. I could easily visualize Renaissance greats like: Michelangelo, Galileo, and Leonardo da Vinci walking down these streets. (There is more about da Vinci later.)

like they had been bombed. In these I could imagine directing World War I-era movies. I could depict tales about our American Doughboys, and/or English Tommys, battling the Prussian Empire. From there, I could easily jump into World War II films about paratroopers from the 101st or 82nd Airborne desperately fighting off the Nazis. Then, of course, there's the D-Day Invasion on the beaches of Normandy. The actual landing beaches are considered sacred, as they should be, and I would not dare disturb them. A visit to the hallowed beaches caused me to reflect on the incredi-



Chateau Chenonceau is a magnificent Renaissance Castle used by Kings and Nobles for generations.

Criss-crossing the French countryside were myriad vineyards, miles and miles of vineyards! When traversing regions like: Champagne, Burgundy, Bordeaux, and Cognac ... yep ... you're going to see a lot of vineyards. In between the vineyards I would occasionally spot the ruins of old farmhouses; some looked

ble courage and sacrifice our soldiers made on June 6th, 1944. But ... there are other beaches on the Normandy coast where a movie about that fateful day could be filmed.

Though romantic comedies are not my style, one could always film in Paris. In my travels around the globe I have seen some beautiful cities, but few could ever rival Paris for the sheer grandeur. The elegant architecture and iconic splendor of this European cap-

ital can leave one breathless. The imagination boggles, for so many movies can still be filmed in “The City of Lights.” A director would be hard-pressed to find a lovelier setting.

Off topic, but on a more personal note, I took the greatest satisfaction in getting close to a personal hero of mine ... Leonardo da Vinci ... an absolute genius and true Renaissance Man. In 1516, the King of France (Francois I) took the aging mastermind under his wing. He invited Leonardo to study whatever he wanted to study, and invent anything his heart desired, as a member of the Royal Court. In the City of Amboise, within walking distance of the Royal Palace, he was awarded an estate, the Chateau du Clos Luce, along with: acres of gardens and orchards, a stream, and a large basement workshop. This super intellectual/inventor lived the last three years of his life at a part of the King's inner circle. I was enthralled to see

few canal and movable bridge designs I had not seen before — not to mention an operational anemometer (wind speed indicator). He breathed his last in May 1519, and so departed one of the most singular men who ever lived. I really love that guy!

In all, visiting France was a lot more than great geography and geology; it was a country brimming with movie sets. A film company could journey around this magnificent country for decades and make a variety of movies. You simply need to aim the camera in almost any direction and you can frame spectacular scenes. It would put Hollywood to shame, because the crew would be shooting in and around the real thing, instead of some manufactured studio backlot. And the real thing can always trump the imitation, any day.



where the great man ate and slept, and best of all, the writing desk in his personal office. The basement workshop was filled with models of Leonardo's inventions. I recognized most of them, but there were a

Chateau du Clos Luce is where Leonardo da Vinci lived the last three years of his still-productive life.

WKU group makes progress on projects to assist remote village in Belize

A WKU group led by Dr Bernie Strenecky, Scholar-in-Residence in the Honors College and founder of The \$100 Solution™, traveled to Belize in September to work in the remote village of Gales Point, Manatee, located near the eastern coast. The team also included Dr Jason Polk, Associate Director of Science for the Hoffman Environmental Research Institute; Jonathan Oglesby, WKU Geography and Geology graduate student and Hoffman staff member; AJ Strenecky of the Merritt Island Florida Rotary Club; and Dr Beth Quick, Dr Terry Silver, and Professor Ruby Black, faculty members from the University of Tennessee-Martin.

The group had several goals during the trip, with the overarching theme of working with the local community in Gales Point. These goals included helping to improve its water supply, discussing and evaluating the school's curriculum, and evaluating the karst geology and groundwater resources in the area. In addition, Dr. Polk and Oglesby conducted fieldwork in western Belize for a project investigating past climate change impacts on the Maya using cave deposits.

"This trip was magic and is a testament to what can happen when a small number of people give of their hearts, minds and skills to improve the lives of a forgotten people," Dr. Strenecky said. Gales Point, Manatee, exists as an isolated community on a peninsula a few miles long and up to only a few hundred feet wide at some points. The peninsula is surrounded by a brackish lagoon just inland from the Caribbean Sea, yet offers little in the way of viable water resources due to its low elevation and karst geology. The primary means of reaching the community is by boat, and the secondary, less-reliable route is via a long, muddy gravel road that can be impassable at times, thus enhancing the difficulty of the community in accessing outside assistance and resources.

The population at Gales Point is made up of a unique people group that originated from runaway slaves and settlers from Nigeria who began inhabiting the peninsula in the early 1800s. Gales Point is one of the few, if not only, places in the world outside of Africa where this culture and its customs still exist and flourish. In addition to the unique population residing in Gales Point, the landscape that comprises the area



AJ Strenecky shows Anthony Flowers from the Ministry of Health how to check the filters on the UV water system installed at the local school in Gales Point prior to testing the system

is a national wildlife preserve, home to many diverse, and sometimes endangered, species of animals and plants, caves, and past Maya activity. The surrounding lagoon is home to multiple threatened or endangered species, including the hawksbill turtle, the goliath grouper, the West Indian manatee, and several exotic bird species.

The trip left little down time, with the group immediately starting on the night of arrival to work on the first major project of installing a UV water filtration and purification system for the local school and pre-school. This system was provided by the generous donation of the Merritt Island Rotary Club and pioneered by AJ Strenecky, who spent more than two years in researching, developing and organizing the purchase and installation of the system.

The system incorporates two filters to remove particulates, and an ultraviolet light tube that kills any harmful pathogens, leaving the water purified as it exits the small and efficient system, which is capable of treating three gallons of water per minute. The system now provides clean water for the entire school and preschool on a continuous basis, requiring little energy and maintenance for its long-term operation.

The team worked with local Chairman of the Water Board, Kevin Andrewin, and community members to install the system and provide training on its operation and upkeep. Community leader Nancy Bailey, who owns Manatee Lodge located at the end of the peninsula, is working to develop and implement best management practices with support from the WKU team to help Gales Point become sustainable with respect to water, energy and health. "I am really excited to see the things fall in place that I've been dreaming about for years," she said. "I look forward to continue working with the WKU team and I know great things can and will come out of it."



Community members of Gales Point celebrate fresh, clean water from the newly installed UV water system.

The WKU team met with Anthony Flowers from the Ministry of Health (Water Division) and Martin Lewis from the Ministry of Rural Development to discuss issues of water quality and sustainable development. Efforts are under way to develop training initiatives and programs to improve water quality testing procedures and local water infrastructure in rural communities. The Gales Point community serves as a pilot project in the joint efforts.

The WKU team also had a follow-up meeting with the Caribbean Community Climate Change Cen-

tre (CCCCC) to continue discussions on how to address climate change issues in the region, including Gales Point. This meeting was part of an ongoing collaboration to build partnerships between WKU and the CCCCC for long-term climate change science and education initiatives in vulnerable Caribbean communities.



Jonathan Oglesby and Kevin Andrewin at the entrance to Ben Loman's Cave.

Dr Polk and Oglesby also performed reconnaissance and collected preliminary data regarding the environmental conditions and resources in Gales Point. They visited Ben Loman's cave across the lagoon and inventoried features within the cave, which included many flora and fauna unique to the cave ecosystem, as well as signatures dating back over 150 years from past visitors.

Dr. Polk began mapping the cave and also did a preliminary investigation of the hydrologic and geologic features of the area. He has submitted a collaborative proposal to perform a pilot study on the regional hydroclimatology examining relationships between extreme storm events, groundwater recharge, sea-level rise, and climate change.

The WKU team is planning to visit Gales Point again over the winter break to continue working with the community on these initiatives, meet with government officials and to begin collecting data on proposed research projects. Additionally, the team will be working with UT-Martin partners and local officials to integrate these efforts into the school curriculum, and to start an environmental education program designed to help study and pre-

serve the socio-environmental linkages in the community.

"This project is a wonderful example of meaningful collaboration across a number of constituencies and the results will have a lasting impact on the quality of life of the Gales Point community," said Dr. David Keeling, head of WKU's Department of Geography and Geology.

WKU's Hoffman Institute project addresses water crisis in West Africa

In February 2013, Hoffman Environmental Research Institute staff member and graduate student Jonathan (Joneo) Oglesby journeyed to Niger, West Africa, to conduct preliminary thesis research with the Songhai people. The focus of the trip was to gain a better understanding of how the Songhai cope with the water cycle, sterilization of water, water sanitation and water hygiene.

Oglesby conducted surveys and interviewed workers in remote villages along the Niger River. The data acquired will be used as the foundation for future thesis work that will include the creation and dissemination of water education materials for the Songhai. The goal is their eventual dissemination to other Least Developed Countries in the region and around the world, including to a second study site at Gales Point, Manatee, in Belize (see prior story).

Through his research, Oglesby is working with his advisor, Dr. Leslie North, to develop and evaluate successful avenues for informal education practices in improving water education in these communities to promote sustainability and water resource protection, as well as to improve economic and educational opportunities through capacity building. He will use data visualization techniques incorporating science and art to cut across culture, language and geography to teach these communities about water sanitation and conservation.

Niger is a landlocked state of West Africa located mostly within the Sahara desert. It relies heavily on foreign aid to maintain sustenance, existing in one of the harshest political and environmental climates in the world. Pneumonia, malaria and diarrhea, coupled with malnutrition and food insecurity, give rise to high mortality rates. "I want to empow-

er groups in developing nations, in particular the women and girls of the Songhai, by educating them about water," Oglesby said. "I'm passionate about water and passionate about the Songhai. I decided to start here and start now."



Women fetch water from a community well, shared by people and animals alike, in Bouban village.

Many of the women Oglesby interviewed during this initial research trip spoke of the daily arduous task of carrying water to and from the river to their homes, often starting before dawn and not finishing until after dark. Some even explained it's as if they never stop. Most gather water from sources that are heavily used and negatively impacted by people and animals. The water is then used without any treatment for consumption. For many communities in Niger, water collection takes up so much time that women and children are often unable to find time to go to school or work to support their families.

Oglesby will return soon to continue his work and envisions a positive, if audacious, endeavor. "I can't change the world," he noted. "But I hope I can change the quality of it, one person at a time." He is starting a website, www.fofohari.org, as the foundation for an organization to address water education for developing countries. The educational tools developed and created for this research will be disseminated through this site, and it will be used to further communicate techniques for water education in developing areas.

Dr. North, Associate Director of the Hoffman Institute, said: "Joneo's research embodies the true spirit of integrating science and education to make a difference in communities. The geography of water

education is understudied, and certainly of pressing importance as water resources diminish in the face of population growth and climate change. "This will be a great step in working to develop and study effective informal education tools aimed toward understanding how to overcome these spatial and cultural differences," she said.



Jonathan (Joneo) Oglesby interviewed the Songhai people at a well to learn about water usage.

WKU storm chasers document EF-4 tornado, other severe weather events

The May 2013 summer term was the fourth year that Dr. Josh Durkee's Field Methods in Weather Analysis and Forecasting class set out across the Great Plains, forecasting and verifying a wide variety of severe weather. As with previous years, the WKU group accomplished much success in their mission.

This year Dr. Durkee, along with Dr. Grady Dixon and eight students, traveled 7,115 miles across 10 states (Kentucky, Missouri, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Colorado, Arkansas and Tennessee) to apply various forecasting techniques with regard to severe weather, and to analyze and document the hazardous outcomes as they unfolded. The group documented up to four confirmed tornadoes, including an EF-4 quasi-stationary tornado near Bennington, Kan., as well as number of damaging hail and wind events and flash floods. The overall purpose of this class is to provide a unique and practical capstone learning experience beyond a traditional classroom setting for students studying meteorology.

ience beyond a traditional classroom setting for students studying meteorology.

"As opposed to many traditional college courses where the instructor makes most of the decisions, in this course the students make many of the decisions," Dr. Durkee said. "This gives each student a true sense of the real responsibility that goes into weather analysis and forecasting, and forces them to put forth their best efforts at all times. Consequently, the students often finish the course with skill sets well ahead of others who have not taken the class."

While the decision-making is largely left up to the students, Dr. Durkee still guides their decisions toward the most ideal and safe outcomes. "As with any field intensive class, the number one rule for this is course is to always practice the best safety measures while targeting the optimal environment from which to learn from," Dr. Durkee said. "There is a lot more than weather forecasting that goes into the daily routine. We always consider the array of potential obstacles that may hinder our safety and/or learning environment. Such obstacles include navigable roadways, topography, population density, traffic, among others. If any one or combination of these factors intrudes on our 'classroom,' we simply avoid that area."

This year has been a particularly troublesome year as many devastating storms and tornadoes repeatedly hit urban areas surrounding Oklahoma City, which Dr. Durkee's class avoided altogether. "I cannot stress enough that our mission for this course is not to test our limitations in the face of these storms in order to see what Mother Nature has to offer," Dr. Durkee said. "Rather, we follow along from the back row so to speak, in order to comfortably observe, learn from, and respect these incredible and powerful events."

This year's group included WKU students Ryan Difani of Pocahontas, Ark.; Will Paschall of Germantown, Tenn.; Tyler Smith of Russellville; Colton Lindsey of Mount Vernon, Ind.; Andrew Schuler of Independence; Tara Wagoner of Lafayette, Tenn.; Ilea Schneider of Lewisport; and Veronica Hall of Livonia, Mich.

Dr Durkee is assembling the forecast analyses, surface, upper-air, radar, satellite, and GPS data, along with the photography and video documenta-

tion to prepare students for upcoming research endeavors, as well as to use these data as learning devices for courses in the upcoming academic school year. Read the student blog entries and view more photos from the 2013 journey on the WKU Meteorology Blog at <http://meteorology.blog.wku.edu/>, on Twitter at <https://twitter.com/wkustormchase> and on Facebook at <https://www.facebook.com/wkumetclimsci>



The WKU group viewed mammtus clouds near Ogallala, Neb. (Photo by Josh Durkee)

Department of Geography and Geology continues to extend international reach

Faculty and students in WKU's Department of Geography and Geology have a long tradition of global research engagement, with their international reach embracing all six inhabited continents. From study abroad experiences to conferences and research projects, the department continues to extend WKU's global ambitions to myriad corners of the world.

In 2012 alone, students and faculty visited countries on all six continents for research, lectures, conferences and other educational opportunities, including Australia, Argentina, the Bahamas, Barbados, Belgium, Belize, Bhutan, China, England, Egypt, Ethiopia, India, Indonesia, Jordan, the Maldives, Peru, Rwanda, Scotland, Slovenia, South Africa, Tahiti, Thailand and the United States.

Fred Siewers began the year with his biannual study abroad program to San Salvador Island in the Bahamas, where 16 students explored the geology and natural history of this fascinating location. Regional field trips during the year to the Appalachians, the Ozarks, the Midwest and to many points in between engaged dozens of meteorology, geology and geography students with all manner of physical and cultural landscapes, including tornadoes.

Conferences in diverse locales such as New York, Asheville and Charlotte (N.C.), Edinburgh (Scotland), Murray (Ky.), New Orleans and San Diego were well attended by students and faculty, who presented papers and posters on a wide variety of research topics.

The Department likely has the most globally focused research agenda of any WKU program, with ongoing projects in China, the Peruvian Andes, Colombia, England, Nepal, Belize, the Bahamas, Argentina, Brazil, Ethiopia, New Zealand, across the United States and points in between. It also has a strong reputation for exciting study abroad programs, with destinations in 2013 to include Mexico's Yucatan, Chile, and the British Isles.



Dr Fred Siewers at Siccar Point in the U.K.



Dr John All leads research expedition to Peru

Dr John All, associate professor in WKU's Department of Geography and Geology, and Clinton Lewis, WKU's University Photographer, recently reached the 18,143-foot summit of Ishinca Mountain as part of a summer expedition in Peru with the American Climber Science Program. Here is a report from Dr All, director of the ACSP, about the trip: "The American Climber Science Program — Peru expedition to the Ishinca valley over the past 12 days was very productive. Ten people comprised the first cohort of the 2013 Cordillera Blanca expeditions and they represented numerous universities and institutions. For the most part, this team will be in Peru all summer with the ACSP as we continue our work and so our first efforts were to collect baseline data and train everyone in mountain safety. Our research efforts including collecting vegetation data for studies on climate change, grazing and fire impacts in the range, we placed an atmospheric

dust experiment at 5100 meters for collection later this summer, we collected over 20 snow samples on three mountains surrounding the valley, and we delineated the location of water bodies and springs across the valley in preparation for later water quality monitoring as the expeditions continue. Team members from 19 to 72 years old ascended mountains including Urus Este (5495 m) and Ishinca (5530 m). For our next expedition to the Cayesh valley, we are being joined by Peruvian graduate students from La Molina University in Lima who will be studying the impact of grazing on mountain wetland ecosystems. Also new teams from Colorado State and Western Washington are joining our efforts and our research diversity will continue to grow throughout the season as more scientists and climbers join us. More: For information and more photos, check out the ACSP's blog at www.mountainscience.org or webpage at www.climberscience.com.

FACULTY ACTIVITIES

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KATIE ALGEO enjoyed an interesting and productive year during 2012-2013. She introduced a revised Cultural Geography class that had an international focus on understanding geography through film for half the semester and a local focus on historic landscapes in Bowling Green for the second half of the semester. Books like Akash Kapur's *India Becoming* and Edward Luce's *In Spite of the Gods* provided background on contemporary India and its historical development, and students then made detailed observations from several films set in India, or by focusing on the Indian diaspora, including *Bend It Like Beckham* and *Slumdog Millionaire*. Students researched aspects of Indian and immigrant geography glimpsed but not self-evident in the films, and then synthesized and made symbolic interpretations of what they saw. Students addressed epistemological questions by comparing ways of knowing derived from books and from film. They then applied what they had learned by exploring the cultural geography of another place via a film they selected. The second half of the semester was devoted to understanding the historic cultural landscape of State Street in Bowling Green through a variety of data sources, including photographs, Sanborn Insurance Maps, and public records. To make spatial display and analysis of data feasible without a background in GIS, students constructed a "virtual GIS," layering information from different time periods along a section of an EST hallway representing State Street. The State Street Virtual GIS is still on display. Stop by and have a look the next time you visit your friends in the Department of Geography and Geology!

It was a busy year on the research front as well. Dr. Algeo is researching and writing a book on the Mammoth Cave Mushroom Company, a short-lived commercial attempt to grow mushrooms underground. She has been tracing the origins and diffusion of underground mushroom production, from the catacombs of Paris, to former beer caves in the New Jersey Palisades, to the cellars of swanky Washington D.C. hotels and, finally, to what promised to be the ultimate underground locale, the world's longest

cave. Understanding the historical geography of this business venture and the reasons for its failure also entails tracing the movements and (sometimes conflicting) motivations of individuals, including the cave's absentee owners, the mushroom company manager (a French refugee who was something of a flim-flam artist), three French laborers brought over to work the mushroom beds of Mammoth Cave (and who bore the brunt of the company's failure in lost wages, uncertain employment, and the difficulties of navigating a culture whose language they spoke poorly), and the manager of the Mammoth Cave Hotel (who had the difficult position of controlling finances without any real authority to make decisions at Mammoth Cave). This book is part of a longer term project documenting the cultural history of, and development of tourism to, Mammoth Cave

Dr. Algeo became the treasurer of PAS-APAL this year. That awkward acronym stands for Pioneer America Society - Association for the Preservation of Artifacts and Landscapes. The group is one that studies and works towards the preservation of significant American historical landscapes, buildings and items of material culture. She continues to serve on the Board of Friends of Dumont Hill, an organization devoted to the preservation and interpretation of the Civil War



JOHN ALL writes that this was the busiest and most productive year of his tenure at Western. John taught his normal array of environmental classes including Global Environmental Change,

Environmental Law, Resource Management, Environmental Planning, and Biogeography. He also revamped and taught his Environmental Ethics class again for the first time in several years. This class was offered both as a face-to-face and an Internet class. John now has numerous classes that are offered online to support distance learning at Western's more far-flung campuses and to support the online Master's in Social Responsibility and Sustainable Communities. John teaches online versions of his graduate environmental course above and beyond his required teaching load to support this program because he believes in its importance for the Commonwealth.

John's research activities this year were focused on the world's mountains. As the Executive Director of the American Climber Science Program, he worked with the American Alpine Club and twelve other universities from the U.S., Europe, and South America to submit grants and develop research projects. The ACSP combines research with conservation activities in the Andes and Himalayas and over a million dollars in grants were submitted by John to USAID, NSF, NASA, and a variety of charitable foundations for this work. The main collaborators in this work include NCAR, the University of Colorado-Boulder, Colorado State, and La Molina University in Lima, Peru. John is also working with conservation research groups like David Breashears' GlacierWorks, The Mountain Institute, and Himalaya Black Ice in these endeavors.

John spent much of the year traveling in support of the program. He gave over fifteen talks at cities and universities across the country, including Harvard, Columbia, Cal Tech, Colorado State, and the University of Reno, Nevada. John gave presentations at three international conferences and five domestic ones as part of these travels. He was also asked to represent the program on the Leadership Committee of the Rocky Mountain Sustainability Science Network and to teach at its annual leadership workshop in Grand Teton National Park.

This summer's research expedition to Peru was

exciting: John was presumed killed during a massive avalanche on Chacraraju – one of Peru's most deadly mountains – but he survived because he had climbed behind a rock outcrop that directed the avalanche around his team. The rest of the summer was spent collecting data in far-safer locations, as over fifty people assisted with the research – including WKU official photographer Clinton Lewis. Students from twelve universities from all over the world brought research projects to the expedition or helped collect data. Research faculty from ten universities also participated and brought their own research projects. There were numerous volunteers who helped with the conservation work from a variety of professions



including an artist from Brooklyn, a doctor from Harvard, retired engineers, a 'green' architect, and even a pediatrician from Australia. This year, numerous Peruvian graduate students and professors accompanied us into several mountain valleys and brought their own research projects into the Program. Overall, it was an incredibly productive time and participants will be processing data for quite some

time. John and Clinton will be offering study abroad opportunities in Peru next year and John will be leading a team from several universities and organizations on a climb of Mt. Everest/Lhotse next year and they will be climbing without oxygen. For more information on the American Climber Science Program and to join us in Nepal or Peru next year, contact John or visit our blog (www.mountainscience.org) or our webpage (www.climberscience.com).

KEVIN CARY writes that the year was fantastic. He spent another week in San Diego this summer at ESRI's education and international user conference where he presented information about 3D modeling campus in ArcGIS with his students in his GIS Analysis and Modeling course. Graduate student Luke Miles also attended, as he won an assistantship for the conference, making this year the 13th consecutive year the Department has had a student from its GIS program win an assistantship.

Only 60 are chosen annually from the U.S.

Kevin continues to be a reviewer for the GIS Certification Institute (<http://www.gisci.org/>) for certifying GIS professionals with the designated GISP and he has been serving as a GISP Reviewer since 2008. He has also been WKU's ESRI Site License Administrator since 2002. Kevin has been a certified GIS professional for the past thirteen years and certification must be renewed every five years. Professional certification in the United States for GIS professionals began in 2004. General-use student labs throughout the main campus and WKU's extension campuses are equipped with ArcGIS software, and so he works closely with WKU's Information Technology. He continues to provide technical support for ArcGIS to our campus community for various faculty and staff, including those in our various centers at WKU. He will play more of a role soon when WKU begins implementing its first enterprise GIS.

He is also the Director of GIS for the Center for GIS at WKU. The Center for GIS is a place for student projects/research, student internships, and independent courses in GIS. Projects include working with the Baker Arboretum; WKU's Department of Planning, Design, and Construction (PDC); WKU Facilities Management (FM); Logan County Economic Development (http://www.loganleads.com/QCMS_LEAD/); Geoscire (<http://www.wku.edu/geoscire>); and the Blueways of Warren Co. (<http://www.wku.edu/blueways>). The Center for GIS now has five servers used for teaching and services. Servers are equipped with ArcSDE, ArcGIS Server, and MS SQL, as well as ArcGIS Desktop and data. Kevin recently went through a major migration of map services from ArcIMS to ArcGIS Server, as well as a migration from ArcGIS Server 10 to 10.1, due to its new functionality and interface. Migration to 10.2 will begin this following spring semester. This year, PDC and FM are initiating an Enterprise GIS for WKU and there will be a major academic component involving our GIS program. This will add opportunities in the classroom for GIS Analysis



and Modeling, GIS Programming, Internet GIS, and GIS Databases, as well as other opportunities for Master's theses and practica. GIScience majors are on the rise at WKU, and WKU's Enterprise GIS equates to more on-campus GIS internships for our majors by providing them rare opportunities in an Enterprise GIS setting; they will thus be much more competitive upon graduating with a GIScience major.

Kevin presented at this year's Kentucky GIS Conference in Louisville with Luke Miles on Kentucky Mesonet web maps, and gave another presentation with Josh Montgomery (GIScience '12) and Tommy Woodall (GIScience '12) of PDC on WKU's initial stages and academic component of the Enterprise GIS. The conference is hosted by the Kentucky Association of Mapping Professionals (<http://kampro.org/>) and convened September 30th to October 2nd.

AARON CELESTIAN

writes that students in the Crystals Kinetics group have been busy. Shelby Rader (B.S. 2012) is enrolled in the Geosciences Ph.D. program at the University of Arizona, and was recently awarded a prestigious National Science Foundation Graduate Research Fellowship. Many congrats, Shelby! Michael Powers (B.S. 2013) completed a summer internship at SM Energy, and is now a geology graduate student at Oklahoma State University. Both Michael and Shelby were co-authors on the paper "In situ Raman spectroscopic study of transient polyhedral distortions during cesium ion exchange into sitinakite" recently published in the *American Mineralogist*. Melinda Rucks (B.S. 2013) has also moved on to the Geosciences Ph.D. program at Stony Brook University (Dr. Celestian's alma mater) where she is working on Martian geochemistry.

The group has slimmed down a bit, but new students are on their way. First year geology student Caleb Chappell is doing very well. He is working on making brand-new porous nanomaterials designed for more efficient and

cleaner crude oil refinement. In collaboration with Dr Cole, Justin Cave is working out the mineralogy of African dust samples in offshore sediment cores, which we hope to link to past climate changes. To keep up to date with the Crystal Kinetics Group, check us out on Google+ (<http://goo.gl/CTwMWP>).

Dr Celestian was recently awarded tenure effective Fall 2013, he remains Director of the Advanced Materials Institute at WKU, an Associate Editor of the *American Mineralogist*, and a member of the Science Review Committee for the Spallation Neutron Source at Oak Ridge National Laboratory. He is also an active member of the Kentucky NanoNET, and gave a lecture at its 2nd Annual Meeting at the University of Louisville in August.

JENNA COLE returns for a second year as a geology instructor. In the 2012 Fall, she was awarded an RCAP-I grant for “Mineral Identification in Saharan Dust Samples Spanning the Last 25,000 Years.” A basic goal of the project is to understand subtropical terrestrial responses to deglacial climate changes. Over the past few months, a number of WKU students have been involved in the project, including undergraduate Geology majors Zach Pennington (B.S. 2013) and Justin Cave (B.S. expected 2013) and first-year Gatton Academy student Mollie Pope. These students have been busy processing samples from a variety of marine cores recovered off NW Africa, and collecting XRD data in the Crystal Kinetics Laboratory at WKU.

The dust mineralogy research builds on a larger project with Prof. Sidney Hemming of Columbia University and others. That collaborative work seeks to develop a new provenance tool combining K-Ar ages and mineral identification for understanding source regions of terrigenous material in the oceans. Preliminary results were presented in August 2013 at the Goldschmidt geochemistry

conference in Florence, Italy.

In October 2013, Dr Cole traveled to NY and NJ to conduct research and meet with collaborators at Stony Brook University, Rutgers University, and Columbia University. One of the main goals of this trip is to date sedimentary carbonates from Olduvai Gorge, Tanzania, with the uranium-lead geochronometer. Although Olduvai is located in a volcanically active area, and many ash layers have been used to constrain the ages of fossils and artifacts, a new locality has been discovered that is difficult to place in the established stratigraphy due to faulting and erosion. Dating the sedimentary carbonates is ideal in this context because they are in direct association with hominin fossils and stone tools. Dr Cole will also process samples from the middle Miocene Barstow Formation, California, for U-Pb dating. Some of that work will be presented at the Society of Vertebrate Paleontology annual meeting in November 2013 in Los Angeles. While at Stony Brook, Dr Cole will give a colloquium talk in the Department of Geosciences.



MARGARET CROWDER presents a thought problem for you: If a print-out of Margaret Crowder's Geogram article is sealed inside a box with a Geiger counter, a bottle of poison, and a sample of uranium 238, is the writing both Nobel Prize worthy and completely unreadable at the same time? (Find the answer

below.)

As you wait on pins and needles to see if you are correct and what you have won, Margaret has such an exciting story to tell you about her year! (There is NO sarcasm there, this is high fiction...um, non-fiction.) Margaret has been very busy over the past year and completed her Doctor of Education in Educational Leadership this past December. Her dissertation was titled: “The University as a Gendered Organization: Effects on Management Type, Climate, and Job Satisfaction” and her research investigated how the ‘genderedness’ of an

organization can influence leadership and employee perceptions. In an effort to contribute to the literature surrounding the relative dearth of women in science careers and the professoriate, Margaret specifically focused her research on the university environment and the climate for female faculty who work in the sciences.

Since becoming “not that kind of doctor,” Margaret has, with the help of Geoscience graduate students Andrew Reeder and Linda Baizel, continued work on an NSF grant to create more student-centered experiences for introductory geology labs. Margaret has also taken on a new course for SKyTeach, the Middle and High School math and science teacher-preparation program at WKU. The new course is SMED 360, Research Methods, and is being taught this Fall via a combination of one face-to-face classroom section and three interactive video services (IVS) sections with the extended campuses of Glasgow, Elizabethtown, and Owensboro.

During this past year, Margaret also began work as a board member for Kentuckians for Science Education, a statewide not-for-profit group supporting science education and educators in the Commonwealth of Kentucky. The organization recently lobbied in Frankfort for state approval of the new K-12 educational standards, the Next Generation Science Standards.

Moreover, although she campaigned against her own candidacy, in the spring, Margaret was elected as the new University Senate Chair for WKU. Margaret reports that being involved in the process of university governance has been a great learning experience (even just through the last couple of months) and she encourages others to get involved. Change only occurs when people take action.

(Well, now that you have been so very patient, it is time to see if you answered our little thought problem correctly -) Is Margaret's article, while sealed in the box, both amazing and amazingly horrible? The answer of course is “Yes!” Although perhaps since the poison is unlikely to actually 'kill' the article, and the half-life of the radioactive

sample is about 4.5 billion years, maybe the answer is “Yes, but a long time from now.” Or maybe the best answer is “The article was immediately shredded by the cat.” Well, if you got the right answer, you win....Schrödinger's Geogram! And now the cat's out of the bag...er, box.

SCOTT DOBLER has completed his twelfth year at Western Kentucky University. He 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 KGA has finished its strategic planning phase and now is implementing its three major goals: Within ten years, 80% of graduating students in Kentucky are prepared by way of highly trained instructors to go into the workforce with geographic skills and knowledge.

Within ten years, 80% of middle and high school social studies teachers in Kentucky have solid geographic backgrounds and the pedagogical knowledge to integrate geography across the curriculum by way of

professional development with partnerships such as ESRI.

Within ten years, the Kentucky Geographic Alliance is a self-sufficient entity with sustainable partners and strong influence in business, political, and education communities, by way of funding through partnerships and grants. If you are interested in understanding the process of how we are going to reach these goals, please read on:

The results of this planning have created a stronger relationship between the government, public and private sector, public schools, and higher education in regards to geographic literacy. This past summer (2013), the KGA trained eight teachers on how to create project-based geospatial programs that integrate into school curriculum. ESRI products were used to provide GIS software to schools free of charge. Next year, we plan on



implementing a state-wide training program that will be implemented at a number of selected sites.

A Kentucky atlas is in its last stage of development. The layouts with maps and supporting text have been created, and a number of K-12 classrooms have used it and provided feedback. Kentucky teachers are developing lesson plans that will supplement the atlas. The last step in this product is to find a number of sponsors in order to deliver a copy to each school in Kentucky. Currently the atlas has been updated with 2010 US census data, and we are searching for addition support.

This year, Scott will continue to develop and revitalize lesson plans for the Kentucky Mesonet (<http://www.kymesonet.org/>) to help K-12 teachers use local meteorology data in their classrooms. Teachers will be able to use real-time data in their school from the Kentucky Mesonet, while following teacher-developed lesson plans that follow their required curriculum.

In the year to come, Scott will be working with state and local educators to help implement Geographic Information Science (GIS) in schools. He will also be searching for additional funds to create an endowment for the Kentucky Geographic Alliance and to continue to fund geoeducational products. If you have any ideas or suggestions (or money), please contact Scott. *He is a nice guy and he would love to help you spend your money.*

JOSH DURKEE completed his fifth year at WKU and was promoted to Associate Professor. Josh taught Synoptic and Mesoscale Meteorology, along with two sections of Introduction to the Physical Environment. His students in the upper-level meteorology courses continued the annual tradition of competing in the national forecasting competition, WxChallenge, which hosts close to 2,500 forecasters that range in skill up to the professional level.

This year Dr. Durkee, along with Dr. Grady Dixon and eight students, traveled 7,115 miles across 10 states (Kentucky, Missouri, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Colorado, Arkansas and Tennessee) to apply various forecasting techniques with regard to severe weather, and to analyze and document the hazardous outcomes as they

unfolded. The group documented up to four confirmed tornadoes, including an hour-long EF-4 quasi-stationary tornado near Bennington, KS. The group also documented a number of damaging hail and wind events and flash floods. Plans for the 2014 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, the Science Olympiad, and a Meteorology workshop at the Cumberland Trace Elementary School here in Bowling Green, KY. With most of the work coming from the students, Josh also helped to coordinate efforts to get WKU officially certified as a National Oceanic Atmospheric Administration-National Weather Service Weather-Ready university.

In terms of research activity, Josh published an article in the *National Weather Digest*, which provides a diagnostic case-study analysis of a particularly complex non-convective high-wind event over the Great Lakes region in 2003. This is the first study to provide a comprehensive dynamical budget of atmospheric forcing that helped produce this landmark non-thunderstorm wind event. Josh also continues to research thunderstorms and precipitation variability across South America.

Aside from his own research endeavors, Josh has collaborated with a number of undergraduate students that resulted in numerous professional conference presentations at the national, regional, and local levels. Further, Josh has developed a new climate research effort with Dr. Jason Polk, Dr. Xingang Fan, and the Caribbean Community Climate Change Centre in Belize.

STUART FOSTER enjoyed a different kind of year. For the first time in his 25 years in the Department, Dr. Foster did not step into the classroom. Stuart completed his first year of a two-year term as president of the American Association of State Climatologists (AASC), where he headed efforts to develop a proposal that would restructure and rebrand the Association. "Growing interest in the dynamic nature of our climate has led to an increase



in the demand for climate services. The AASC is faced with an opportunity to play a greater role in the delivery of climate services, and my goal is to help seize that opportunity,” said Foster. He concluded his first year by presiding over the AASC Annual Meeting held during early July in St. Louis.

Dr. Foster continues to work diligently on building support around the Commonwealth for the Kentucky Mesonet. “We achieved proof of concept by building and operating a high-quality network of weather and climate monitoring stations that serves people in communities throughout the state,” he said. “Now, we are challenged to ensure its economic sustainability in the context of a very difficult budget environment.” Over the course of the year, Stuart gave several presentations and participated in many face-to-face meetings in an effort to build statewide political support for the Mesonet. One of his presentations occurred at a spring conference hosted by the Kentucky Chapter of the American Planning Association. “This was a nice opportunity to connect with the professional planning community, and it was rewarding to see a number of our former graduates from the city and regional planning program who have gone on to successful careers,” Foster said.

In addition to his professional efforts, Dr. Foster saw both of his children graduate with degrees from WKU, including his daughter Caley, who completed her Master’s degree in Industrial and Organizational Psychology, and his son Greg, who finished his Bachelor’s degree in Business Economics. Recognizing that he is not getting any younger, Stuart pursued an opportunity to follow a childhood dream when he stepped into the radio broadcast booth for the Bowling Green Hot Rods and made his debut as a color commentator. Over the course of the season he provided color commentary for more than a dozen professional minor league baseball games. “It was a wonderful experience. I was able to see a different side of professional baseball and had the opportunity to meet and work with some great people.”

NAHID GANI spent a wonderful and productive first year in the Department of Geography and Geology. She is glad to contribute to this year’s GEOGRAM once again. She spent most of her time preparing to teach three new courses, including

Tectonics, Structural Geology, and The Earth. She was excited to bring her entire Structural Geology class to the heart of the Appalachian Mountain Belt in Tennessee and North Carolina, as part of a combined fieldtrip with the Petrology class taught by Dr Wulff. She realized that her students learned concepts of a difficult class like Structural Geology better in the outcrop than in a classroom setting. Highlighting the importance of fieldtrips in geoscience, she recently received an Honors Faculty Engagement Grant to engage her Honors students in The Earth (GEOL111) class for an on-campus field experience to study an outcropping of ~300 Ma old limestone.

On the research front, she spent her time in the field in the Himalayas foreland, Nepal, and the Rough Creek Graben of the stable craton of the central U.S. She also worked on developing her research lab, and submitting manuscripts and conference abstracts. Dr Gani is continuing her international research in East Africa and in the Nepalese Himalayas. She submitted a large-scale collaborative proposal with Arizona State University, Brown University, and the University of New Orleans to NSF to further her research overseas to address grand challenges of how earth-systems feedback plays a critical role in tectonics, paleoclimate, and landscape evolution. She and her student collected Siwalik sedimentary rock samples from the Himalayan foreland basin in Nepal to investigate orogenic unroofing of the Himalayas as a potential link to the late Miocene vegetation change and paleoclimate of the region. The Siwalik Group is structurally situated between the Main Boundary Thrust and Main Frontal Thrust. The Himalaya is one of the unique natural laboratories to understand Earth systems feedback among uplift, paleoclimate, and paleoecology. Dr Gani and co-authors are presenting their exciting initial results obtained from these samples at the October GSA annual meeting in Denver.

Her Ethiopian Plateau research is advancing nicely where she is investigating uplift history of the Ethiopian Plateau, which is critical to deciphering the tectonic and climatic evolution of the region. This region has long been used as a natural laboratory to comprehend the processes of continental rifting, which is the first stage in the formation of a new ocean basin. Moreover, the geological information that her research will extract is critical in evaluating

how the dynamic landscape of East Africa controlled the paleoclimate of the region and created a highly variable physiography that acted as a perfect cradle for the evolution of hominin. She has submitted one related manuscript over the summer and is presenting part of the results in the GSA annual meeting this year. Leah Sossamon, her new Master's student, arrived this fall, and started to work on the Ethiopian Plateau project. Her research focuses on understanding the incision history of the Ethiopian Plateau to reveal uplift history using a low-temperature (U-Th)/He thermochronology approach. Dr Gani and her student, Evan Crowe, have collected GPS-based field data over the summer to be simulated by 3D models in GIS. Evan has been successful in securing a FUSE-grant with Dr Gani for his undergraduate research on the Rough Creek Graben (RCG). Through fieldwork in the RCG over the summer, he acquired data for structural and geomorphic modeling to predict its behavior to the seismic energy originating from the New Madrid Seismic Zone. Evan also presented his research findings at the GSA annual meeting in Denver. He is greatly excited to gain the experience of attending such a reputable national meeting for the first time.

Naomi Kellogg, a Gatton Academy undergraduate student, joined Dr Gani's research group this Fall to understand the causes and effects of the unroofing of the Himalayan foreland basin. She has just started her lab work in the Geography and Geology department on Siwalik rock sample preparation and heavy mineral separation to extract zircon and apatite minerals. These minerals will be dated at Arizona State University, and the results will be used to understand how the exhumation of the Himalayas affected paleoclimate and paleoecology during the late Miocene. Natasha Patterson, an honors Geology undergraduate student, is also working with Dr Gani's research group on her independent study research. Natasha is focusing on remote-sensing analysis and mapping of continental flood basalts to constrain

basalt thickness throughout the Ethiopian Plateau. She will be generating a series of false-color composite and image-fusion models through the digital processing of ASTER imageries.

Dr Gani's collaborative project on reservoir analog modeling in the Book Cliffs, Utah, where she is involved in modeling channel sandbody using high-resolution, helicopter-born LIDAR data and GIS techniques, is also progressing quite well. One research paper co-authored by Dr Gani was published recently in *Sedimentology*, and another manuscript is currently under revision for the AAPG Bulletin. The Ph.D. student at UNO, whom Dr Gani is mentoring for LIDAR modeling, is preparing to defend his dissertation during this Fall semester.

Although Dr Gani's GEOWALL research lab in



the Geography and Geology department is progressing at a rather glacial pace, it would be a fantastic visualization center, once it is completed this academic year, for students and faculties to analyze various geoscience problems in 4D. This summer, she attended a week-long NSF-sponsored Early Career Geoscience Faculty workshop in

Washington D.C. This has been one of the best professional development experiences she had so far, where she got new insights into teaching, research, and managing a geoscience career, particularly as a female faculty trying to raise two kids. She is looking forward to applying these potential lessons and strategies that she learned to effective and active teaching techniques, student-oriented teaching, on successful strategies for maintaining active research, and on balancing competing academic demands.

Dr Gani is also maintaining active memberships with the American Geophysical Union, Geological Society of America, American Association of Petroleum Geologists, Association of Women Geoscientists, and the Kentucky Academy of Sciences. Dr Gani is anticipating another busy and productive year to devote herself in teaching, research, and departmental activities. She is also

looking forward to the wonderful opportunities for intermingling with students and colleagues that will invigorate WKU teaching and research profiles. Although it was a busy first year, she managed to take some time out with her husband Royhan (a Geo-faculty at UNO) to engage completely with their two beautiful daughters Ariti (7 years, in second grade and a ballerina) and Fia (2 years, in early-early pre-school!). This time, it was in the spectacular Niagara Falls in Canada!

GREG GOODRICH supervised the completion of graduate student Jeremy Young's thesis project on teleconnective relationships to post-tropical cyclones. This research was about figuring out why some hurricanes strengthen after leaving the warm tropical waters of the Gulf or Atlantic as they interact with mid-latitude systems over the United States. Part of the project was a case study on Hurricane Ike, which brought hurricane-force winds to parts of Kentucky in 2008 and knocked over Dr. Goodrich's apple tree. This research was especially timely as, just the week before Jeremy's public defense in early November, Hurricane Sandy gained strength and devastated New Jersey and other Mid-Atlantic states after merging with a frontal system over the East Coast. After graduation, Jeremy started a new position as a Systems Engineer with MorphoTrust.

Dr Goodrich started a new research project with undergraduate meteorology major Ashlan Clark, investigating nocturnal risk in the Mid-South. Recent research shows that Tennessee and Kentucky have the 1st and 3rd highest risk of nocturnal tornadoes in the United States. Since mortality and injury rates are typically higher with nocturnal tornadoes, they decided to do a spatial and temporal analysis of nocturnal tornadoes 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. Ashlan won first place at the WKU Student Research competition in the spring.

Finally, Dr Goodrich 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 corn production in Kentucky. A manuscript was submitted to *Applied Geography* and has received favorable reviews.

In the classroom, Dr Goodrich taught classes he had offered before, including sections of GEOG 325 (Meteorological Instruments) and GEOG 424 (Weather Analysis and Forecasting). He also developed new Gen-Ed courses for the WKU Colonnade Program titled "Our Dangerous Planet" (GEOG 226) and "Our Vulnerable Planet" (GEOG 227), which are both natural hazards classes that can be thought of as "How the Earth can kill us" and "How we are killing the Earth" respectively. The Meteorology Program continues to grow and now has over 70 majors. Several recent graduates found work in meteorology in the past year, including Dustin Jordan at the Caribou, ME, office of the National Weather Service,

Nathaniel Shearer as a Weather Officer with the U.S. Air Force, and Marcus Bagwell as a Broadcast Meteorologist with a TV station in Tyler, TX. On a personal note Dr. Goodrich welcomed a daughter, named Aurora Skye, on June 17th.



MARGARET "PEGGY" GRIPSHOVER asks "what's new in 2013?" The biggest news is that Governor Steve Beshear named her as the State Geographer for the Commonwealth of Kentucky. Dr Gripshover is the first woman to hold this position. The State Geographer serves as an expert-in-residence who could be called upon to consult with state and local officials on geographic issues. Peggy has many ideas for the Commonwealth but so far no one has

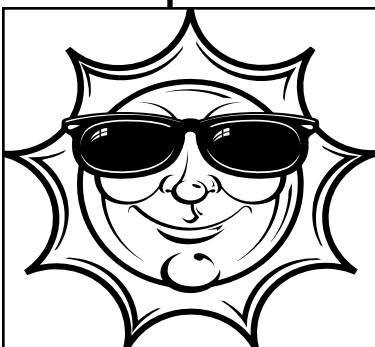
supported her proposal to rename it the “State of Gripshover.” When she is not tending to Kentucky’s geographic problems, Dr Gripshover is busy teaching classes in World Regional, Cultural, Economic, Urban and, of course, the Geography of Kentucky. Peggy worked on several Kentucky-based research projects over the past year on such topics as landscape change among Thoroughbred horse farms in Kentucky and historic neighborhoods and landscapes of Bowling Green. Dr Gripshover also continued working on research related to the geography of patent innovation and as well as on her book about Charles Weeghman, the man who built Wrigley Field. She published a photo essay on “Ghost Horse” landscapes in the journal *Material Culture* and has a book review set to appear in that same journal in an upcoming issue.

Dr Gripshover also wrote the narrative material for the forthcoming Atlas of Kentucky, to be published by the Kentucky Geographic Alliance. Peggy presented papers, posters, and served on panels at several conferences over the past year, including the Mammoth Cave Research Symposium, Pioneer America Society/Association for the Preservation of Artifacts and Landscape Conference, and the Annual Meeting of the Southeastern Division of the Association of American Geographers. Her presentations included such diverse topics as tobacco patents, journal editing, Kentucky horse farms, and the geography of music venues. Dr Gripshover also continued her work as co-editor of the international journal *FOCUS on Geography* with co-editor and spousal unit Thomas L. Bell. Peggy and Tom are also co-authors on several current research projects. When she is not busy chasing horses, documenting the cultural landscape, teaching classes, and serving on departmental and university committees, Peggy likes to take out her frustrations on a fuzzy yellow ball on the tennis court, putter around in her garden, and travel with husband Tom and their Australian Shepherd, Sophie. Sophie is becoming a regular on campus these days. In 2012, she made her second appearance in the WKU Homecoming parade as a member of the “Big Red Barking Band,” along with her canine friend, Goldie, who was owned by our dear friend and fellow geographer Debbie Kreitzer. Debbie

passed away earlier this year and we deeply miss her as a friend and colleague.

CHRIS GROVES continued through the year with a variety of local, national, and international programs and conferences that provided excellent chances to learn about new karst regions and develop interactions with colleagues around the world. In September, 2012, he travelled as an invited speaker to the International Conference on Scientific Research in Show Caves held at the spectacular Škocjanske Jame World Heritage Site in Slovenia in the northern part of the former Yugoslavia, home to the “Classical Karst” region that now gives its name to karst regions worldwide. Field excursions within Slovenia and nearby Italy highlighted visits to great huge caves and, during the conference, he spoke about the legacy of research in Show Caves of the Mammoth Cave area.

As in past years, Groves made several trips to rural southwest China for meetings, fieldwork, and other interactions with Chinese colleagues and landscapes. In December, he attended the annual meetings of the



Board of Governors and Academic Committee of UNESCO’s International Research Center on Karst (IRCK) in Guilin and had a chance to visit experimental watersheds at Maocun. This was followed up in April when he returned to IRCK as an invited speaker at the International Symposium on Karst Water Under Climate Change. There, he talked about the potential impacts of climate change on karst water resources in the United States, and what water managers in the U.S. are doing to prepare for that. While investigating the topic, which had been assigned to him by the conference organizers, Groves to his surprise concluded that, with the exceptions of a few U.S. regions, there’s really not much. In part, this is because, while karst regions cover extensive parts of the U.S., many urban areas within them—Bowling Green, Louisville, and Nashville, for example—tend to be built along surface rivers.

Another fine, if short, trip took place in September 2013 to the International Association of Hydrogeologists’ conference in Budapest, Hungary.

Besides the beautiful architecture straddling the Danube River, Budapest is well known for the popular use of the city's springs as bathing spas that goes back to at least the Roman period and reflects influences of the various cultures that have developed them, notably the Ottoman Turks who occupied the region in the 15th and 16th centuries. Purely in the interest of science, a large group of hydrogeologists from the conference investigated the Széchenyi spa one evening after the day's presentations.

Still outside the classroom, yet closer to home, Groves continued serving on the Kentucky Board of Trustees for The Nature Conservancy, and is happy to be acting in a science advisory capacity on what is emerging as a national effort to raise awareness about, and conservation of, karst landscapes with TNC.

At home Lillian (now 10) and Leah (7) continue to grow like the proverbial weeds out here in the countryside, and we are working to settle into a new routine following Deana's permanent promotion to Department Head of WKU's Library Technical Services, which is keeping her busier than ever.

Now in the Fall, when we all write our Geogram news updates and reflect on the past year, I am mindful of our colleague and friend, Debbie Kreitzer, who is sorely missed. Almost as a Fall ritual, not long ago it popped into my head that it was time once again to check with Debbie about scheduling what seems like our millionth class expedition to Mammoth Cave, and I almost got up to head down the hall to find her when I stopped myself and experienced a sad, sad moment. Well, Scott Dobler, Will Blackburn, and I will carry on with these fun trips (and all are welcome) and we will certainly be mindful of Debbie whenever we head once again down those steps into the cool air of the cave.

DAVID J. KEELING writes that his twentieth year in the Department, and twelfth as Department Head, continued to generate 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! For two weeks in May

-June 2012, he explored the canal landscapes and transportation byways of North Wales and central England with spouse DJ Urquhart and a friend from Cambridge, UK. The trip included a 7-day sojourn on the Llangollen Canal in North Wales. He then traveled south to Buenos Aires, Argentina, to join his colleague Dr John Dizgun, 2012 leader of the KIIS Argentina program, to give a couple of guest lectures and to continue research on that complex and challenging country!

After returning from the Southern Cone, Dr Keeling flew back across the Atlantic to Edinburgh, Scotland, to attend the annual conference of the Royal Geographical Society and Institute of British Geographers. He presented a paper at the conference on transport issues and participated in a meeting of the Board of the *Journal of Transport Geography*, on which he serves as editor for the Americas. A few days R&R in Myrtle Beach, SC, followed to close out the summer.

His international travel continued in October with the inaugural Four Seasons Around the World educational expedition, run by TCS-Starquest, on which he served as the American Geographical Society lecturer. During visits to Hawaii, Bora Bora, Sydney (Australia), Bali (Indonesia), Chiang Mai (Thailand), Burma/Laos, Agra and Mumbai (India), Cairo (Egypt), and London (England), he gave several lectures on political geography, environmental change, and transportation. Other travels during the academic year included Milwaukee, for the annual American Geographical Society Council meeting, England for Christmas Break, Los Angeles for the annual AAG conference, Denver for guest lectures at the University of Denver, and Portland (Maine) for some lobster dinners. Dr Keeling finished up the year's travels with a visit to Santiago, Chile, to guest lecture for the KIIS Chile program led by colleague Dr John Dizgun. Dr Keeling will return to Argentina in summer 2014 as leader of the KIIS Argentina program that now rotates annually between Chile and Argentina.

Locally, Dr Keeling supervised the completion of Jess Cary's graduate thesis titled "*Bosnian Immigrants: An Analysis of the Bosnian Community's*



Influence on the Cultural Landscape of Bowling Green, KY,” and served as a reader on several other graduate theses. On the research front, Dr Keeling completed several projects, included OpEds on both Syria and the Falkland Islands and several short essays for *FOCUS on Geography*. He published a Viewpoint article in the *Journal of Transport Geography* on the state of transport research in Latin America, and contributed an essay titled “A Geopolitical Perspective on Argentina’s Malvinas/Falkland Claims” for the journal *Global Discourse*, part of a Symposium on the 180th anniversary of the Britain’s settlement of the islands in 1833. He is currently completing a new chapter on Transportation and a revision of the Southern Cone chapter for the 7th edition of the Blouet and Blouet *Latin America and the Caribbean* textbook, for publication in 2014.

Within the community and on campus, Dr Keeling gave several talks on issues ranging from cyberwarfare and geopolitics to WKU’s international reach, appearing on the WKYU-TV program *Outlook* (check it out on Youtube) in September. He also gave a talk in the Department’s bi-weekly seminar series titled “How to Use Geographic Analysis to Influence Public Opinion.” Dr Keeling also continued to serve as a National Councilor for the American Geographical Society, and as the webmaster for the 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. He was honored to be appointed a University Distinguished Professor of Geography at the annual WKU Convocation in August, in recognition of his many years of service to the university and of his research and teaching accomplishments. Also, 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!

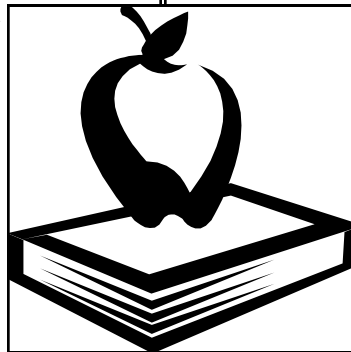
As always, Dr Keeling encourages past, present, and potential students to come by and share travel stories, information, and geographic tidbits. He can be

reached easily in cyberspace at: david.keeling@wku.edu or by phone at (270) 745-4555. Also, visit Dr Keeling’s page on Facebook to follow his global adventures.

REZAUL MAHMOOD has continued to contribute to departmental teaching, research, and service goals. He taught courses in Meteorology, Hydroclimatology, supervised a graduate thesis and several independent study courses. Rezaul has continue to expand his research in meso-scale weather and climate observations, impacts of land-cover change on weather and climate, soil moisture, land surface-atmosphere interactions, and modeling of gaseous emissions and transport. Four graduate and six undergraduate students participated in these research activities and gained hands-on learning experience. Rezaul mentored three students to present papers and posters at the 93rd Annual Meeting of the American Meteorological Society, Austin, TX. In addition, he has made invited presentation at the Department of Atmospheric Science, The University of Alabama in Huntsville.

Over the past year, Rezaul has published his research in a number of peer-reviewed journals, including *International Journal of Climatology*, *Applied Geography*, and *Applied Engineering in Agriculture*. He also submitted a number of other papers for peer-reviewed publication. Rezaul continues to serve as an editor of the journal *Earth Interactions*. He also serves on the editorial board of *Geography Compass*. Rezaul attended the annual Editor-in-Chief’s meetings of the American Geophysical Union (AGU) in Miami, FL, and of the American Meteorological Society (AMS) in Boston, MA. He has continued to serve in the National Climate Assessment Development and Advisory Committee (NCADAC) and on the Board of Directors of the Applied Geography Conference. As a result, he also traveled to Washington, D.C., several times to attend the NCADAC meetings and to Minneapolis to present as a panelist at the Applied Geography Conference.

Rezaul traveled to China again this year for two weeks to continue collaborative research in modeling

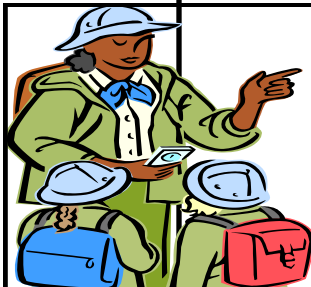


the impacts of land-cover changes on weather and climate. Rezaul also visited England this summer for two weeks.

Rezaul and Dr Stuart Foster have continued to build the Kentucky Mesonet. This is a world-class research-grade operational network for weather and climate monitoring. This is only the second of this type of network 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 also submitted several large competitive grants.

Rezaul's overall activities led to several visits by internationally renowned scientists, including from the USGS/EROS Center, National Autonomous University of Mexico (UNAM), the University of Alabama at Huntsville, and Curtin University, Australia.



MICHAEL MAY is enjoying his work with several graduate students researching in either Illinois, Indiana, Kentucky or limited areas of Tennessee (Illinois Basin). This group of grad students refers to themselves as the Illinois Basin Group at WKU. This is proving to be a great moniker for student "business cards" that are presented at regional and national meetings such as last spring's AAPG meeting in Pittsburgh. This generated some interest in geology at WKU on the part of several oil and gas companies and consultants. At least two grad students that Dr May has been working with are presently working on securing contract work in the basin as they complete their M.S. degrees.

Mike continues his interest in unconventional resources (heavy oil and tar sands) in the Kentucky region and over the past summer, along with Dr Andrew Wulff, happened upon some important related historical pieces of the Kyrock or Asphalt rock puzzle. This discovery of old post cards, photographs, and negatives, primarily from the 1920s and 1930s, of long-gone towns and asphalt rock mines in Edmonson County, such as Kyrock and Black Gold, was quite a

surprise. These and other items were discovered upon their helping to clean out the old basement of the Colonel and Mrs. John Carmichael house located just a stone's throw from EST on Chestnut Street. It turns out that many of the early 1900s' items actually belonged to the Colonel's father, Harry St. George Tucker Carmichael, a main player in the development of the asphalt rock, the mining engineer who attempted to free Floyd Collins from Sand Cave, and the same fellow who drilled and constructed the Carmichael Entrance at Mammoth Cave National Park. The Colonel was an air force fighter pilot and, like his father Harry, had ties to both Virginia and Kentucky. It was discovered that Colonel John Carmichael was also quite the rock hound. He operated "The Colonel's Rock Shop" out of his basement in this Chestnut Street house. There were a few lapidary saws, polishing wheels, and a multitude of tumbled stones and agate slabs ready for belt buckles, jewelry, clocks, etc. These materials were moved to the basement of EST, where existing rock saws and associated lapidary equipment reside. The Department thanks Prof. Neal Downing in Architectural and Manufacturing Science for alerting us about these geological riches and equipment. We also thank Cheri and Joe Natcher for suggesting that WKU could possibly benefit from this collection from the house that they own and are refurbishing for a WKU sorority. Faculty and students are quite excited about this donation!

Dr May continues chairing the theses of Linda Baizel, Jeremy London, and Kort Butler and he is on the committee for Andrew Reeder (chair Dr Siewers) and Bruce Hatcher (chair Dr Groves). Growth in the Graduate Program continues as two additional grad students joining his research group in August, WKU Geology alumnus Ryan Hart and Austin Peay State University alumnus, Steven Devine. Both Hart and Devine are working on limestone (carbonate) topics. Ryan is working with Dr May in the subsurface in oil productive areas of the basin (oolitic shoals as petroleum producers and candidates for horizontal drilling) and Steven is focused on petrographic characteristics associated with the generation of cavernous porosity development. In addition to graduate students, Mike continues to engage a few

undergraduate students in research. He advised several graduate and undergraduate students on presenting their research on Illinois Basin geology at the 2013 WKU Spring Research Conference.

Dr May, along with instructor Joe Islas, traveled with a group of graduate students to the National American Association of Petroleum Geologists Convention in Pittsburgh, Pennsylvania, in May 2013. A primary goal of attending the conference was to present two poster sessions related to tar-sand and heavy oil research that is ongoing in our south central Kentucky region. The convention was a good one as always and was made especially nice with a hotel nearest the triangle park area where the Ohio River begins. Another highlight was meeting up with WKU Geology alum and benefactor, Robert (Bo) McCue and his wife Lindsey at their home in the Pittsburgh area. The Geology program continues to benefit from the McCues' generosity, which provides funds for student engagement in the field and for attending meetings with faculty advisors.

Course offerings by Mike included the usual, but a new course running this Fall entitled Petrophysics and Well Logs is providing more in-depth topical coverage on the theory of subsurface well logging, as well as examination of cores and associated well logs and petrophysical parameters such as rock porosity and permeability. Much of the on-hands portion is taking advantage of well documented core and geophysical well logs and core analysis data from WKU Geology alumnus Bill Dost (BS '79) in Oklahoma. The Department acquired these materials over the summer this year. With the growth of student interest in the petroleum industry, these donated cores and well logs and the AAPG library resources funded by the William Dost Energy Research Endowment continue to be heavily utilized by students.

It was a busy year for the Geology Program overall and Mike was quite involved with the dedication of Reynolds Geological Resources Laboratory (see

article mentioning this elsewhere in the Geogram). Dr May once again invites alumni or anyone interested to visit the developing Reynolds Laboratory space. The next large purchase for the lab is anticipated to be a high-end research petrographic microscope with various visibility tools attached including camera, projector, and video system and possibly a luminescope (the latter for studying luminescence in mineral cements for example, for establishing sequence of mineralization in ore bodies, oil reservoir rocks, etc). The Department continues to get mileage out of the Reynolds Lab with plans for GIS software and other geology software in the near future. If you would like to come by and see it, or make a contribution for maintaining this space and expanding the capabilities of the lab please contact Dr May at michael.may@wku.edu.



On a personal front, the May family continues with soccer and school activities with Peter as a junior at the University of Evansville (IN) and Kevin as a freshman at Colorado School of Mines in Petroleum Engineering. Beth is also continuing her teaching of middle grades science at St. Joseph Interparochial School in Bowling Green. Although

the May boys are off away at college, the Bowling Green-based parents continue to attempt to travel to as many soccer games as possible, with care packages in tow.

AMY NEMON writes that Fall 2013 marks the start of her ninth year teaching for WKU. She continues to be located in Glasgow with outreach to other extended campuses and online courses. Amy continues to teach World Regional, Geography of North America and Kentucky, and GIS courses. This year she has added Environmental Science and Global Sustainability to her schedule.

Amy continues being active on the Kentucky Geographic Alliance's (KGA) steering committee and the Kentucky Geographic Names Committee (KGNC). This year Amy will be the sole state coordinator for the National Geographic State Bee.

The next be will be April 4th, 2014, at the Carroll Knicely Conference center in Bowling Green. This spring will be the 11th year the event has been held in Bowling Green. It is very exciting to see so many geographically aware students from around the state! The turnout of volunteers from the department's faculty, graduate students, and pre-service teachers helps to make this a very successful event!

This past academic year, Amy saw one of her long-term goals come to fruition by becoming a founding faculty advisor for the WKU Glasgow Greentoppers, which has a commitment towards a greener more sustainable future on campus and throughout the community. The organization sponsored a number of events this past year including B.O.O., an event supporting local pumpkin farmers; Awaken the Dreamer workshop, which

brought 50 community members and students together to inspire sustainable practices; Rain Barrel workshop where participants built their own 55 gallon rain barrels out of recycled material; A Tour de Farm bike ride event, which was the kick off for the local farmers market opening; and the organization joined up with Barren County High School for an Earth Day event. With a great group of motivated students, the Greentoppers hope to keep the momentum going with the 2013-2014 academic year. With interest where it is in Glasgow, Amy is working on developing a new Interdisciplinary major in Sustainability for the Glasgow campus.

Amy's research interests are still strongly geared towards K-12 geography education and medical geography. 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. There are also talks of creating an online GIS that supports the local economy. The website would list and locate all small, local, green businesses, making it easier for the consumer to support local businesses.

LESLIE NORTH had a productive second

year in the Department, and also directed the Karst Field Studies program to one of its most successful years in recent history. Leslie was involved with numerous grant/contract submissions, with over half awarded from a myriad of funding agencies. Multiple exciting projects initiated during her first year were also completed, including the production of nine sustainability-related interpretative signs at the local Habitat for Humanity community, Durbin Estates, and the launch of "The Great Karst Trail." The trail is designed to connect the most important, famous, or interesting karst areas, not only on the ground through interpretative signs but also in virtual space, where you can explore karst all over the world through an interactive website.

The first of the Great Karst Trail sites will be installed this Fall at Lost River Cave and Valley, and the full interactive website with accompanying app is scheduled to launch in late December. The second Great Karst Trail stop, Edwards Aquifer in Texas, will be completed this year, followed soon thereafter by the first international

location, Doolin Cave in Doolin, Ireland. In partnership with the WKU Office of Sustainability, Dr. North and Hoffman Environmental Research Institute staff member Jonathan Oglesby also completed "Big Red, Small Planet: Sustainability at Western Kentucky University," an iBook featuring the sustainability initiatives and accomplishments of WKU during the 2013 academic year. Download the 93-page book for free through the Apple iTunes Store and discover the unique ways WKU is working to promote a sustainable campus and community.

Perhaps one of the most exciting adventures Dr North had this past academic year was a month-long research trip through ten European countries. Accompanied by Dr Jason Polk, and supported by a WKU RCAP grant, the team sought to investigate guided show-cave experiences and interpretative learning opportunities offered to cave visitors. In total, seventeen show caves were visited and



Department of Geography and Geology
GEOGRAPHY GEOLOGY METEOROLOGY GIS

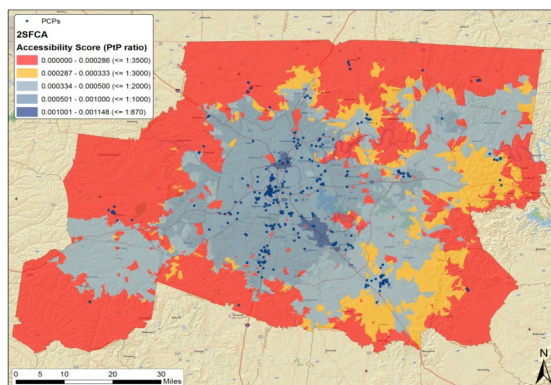
examined in countries including Ireland, Italy, Slovenia, and Germany, among others. Additionally, over three hundred surveys to show-cave visitors were collected from July to August to establish learning outcomes of these guided cave experiences. Data collected from this study will be used to strengthen a larger National Science Foundation grant proposal related to show-cave management and interpretation practices in both the United States and Internationally. She is excited to continue working on this research during the academic year and even further into the future.

Funding acquired from various sources in her second year was used to purchase an eye-tracking device, which will be used in the first of many research projects related to karst visualizations and interpretation this academic year. Eye-tracking is a technique used to measure quantitatively an individual's points of interest and eye movements when viewing a 2D or 3D visualization. Dr North and a team of graduate and undergraduate students hope to combine image-processing capabilities with eye-tracking techniques to understand how observers visualize and interpret karst landscapes and educational materials, and ultimately perpetuate karst knowledge by developing new educational resources that communicate more effectively and efficiently karst and groundwater concepts to non-karst experts.

While in Europe, Drs. Polk and North joined six additional WKU staff and students in Brno, Czech Republic, at the International Congress of Speleology. Additionally, with student engagement, collaboration and, of course, travel opportunities in mind, Dr North also attended professional meetings of the Southeast Division of the Association of American Geographers, Geological Society of America, and the Kentucky Academy of Science during the 2013 academic year. At these meetings she presented multiple papers/posters and participated in the development of several additional presentations with fellow colleagues, WKU graduate and undergraduate students, and Hoffman Institute staff members.

As she begins her third year at WKU, Dr North is looking forward to enhancing the program's environmental focus during the 2014 academic year, continuing her travels in the states and internationally, and spending more time creating great memories with friends and family! With many outreach projects now completed, she is anxious to discover what other exciting outreach projects may be on the horizon, and how eye-tracking can help advance our understanding of, and advance, karst education.

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, Environmental Isotope Geochemistry, which focused on an interdisciplinary

approach to studying isotopes to explore environmental processes. In addition, he helped to welcome several new graduate and undergraduate students to the program. Dr Polk also graduated another Geoscience student, Gil Ouellette, whose thesis focused on a paleoclimate reconstruction of rainfall in Barbados over the past 1,500 years. Gil also received the Ogden College Outstanding Graduate Student award, and has now started his Ph.D. at Louisiana State University to study multi-proxy paleoclimate reconstruction under Dr Kristine DeLong.

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 over 25 conference presentations at local and national meetings, including the Geological Society of America, Kentucky Academy of Science,

and the International Congress of Speleology in the Czech Republic. This latter conference was one component of a month-long trip to Europe, which involved 10 countries and many thousands of miles to research show caves under a project directed by Dr Leslie North. Collectively, they visited over 15 show caves to conduct research related to informal learning, interpretation, and international show cave communication practices. During this trip, Dr Polk visited several iconic karst landscapes, including the Moravian karst in the Czech Republic, the Burren in Ireland, and the Kras Plateau in Slovenia, among others.

This past year, Dr Polk also engaged in myriad other research and outreach activities, including several continuations with colleagues involving water, climate, and karst landscape research. He has submitted several proposals with colleagues from the University of West Indies, University of Belize, Vanderbilt University, Louisiana State University, the University of Southern Mississippi, and the USGS on projects ranging from isotope studies of carbon flux through the northern hemisphere to water resource issues in Belize. 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. Dr Polk also collaborated on a BBC/Discovery channel documentary on an environmental issue that will air later this year!

Continuing to delve into his research, Dr Polk performed lab experiments and fieldwork with several undergraduate and graduate students during the past year, including two trips to Barbados with grad student Gil Ouellette to work on a paleoclimate reconstruction of precipitation in the region using cave deposits. From that work, several undergrads have been working on these samples in the lab for isotope and mineralogical analyses. He also traveled to Belize several times with colleagues and students, including one trip with Drs Josh Durkee and Xingang Fan, to develop a downscale climate model for the Caribbean region. Other trips included grad students and work with community groups regarding water resources, climate change, and cave studies. Dr Polk also worked with other colleagues and students within

the Department to create and educational launch of the CCORAL online climate risk adaptation tool with the Caribbean Community Climate Change Centre, which is responsible for climate change science and policy in the Caribbean region. Dr Polk will travel to Jamaica in October to give a workshop on isotope hydrology and water resources as part of an ongoing effort to address these issues in the region.

Dr Polk is very proud of completing a book chapter this past summer on caves and karst development in Florida for *Coastal Karst Landforms*, which was published recently by Springer. 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 the Climate Change Challenge voyage to Northern Europe with the Semester at Sea program.

Now entering his fifth year at WKU, Dr Polk is really digging into new research projects, settling in nicely, and hitting stride for another busy 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. Dr Polk plans to balance out all these activities by continuing to engage in caving, travel, and plans to attend several concerts this year. He is excited for the upcoming year and wishes everyone well in his or her endeavors!



FRED SIEWERS had a varied and exciting year. He spent the Fall semester with his family teaching at Harlaxton College, England, the British campus of the University of Evansville; WKU sends students there for a Britain-based study abroad experience. Fred went explicitly to walk in the footsteps of founding fathers (and mothers) of Geology: James Hutton, William Smith, and Mary Anning. His travels throughout the UK allowed him to check-off lots of "bucket-list" geology destinations, including Siccar Point, the Giants Causeway, Lyme Regis and the Jurassic Coast, and numerous important natural history museums. When not traveling, Dr Siewers

taught courses in Environmental Science, Physical Geography, and the Geology of Britain. All of those courses featured field trips to important English sites such as the Royal Astronomical Observatory in Greenwich (think Prime Meridian), the Thames Flood Control Barrier in London, and the Sedgwick Museum of Earth Science in Cambridge (which included Darwin's personal rock collection from the HMS Beagle!). All in all, it was a tremendous experience for Fred and his family.

During the Spring Semester, Fred was back at WKU teaching his usual mix of courses. Those courses included Earth History, Sedimentology and Stratigraphy, and Professional Preparation. In Sed-Strat he ran another highly successful Pound Gap trip. In Professional Prep, he once again invited program

graduates to share their post-WKU life and work experience. This year's presenters included Ron Taylor ('04), Bethany Overfield ('01), Chelsea Brunner ('09), David Doyle ('91), and Austin Moyers ('10). These folks had much wisdom to impart! The students clearly benefited from their time and willingness to share their stories and experience.

Dr Siewers continued to work with undergraduates and graduate students on various research projects. A few of those projects focused on the use of ostracodes (bi-valved microcrustaceans) as proxies for environmental conditions in Bahamian lakes systems. One student, Rachel Bowles, completed her M.S. thesis under Dr Siewers' direction; another undergraduate student, Jordan Seng, worked to extend Rachel's work into the geologic past through a study of ostracodes in sediment cores. Dr Siewers also directed, along with Mike May, the M.S. thesis of Andrew Reeder. Andy's work has focused on 3-D subsurface visualization of past petroleum production in Kentucky. That project will wrap up in the coming year.

In addition to these research efforts, Dr Siewers began a new initiative focused on carbon sequestration education. Funded through a subcontract from the Illinois State Geological Survey and the

Department of Energy, Dr Siewers and colleagues are developing a series of professional development workshops focused on the capture and storage of CO₂ in geologic formations (see <http://www.sequestration.org/step/>). Dr Siewers is excited to bring his long classroom teaching experience to a new audience of regulators, engineers, and practicing geoscientists.

Finally, Dr Siewers led an initiative to bring the energy documentary "Switch" to WKU. Switch is an award-winning film that focuses on what it will take to switch from our current sources of energy to a more sustainable energy future (see <http://www.switchenergyproject.com>). Sponsored by the Department of Geography and Geology and the WKU Office of Sustainability, *Switch* was a major campus event with over 300 attendees and a follow-up panel discussion with WKU staff and faculty. Students left the event with a much clearer understanding of our shared energy future.

Dr Siewers loves keeping up with program graduates. Feel free to contact him at any time (fred.siewers@wku.edu) or to "friend" him on Facebook. Also, consider coming to WKU to share your post-WKU story with our current students! They have much to learn from your perspective and experience! 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 seven research presentations at regional to national scientific conferences. Andrew is currently supervising undergraduates working on projects including igneous petrology/geochemistry, characterization of ore suites, models of ore petrogenesis, and the use of Raman microscopy and electron microprobe to identify zoning profiles in minerals. Having good analytical facilities leads to so many exciting research experiences for our students!

Andrew had two articles published; "Portals for

Undergraduate Research in Geology” in *EOS*, 94(6), and, along with Dr May, “Intentional Learning for Career Success” in *The Professional Geologist*, 50(2), 10-13. He also is a co-author with colleagues from Illinois State, Columbia University, and MacAlester College, on: “Precise Initiation Age (48.7 Ma) of the Eocene Heart Mountain Slide, Wyoming, USA” (submitted to *Geosphere* this past August)

WKU initiated a new program for funding competitive undergraduate research projects. The FUSE program (Faculty Undergraduate Student Engagement) provides monies for research and travel to conferences to present results. Jordan Cottingham and Jacob Hughes both were awarded grants totaling \$9100 to complete their research with Dr. Wulff. Jordan, accompanied by John Papineau and Brandon Thomas, developed an SOP for an air rotary drill rig and drilled a successful hole at the WKU McChesney Field Station. Jacob will be 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 will also be looking at MVT-type deposits, using the same techniques as Jacob, but from the area around Burkesville, KY. Both have their eyes on graduate work in economic geology. Darrin Green will be 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. These four, and five students in the past two years, have laid the groundwork for a growing research group in Economic Geology.

Student interest in mining and resource exploration has risen, as evidenced by a full class in Economic Geology last Fall. All the students modeled exploration techniques by characterizing ore samples from different locales, and studied models of ore petrogenesis. If you have access to ore samples – please consider sending them to us for analysis in this 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 six universities (see story and photo 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. WKU Geology majors again represented the program well, with three “A”s and a nomination for a USGS/NAGT internship. Strong performance in the field course leads to these great “door-opening” internships. 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 finishing his second three-year term as a national Councilor in Geosciences for the Council on Undergraduate Research (CUR), and looks forward to his annual visit to legislators in Washington in September to advocate for increased funding for the geosciences. Dr Wulff worked again on the federally-funded EARTHSCOPE project with folks at Illinois State University, leading workshops that develop the principles of magma generation along volcanic arcs, and eruption prediction. Dr Wulff is committed as ever to bringing more earth science to the K-12 classrooms in the area and he and ten geology majors contributed many “contact hours” with students (primarily 4th, 5th, and 10th 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 (from New Mexico, Honduras, Nevada, Arizona, Oregon, and even Kentucky!). 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, and giving presentations on earthquake preparedness, and radon analysis and mitigation. Both kids are playing several sports and taking piano and cello lessons, with many additional

activities to keep Dad running – and young (or so they say!).

JUN YAN taught several upper-level GIS courses over the past year, including GIS Programming, Urban GIS Applications, and Geoscience Statistical Methods. In the GIS Programming class, students learned in-depth several advanced geoprocessing techniques with both ArcGIS ModelBuilder and Python scripting in ArcGIS 10.1. In the Urban GIS Applications class, they worked on a number of real-world projects, including assessing response times of fire stations in Bowling Green, selecting a new site for a fire station, redrawing school attendance zones, assessing bike latent demand routes, etc. Through these projects, students gained invaluable experiences on how to plan and implement a GIS project independently. Dr. Yan takes great pride in his students' accomplishments! Currently, he is developing a language rider course, Geography of China, for WKU's Chinese Flagship Program, in which students will learn the basic geography of China, in Chinese!

Dr. Yan also had a very productive academic year research wise. He conducted his research projects in the various fields of applied GIS and spatial statistics. 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*. Currently Dr Yan is on sabbatical leave for the Fall of 2013 and he is working on a project that looks at the spatio-temporal dynamics of the U.S. domestic airline market. Dr Yan advised several Master's students and two of them are scheduled to defend their theses in November, 2013. Frank Aryee's thesis assesses the services of GoBG public transit in the Bowling Green area from a geographic perspective, while Yan Chen's thesis investigates the spatial distribution of different types of fatal automobile crashes in the great Nashville area.

ALUMNI CONTRIBUTIONS

Contributions to the Department of Geography and Geology Development Fund in 2012-2013 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:

Anderson, Alan B.
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ALUMNI NEWS

Anthony Bedel (B.S. Meteorology 2010) completed his M.S. Thesis at the University of Georgia, titled "Climate Change and Associated Fire Potential for the southeastern United States in the 21st Century."

Melissa Cary (M.S. Geoscience 2012) writes that she and Rebecca Sales (B.S. Geography 2008) organized a successful music festival recently, along with Sara Haynes, Melissa Hawkins, and Paige Davenport. The Stucky Music Festival was held on May 17 and 18th at Park Mammoth Resort in Park City, KY. The purpose of the festival is to raise money for charity and to celebrate the great, often overlooked, music scene located in Southern Kentucky. The bands featured were regional acts from the Barren River area, Louisville, Lexington, and Nashville. The organizers had a great first year turnout and 25 bands performed. They still can't believe that they did this! It has been a very popular topic on many social networking sites.

Robert Gates (B.S. Geography 2010) has been working at the Barren River Development District for the past two years (first as a GIS Specialist and then as the Water Management Planner).

J. Alan Glennon (M.S. Geoscience 2001) completed his Ph.D. at U.C. Santa Barbara, titled "Analysis of Geographically Embedded Networks."

Ashley Littell Hitt (M.S. Geoscience 2007) was recently elected to the URISA Board of Directors for a three-year term. She is also the president-elect of the recently formed Cumberland Chapter of URISA, serving geospatial professionals in KY/TN. Currently, she is the Director of GIS Services at Connected Nation.

Travis Keeling (B.S. Geography 2004) was co-author with Mahmood, R., Foster, S.A., and Hubbard, K.G. on a peer-reviewed paper titled "Did irrigation impact 20th century temperature in the High Plains aquifer region?" published in 2013 in *Applied Geography* 38(1): 11-21.



Fill out the Alumni Information sheet on the next page and mail 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.

"I predict a fantastic 2014 if you send in your Alumni Information sheet right away....."

Rob Lewis (B.S. Geography 2007) has been accepted into the U.S. Army. with a logistics reserve unit, near where he lives in CA. For reservists, this job placement is necessary prior to training. He shipped out on March 25th to Ft. Jackson, South Carolina, where he will go through basic training, and then on to Ft. Benning, Georgia. for OCS.

LTC Kenny McDonald (M.S. Geography 1995) who is serving at the U.S. Military Academy as an associate professor and Engineering Management Program Director in the Department of Systems Engineering, has been appointed Associate Professor and Associate Director of the Center for Nation Reconstruction and Capacity Development at West Point. He earned his Ph.D. in Geological Engineering from the Missouri School of Mines.

McDonald is a licensed Professional Engineering (PE) as well as a Project Management Professional (PMP) and Certified Planner (AICP) and belongs to several professional organizations including the American Planning Association (APA), the Institute of Industrial Engineers (IIE), and the Society of American Military Engineers (SAME). In 2001, he was recognized as the TRADOC Engineer of the Year. The following year he was named the NSPE Federal Engineer of the Year. Additionally, under his direction, the Engineering Management program at West Point has been the recipient of the ASEM Founders Award for Best Engineering Management Program (2009-10). He has also authored in the areas of engineering education, engineering management, and environmental impact.

Justin Sowers (B.S. GIS 2011) is a Research Analyst for Store Development at the AutoZone Corporate HQ in Memphis. The company does high-level spatial analysis using GIS to select sites for new stores. Justin is enjoying the challenges of a new career in Memphis.

Andy Zimmerman (B.S. Geography 2004) has been promoted to GIS Manager at EnSafe, Inc.



GEOGRAM is designed, edited, and produced for the Department by Dr David J. Keeling.

david.keeling@wku.edu

<http://www.wku.edu/geoweb>

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GEOGRAM 2013

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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: _____

Mail to: Dr. David J. Keeling, Editor
Department of Geography & Geology
Western Kentucky University
1906 College Heights Blvd #31066
Bowling Green, KY 42101-1066