

## GEOLOGY

Alumni Newsletter | Fall 2015



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Cover photos courtesy of Hunter Harlow, taken in Paria, Utah in the Grand Staircase-Escalante.

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#### Dear Alumni and Friends of the Baylor University Department of Geology:

We are ever appreciative of your continued financial support that allows our students to enjoy excellent facilities, equipment and enriching classroom and research experiences. It is without exaggeration when I say that your generous financial support allows Baylor Geology to provide an educational experience that exceeds student expectation and is second to none. Students and faculty alike are most grateful to you all!

In regards to departmental news, we added a new hydrogeological modeler, Dr. Scott James, during Fall 2014. Dr. James received his Ph.D. from the University of California, Irvine, and spent the last 12 years working at both Sandia National Laboratory and Exponent Failure Analysis Associates. Dr. James joins us with a great deal of applied experience and is already collaborating in a range of projects related to water resources, renewable energy and unconventional bitumen reservoir modeling.

Also during 2014-2015, we completed a successful search to fill the Mineralogy/Petrology faculty position that was vacated as a result of Dr. Don Parker's retirement. Filling this position as an Assistant Professor is Dr. Kenneth (Kenny) Befus. Dr. Befus received his Ph.D. from the University of Texas at Austin and specializes in volcanology. Most recently, Dr. Befus served as a visiting Professor at Stanford University. During the Spring of 2014, Mr. Tim Meredith was hired as a Research Technician in support of Dr. Dan Peppe's paleomagnetism laboratory, as well as the geophysics research efforts of Drs. John Dunbar and Jay Pulliam. Prior to joining Baylor, Mr. Meredith was a contractor at Fort Hood, Texas, where he provided oversight to seismic monitoring.

Our undergraduate program has grown to about 74 majors. Most of these are in Geology, but we also have a few Geophysics and Earth Science majors as well. Our graduate program has an all-time high enrollment of 46 that includes 27 Ph.D. and 19 M.S. students. This total also includes a bumper crop of 9 incoming M.S. and 5 Ph.D. students. Funding for our M.S. students is largely derived from corporate contributions and individual gifts, whereas Ph.D. students are supported by the Baylor Graduate School and to a lesser amount by external grants. During the 2014-2015 academic year, 4 Ph.D. dissertations and 5 M.S. theses were completed. Our Ph.D. students accounted for 9 first-authored journal articles, and both our M.S. and Ph.D. students delivered 43 presentations at various professional meetings.

Finally, our Baylor Geological Studies/AAPG Student Chapter had an excellent year under the leadership of Ph.D. students Hunter Harlow and Caitlin Leslie. In addition to various social events and community service initiatives, e.g., Bowling night, "sailgating" at McLane Stadium, Habitat for Humanity, Mission Waco Christmas toy drive, the chapter organized 6 recruiting visits and/or technical presentations by various industry representatives, and increased graduate student membership by 40% and undergraduate membership by 90%. For their noteworthy efforts, the BGS/AAPG student chapter was recognized as the National Chapter of the Year by the AAPG. This is a high honor and a first for Baylor Geology! Once again, that you for your continued support and interest in Baylor Geology. Ultimately, it's our relationship with current and former students that motivate the faculty and staff within the Department of Geology. That is truly what it's all about!

Sincerely, Stacy Atchley Chairman

### Dr. Peter Allen



Another year of fun. Began with typical courses in physical geology and hydrology which are always a lot of fun and always lead to new questions. This year I have been working with senior geology major, Andrew Watson, on a newly designed submerged jet test which allows more controlled scour as well as simultaneous measurement of soil shear strength. Andrew is finishing up his senior thesis on this project. The results will be used to further refine the science of jet testing which is used to assess the rate of erosion in rivers, gullies, dam spillways etc. With about 400,000 miles of eroding channels in the United States, this seems like a pretty important endeavor. Next, I've been working with Dr. Joe Kuehl, a new assistant professor in the Department of Engineering and Bruce Byars on assessing lake shallow water velocities and shear with a newly developed instrument invented by one of Joe's former professors in oceanography.

The device allows assessment of both current direction, speed as well as bottom shear. We hope to use this to assess lake and reservoir shoreline erosion and have some pilot studies going. In Fort Worth, I have been working with the Stormwater Department under the supervision of my former students Dave and Stephanie Coffman on monitoring an eroding urban stream channel which impacts about 30 homeowners. This project included monitoring the erosion, submerged jet testing done by Andrew Watson, and working with Dave and Stephanie and Ranjan Muttiah of the City of Fort Worth to come up with potential remedial strategies with cost estimates running from 1-4 million dollars. Work still continues on software for the WEB in concert with the Department of Engineering at Colorado State https://erams.com/ with Drs. Arabi and Bledsoe at Colorado and Dr. Ieff Arnold at the USDA, ARS in Temple. It is hoped that final model

Hydrology class in action on Childress Creek on the first rains of El Nino





View from the top in Cagliari, Sardinia, location of the SWAT 2015 Conference

input will be finished this summer. The model, SWAT-DEG is a continuous simulation model which will help engineers and planners to assess the rate and magnitude of channel erosion with urbanization across the United States. We were host to Dr. Brian Bledsoe this spring for the OT Hayward Lectureship. Brian is one of the world's foremost experts on river dynamics especially associated with urbanization. Brian's group set many of the guidelines for California streams. Stephen Norair, a new MS student, came on in the fall and is working on an exciting project using dendrochronology or tree rings to assess the rates of urban stream erosion and incision. He is working along with Dr. Joseph White and I to use a combination of tree ring analysis , submerged jet testing and modeling to quantify rates of channel enlargement.

I continue to work on the SWAT model with Jeff Arnold and Mike White in Temple with the USDA/ARS. They are beginning a new national assessment of farming practices for the USDA and government to assess the benefits of "best management practices " in the farm bill. This go around they plan to model about 85,000 basins. In this regard, this summer I traveled to the International SWAT Conference in Sardinia, Italy and worked with Jeff and the international model developers group on new versions of the model in which we are modeling a wider variety of surficial processes. At the meeting, Dr. Srinivassan of Texas A&M announced he and Jeff had completed the first SWAT grid model of the world, had it running, and were now calibrating the model. It is to be free to download and will be used to assess world- wide trends for water use planning such as droughts, and water balance issues. Joseph Sang is close to defending his dissertation having published two papers (Earth Surface Processes and Canadian Geotechnical Journal) and will have his third paper ready to submit shortly. Joseph will be defending early this fall.





Velocity shear sensor testing on a cold rainy day in December

Finally on the home front, Peggy has been remodeling our new house, and we hope to move in in the next century. Sarah still lives in Dallas, and the grandkids are 9 and 13. Maggie is now in Denver and had her first child this July. Annabel is now based in Chicago and is a consultant working out of Chicago in hospitals around the United States.





Dr. Joseph White and Stephen Norair working on dendrochronology of stream in Texas. Note the depth from the top roots to the gully bottom denoting the amount of erosion.

Dr. Joe Keuhl

installing lake

velocity/shear sensors in Lake

and team

Waco





Greetings Baylor Geology alumni and friends! Aside from my duties as department Chair, much of my discretionary time during 2014-2015 was spent working on a study of the late Devonian Grosmont and Upper Ireton formations in northeastern Alberta with PhD students Hunter Harlow and Caitlin Leslie. The project was sponsored by GLJ Petroleum Consultants of Calgary, Alberta, and the goal of the project was to characterize the nature and distribution of potential reservoir flow units and estimate the associated quantity of in-place bitumen. To this end, Hunter, Caitlin, myself and three GLJ geoscientists described 14,000' (YES, 14,000') of core in Calgary over a 3-week period during July of 2014. The core descriptions, in turn, were integrated with core analysis and well log data to complete the study. Following our visit to Calgary, the project was completed during the Fall 2015 semester. GLJ released the results of the study for publication, and two abstracts have been accepted for presentation in the inaugural

Caitlin Leslie, Dr. Atchley, and Hunter Harlow in Calgary



SEPM Mountjoy Conference that will be held in Banff, Alberta during August of 2015. Our new hydrogeological modeler, Dr. Scott James is also collaborating with us on the project and has used our results to generate a numerical flow model of the reservoir interval.

My M.S. students Brian Crass and Kieron Prince successfully defended their theses on the Pennsylvanian Cline Shale of the Midland Basin. Brian and Kieron worked closely together on their thesis projects: Brian focused on the use of well logs in the prediction of both unconventional shale facies and associated organic richness, and Kieron on the spatial distribution of potential reservoir bodies across the area of study. Their work is excellent, and is certainly of a quality that is publishable within a journal. Hopefully they (we) can make that happen. Caitlin Leslie and Adam Davis (both PhD students) worked hard on collecting field data in support of their dissertation projects involving the Paleocene of the San Juan Basin, New Mexico. Caitlin and Adam fought through the wet springtime and early summer weather to complete a successful summer field season. I Joined Hunter Harlow (PhD student) in May on a scouting expedition of a prospective dissertation outcrop locality at Paria, Utah. The outcrop was spectacular and Hunter plans to add it to his project. The outcrop location is famous for it's use in the filming of numerous Hollywood

M.S. student Kieron Prince and Dr. Atchley

westerns from the 1940s to 1970s: Buffalo Bill (1943), Sergeants 3 (1961), The Outlaw Josey Wales (1976). I expect Hunter's dissertation to include spectacular outcrop photopanoramas... especially since Hunter splurged and purchased his own personal drone to assist in his collection of highresolution aerial photos. . I anticipate that Hunter, Adam and Caitlin will all complete the first paper of their dissertation requirement within the coming year.

On the home front, the most significant event of the year was daughter Dallas transferring from Texas A&M to Baylor. She has enjoyed the smaller class size and the overall upgrade in the campus aesthetic. Dallas is continuing with her studies in Anthropology and aspirations of becoming a high school teacher. During the Fall of 2015 youngest daughter Audra is entering her senior year of high school. We are all anxious to see where she ultimately chooses to attend college... TCU? Belmont? Baylor? During the Spring of 2015 Audra was a member the Vanguard College Preparatory state championship golf team. This is their third consecutive state championship, and is noteworthy because this year they moved from class 2A to the larger class 3A! Janelle continues to work as a part-time grants accountant within Baylor Geology, and perhaps more significantly, at least to me anyway, she also continues to do our family's tax return(s). I have not completed a tax return since we were married in 1986. It's important that I keep that string going!

We appreciate our alumni and certainly hope that you will stop by for a visit if ever passing through Waco.



Kieron Prince and Brian Crass defended theses on the Pennsylvanian Cline Shale of the Midland Basin.





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### Dr. Kenny Befus

Hi. I am a new hire to the department so this is my opportunity to introduce myself to the greater Baylor Geology community. My role will be as the hard rock geologist, and my specific interests lie primarily in volcanology and igneous petrology. My past and current research has focused on basaltic and rhyolitic systems and has heavily incorporated geochemistry, experimental petrology, field studies, and fluid dynamic modeling. My research focuses on understanding volcanic processes from the magma chamber to the surface. I am most excited about magma volatiles and how they can be used to understand eruption triggering. At Baylor I will build a state-of-theart experimental petrology lab that I will use to synthesize magmas and simulate volcanic eruptions. I will also use FTIR and Raman spectroscopy to analyze materials.

I completed my Ph.D at the University of Texas at Austin in 2014. I focused on the geochemistry of the most recent Yellowstone magmas and the eruption dynamics of effusive high-silica rhyolites. Basically, that

Contraction of the second seco

means I am an expert on obsidians, which is pretty cool because obsidian is so culturally relevant. The Yellowstone aspect of the research has been really rewarding too because that national park is so important to so many people. Thankfully, I have been able to get much of the work on the Yellowstone rhyolites published and even got one in *Geology* this summer. Feel free to email me if you want a copy of an article or find that one topic really interests you.

As this is an introduction, I suppose I should include some personal details. I am married to Elizabeth and together we have a little Cairn Terrier named Dax. We just moved to Waco this summer and we are getting settled into a new home and community. Elizabeth is an exceptional technical writer who most recently worked for Apple. We aren't exactly sure where she will apply those talents in Waco, but she is enjoying the current respite from the intense business world as we assess our new home. We are quite happy to get back to Texas.

Last year Elizabeth and I lived in Cupertino, CA. Elizabeth worked at Apple HQ, and I was a visiting professor at Stanford University. The year at Stanford started slow but then really turned out fun and fruitful. I taught one class per quarter during my stay, and the classes were Introduction to Geology (first years), Optical Mineralogy (second/third years), and Special Problems in Volcanology (grad). I also helped teach two short field courses, the first was at Death Valley and the second to Long Valley Caldera in Eastern California.



The experiences at Stanford have prepared me for my teaching responsibilities at Baylor. This first year I will teach Introduction to Geology and Igneous and Metamorphic Petrology. In future years I will teach Mineralogy, Gems and Gem Minerals, and will assist with field camp. Gems and Gem Minerals is a new class that I hope to develop which will introduce nonmajors to mineralogy, optics, and crystallography. Gems and faceting is my recreational hobby and something I tend to filibuster about, so I better stop here.



The volcanology research group at Stanford standing on Obsidian Dome, the world's most famous rhyolite lava flow



Dr. Rena Bonem

The undergraduate Geology and Geophysics programs continue to increase in popularity. The current number

of majors is approximately 85 (we have new transfers coming in every week during the summer). We will have 5 seniors graduate in August, but Mineralogy has about 25 students this fall. Paleontology has 18 majors with 2 biology students enrolled. This year, field camp took all 3 vans. The department just approved a secondary major in Geology, but that has to be approved by the administration before we see the impact on our department. We also have concentrations in geology within the Business School and Engineering.

Last summer I had my knee replaced, so my field work and travel have been limited this year. I hope to make GSA in Baltimore this year, but will see how the knee is doing as we get closer. Three of my B. S. students have completed theses this year: Daniel Gaskell, Kolin Beam, and Brian Diehl. Ryan Morgan, a Ph. D. candidate from Michigan, is teaching at Tarleton State and has two papers accepted. One of his papers is on Dr. Beaver's blastoids from Timor and the other is on *Gyrolithes* in the Austin Chalk. Ryan should be submitting the third paper and graduating this fall if all goes according to plans. His wife is working on her graduate degree in Biology at Tarleton. My teaching schedule for the fall has me teaching invertebrate paleontology, historical, and world oceans for a total of just over 200 students, plus continuing to do advisement for juniors and seniors.

Much of my time outside of school this spring has been taken up helping my sister-in-law and brother. My sister-in-law broke her hip last fall, so my brother had to be in a nursing home and memory care unit until this May.

My knee replacement has slowed down the dog agility competitions, though I hope to get back to running Lady Bug and Brady soon. Lady Bug has been running with other people while I could not run and has picked up several new titles, but Brady will only run with me, so he has been a couch potato.

As always, I look forward to seeing all of our former students and hope that you will be able to come and visit us soon.



Lady Bug's competitive jumping in April

### Sharon Browning



It's hard to believe I am completing my 8th year here at Baylor, where I continue to focus on our freshman labs and community outreach. We have now completed 6 semesters of The Math You Need, an online tutoring program in our disasters course. This program gives students the opportunity to review basic math skills prior to using them in lab, and facilitates efficient use of class time and TA instruction. It has been used at universities and community colleges across the nation, with Baylor being one of the most selective in terms of undergraduate admissions. Ongoing results were presented at the American Geophysical Union meeting in San Francisco last December, and the program remains available for use.

Summer 2014 was the only time the weather cooperated for our scheduled star parties. Approximately 20 GEO 1408 students were able to see a variety of celestial objects, including the planets Saturn and Mars, several 1st magnitude stars discussed in lab (Arcturus and Antares), and the easily recognizable constellations Ursa Major and Ursa Minor. I am personally disappointed the weather was not favorable for the two total lunar eclipses this past year (October 8th, 2014 and April 4th, 2015). I am hopeful we will able to see the one later this year (September 8th, 2015), as it is the 4th total lunar eclipse in two years.

Our consistent use of our physical models in the disasters lab has necessitated their duplication due to wear and tear over the years. With the help of craftsman in facilities, we have also been able to create additional copies of a subset of the models and dedicate them to our ongoing outreach efforts without endangering their primary use with our undergraduate students. These models, originally designed and built by Baylor faculty Vince Cronin and John Dunbar, continue to be excellent teaching models that effectively communicate a variety of physical processes addressed in our courses.

Our outreach continues as well. This is the 4th year we have been able to host students from



Left: Mountain View Elementary Students listening to Baylor graduate students talking about their geologic research

Right: Graduate student Zack Valdez assists students in demonstrating floor and column construction.



Mountain View Elementary in the Waco ISD for enrichment activities involving our earthquake and tsunami models. We had 65 third graders this past spring who were able to participate. Faculty and graduate students involved included Dr. Bill Hockaday, Zack Valdez, Andrew Flynn, Jeffrey Jex, Yohan Letourmy, Caitlin Leslie, Hunter Harlow, and Environmental Science undergraduate Conner Costello. We were also invited for a 2nd year to visit Spring Valley Elementary as part of their camping unit to discuss rocks and minerals with approximately 100 1st graders.

In Spring of 2015, we were contacted by Roger Waguespack of Austin, TX, who generously donated approximately 2000 mineral samples collected over the past 20 years to our department. These samples were all well-catalogued including mineral identification and source locations, and we eagerly anticipate their utilization in our courses.

On a personal note, my daughter graduated from Midway High School in June 2015, and is making plans for her future. Her aunt and grandparents were able to visit from out of state to witness this momentous occasion. It doesn't seem possible that we have been in Texas this long, or that she has grown up so quickly.



Above: Graduate student Jeffrey Jex demonstrating the transmission and reflection of seismic waves

Below: Talking to students at Spring Valley Elementary about geology





### Dr. Vince Cronin

I am still at my post, helping novice geoscientists learn about Earth and its structure and advising MS students with an interest in structural geology, all of whom so far have wanted to pursue careers in the oil business.

Baylor decided last year to pull the plug on the web server that hosted the individual web sites of its faculty. With prior warning, that server went dark in March of 2015. Since December, I have been slowly porting all of my hundreds of web pages to a private site that my family pays for. While it is still a digital construction zone, my new web site is at http://CroninProjects. org. This replaces the old bearspace site that no longer exists. Rather than clutter this newsletter with mention of events that only my mother might care about, I will be putting together a calendar/blog of my major activities by year that will be accessible at http://CroninProjects.org/Vince/Activities/.

Undergraduate students Jordan Dickinson and Jeremy Ashburn worked with me on their thesis field work last summer -- Jordan in the Trinidad Basin of southern Colorado, and Jeremy in the north Tahoe-Truckee area Nicky Arellano presents her electronic+paper poster at the GSA Annual Meeting in Vancouver, Canada.



Jeremy Ashburn presents a poster of his BS thesis on active faults in the Truckee area to Katherine Haller of the USGS at the GSA Annual Meeting.



Jordan Dickinson presents her BS thesis research on active faults in the Raton Basin of southern Colorado at the GSA Annual Meeting in Vancouver, Canada.



Luke Pajer, Jeremy Ashburn and Jordan Dickinson at Luke's poster at the GSA Annual Meeting.

of California. Jordan completed and successfully defended her thesis, *A seismo-lineament study of magnitude 3.3-5.3 earthquakes near Trinidad, Colorado*, in time for graduation this past May (http://CroninProjects.org/ Dickinson.pdf and http://croninprojects.org/Dickinson/), and Jeremy intends to do the same in time for graduation in August. Jordan will be attending the University of Houston in the fall. I also worked with undergraduates Nicky Arellano and Luke Pajer on research/education projects, and all four of these undergraduates presented the results of their work with me at the GSA meeting in Vancouver last October (http://croninprojects. org/Vince/CroninStudents/Current-Past.html).

Victoria Worrell and Brandon Rasaka started working on their MS research with me this past fall. Tori is working on applying SLAM to the M6 South Napa earthquake of August 24, 2014, which caused an estimated \$400M in damage. She presented a poster of her preliminary results in a special session on the South Napa earthquake at the 2014 AGU meeting in San Francisco, and we conducted fieldwork in Napa this past May. Tori is an intern at Pioneer Oil & Gas this summer (2015). Brandon is using SLAM in an attempt to identify the fault(s) responsible for some of the larger earthquakes near Oklahoma City that have occurred in the last couple of years. In 2014, Oklahoma changed from being a largely aseismic state to being the second most seismogenic state in the US, behind only Alaska. He gave an oral presentation of his preliminary results at the GSA South-Central meeting in Tulsa, and I presented some of his results at the AGU Joint Assembly in Montreal, Canada. Brandon is an intern at Jones Energy this summer. Both Tori and Brandon are likely to graduate in May, 2016, although both are working toward defending their theses in December. Matthew Strasser, who is a graduate of BYU Idaho as is Brandon, will be joining us as an MS student in the fall.

I gave or co-authored something like 18 professional presentations during 2014, spanning three countries and Alaska (which qualifies for special mention because it takes a long time to get there and back). The farthest I went to give an invited presentation was South Korea, for a paleoseismology meeting in Busan. I left Dallas at noon on a Saturday and flew non-stop 14-and-a-half hours to Seoul across the international dateline, arriving at 4:30 PM Sunday. On the return trip, I left Seoul at 8:10 AM Saturday and arrived in Dallas at 10 AM Saturday. Two hours by the clock, but a lot longer according to my rump. My dad had had a far less placid visit to Korea in the 1950s as a member of the US Army Second Division, and left with a Silver Star, Bronze Stars, and a fresh rifle wound in his shoulder.

I have been interested in and have written about applied ethics in the geosciences since the late 1980s. In 1997, Dave Stephenson used his prerogative as a GSA President to organize a "Presidential Conference on Ethics in the Geosciences," to which I was invited. Circa 1997-98, I was subsequently appointed a member of the AGI Ethics Steering Committee. Last summer, Cindy Palinkas (University of Maryland) and I were asked to be the co-leaders of the *International Association for Promoting Geoethics* in the United States.

In coordination with IAPG members in Canada (Anne-Marie Ryan, Catherine Pappas-Maenz and Charly Banks), we organized an ethics workshop and an ethics symposium at the AGU Joint Assembly in Montreal this past May. Along with Silvia Peppoloni and Giuseppe Di Capua (*Instituto Nazionale di Geofisica e Vulcanologia* in Rome), we presented an audience-participation poster entitled *A collaborative effort to build a modular course on GeoEthics* at the AGU meeting in San Francisco, the European Geological Union meeting in Vienna, and the AGU Joint Assembly in Montreal. Visitors to our poster were invited to add their thoughts to the poster via post-it notes, and those ideas became part of the poster used at subsequent meetings. Dr. Palinkas and I are organizing geoethics symposia at the upcoming GSA and AGU meetings in the fall of 2015.

Last fall, Linda Gunderson was asked by AGU to put together a book on scientific integrity and ethics for the geosciences, "to serve as a current reference, textbook, and handbook for professionals, faculty, and students." Linda is the recently-retired Chief Scientist for Geology and Director of the Office of Science Quality and Integrity at the United States Geological Survey and Chair of the AGU Task Force on Scientific Integrity. (She is a sufficiently big kahuna that a new wing of a research building at Woods Hole Oceanographic Institution is named in her honor.) Linda asked me to write an essay on "facilitating a geoscience student's ethical development" for chapter 7 of her book, and Silvia Peppoloni asked me to contribute to chapter 6 on "the emerging field of geoethics" along with four other members of IAPG. After appropriate peer review, the result will be published by Wiley in the coming year.



Becky Davis and Jordan Dickinson in Jordan's field area in the Raton Basin of southern Colorado



Jordan Dickinson pointing to the K-T boundary layer in Trinidad Lake State Park, Colorado, in her BS research area



Jordan Dickinson photographing a newly discovered fault in her BS thesis research area, in the Raton Basin, southern Colorado



Becky Davis and Jordan Dickinson in Jordan's field area in the Raton Basin of southern Colorado



Victoria Worrell examines a surface trace of the West Napa fault that ruptured during the M6 South Napa earthquake of August 2014. The fault crosses the road and under a grammar school filled with children.



Victoria Worrell and her field assistant, Dakota Draper, look for the surface trace of the West Napa fault near a vinyard within her MS thesis research area.



Victoria Worrell and Dakota Draper document damage from the M6 South Napa earthquake in the Browns Valley neighborhood of Napa, California.

Last September, Professor Basil Tikoff of the University of Wisconsin-Madison asked me whether I might be interested in being considered for the job of being the primary editor/author of the next edition of the AGI/NAGT Laboratory Manual in Physical Geology. I am told by AGI that this is the most widely used textbook on physical geology in the country. There were some phone calls, an in-person interview with the executive directors of AGI and NAGT and the geoscience editor from Pearson Higher Education, phone interviews, some detailed written reviews of existing chapters, and maybe a few other steps that I have now forgotten. In the end, they selected me to be in charge of the 11th edition and hopefully of several more editions after that. The current edition will need substantial revision and updating, and we will be moving toward the use of online resources as future editions are developed. The 11th edition will be in print in 2017, so I have a lot of work ahead of me. As I look toward the next decade of my career, I will be devoting my time apart from classroom teaching to writing a renewed AGI/NAGT lab book, promoting geoethics, helping my graduate advisees with projects involving SLAM, and revision of my plate kinematics book. That should keep me busy.

Family News: On March 28, our daughter Kelly ran the Holy Half (13.1-mile half marathon) at Notre Dame. Training for the Holy Half involved months of slogging through the snow and muck of one of the worst winters in recent memory in South Bend. A week or two after conquering the Holy Half, Kelly began the equivalent of a senior thesis in music performance -- a juried recital. This high-stakes enterprise is done in two parts: a grilling by a jury of Music Department faculty members and, a week later if she passes part 1, an hour-long public performance that is graded by the jury. She sang works in English, French, Italian and German. A week after her recital, she sang the role of Paquette in ND Opera's presentation of Leonard Bernstein's Candide. After her first performance, the past chairman of the ND Music Department said that she "stole the show." And three weeks later, Kelly graduated from the University of Notre Dame with a double major in economics and music (with a concentration in vocal performance.)

During the ND graduation weekend, Kelly was asked to speak at the ND Gender Relations Center luncheon in recognition of her years of volunteer effort on behalf of the students they serve, which was one of the highlights for me (http://www.grc. nd.edu/). Then we were off to the Econ graduation-recognition ceremony (yawn) followed in the evening by performances by Kelly and the other performance majors who were graduating. The main graduation ceremony was in Notre Dame Stadium, and featured as guest speaker the chancellor of Oxford University, Lord Christopher Patten. Patten, one of the most prominent Catholics in Great Britain, said, "I imagine that my Irish ancestors would have been surprised to discover that their descendant was the public official who was the last governor of Hong Kong and closed the last chapter in the history of the British Empire. Such are the complications of identity." My Irish grandmother would have loved to meet him, because she grew-up in an Ireland that was still part of the British Empire and witnessed the Irish Revolution before making her way across the Atlantic.

Connor made it through his first year as a mechanical engineering student at the University of Portland, which is run in Oregon by the same order of priests who run the University of Notre Dame. Connor's first semester was punctuated by a case of mono, which arrived during fall break and landed him in the hospital. With his throat swollen shut, he had become dehydrated, adding to his miseries. (One of his friends, a nursing student, simply commented, "We didn't water him enough.") Luckily, Cindy and I were just up the coast at the GSA meeting in Toronto when Connor's mono flared-up, and we were able to swing by on the way home to help right the ship. By the end of the spring semester, he was fit enough to compete in a 5k Mudder event, in preparation for a full Tough Mudder he intends to slog through in September. (The Tough Mudder is a 12-mile obstacle course in which mud plays a significant role.)

My brother-in-law, Jim, was working on one of our family's natural gas pipelines out in the middle of nowhere when an emaciated little blue-eyed catahoula puppy came wandering over. She was very friendly, but plainly in trouble. He took a picture of the pup and sent it around to friends and family to see if anyone wanted to try to save her and, well, that's how Cindy became the proud owner of a goofy little blue-eyed dog. The guys on Jim's crew had named her Taco, because they said that there wasn't enough meat on that dog to make a decent taco. Her new name is Sophie, and she has doubled her weight to a reasonable 40 pounds since she arrived in Waco. So now we have three rescued dogs and a rescued cat.

I look forward to hearing from any former students who feel inclined to tell me what you are up to these days. You can contact me at Vince\_Cronin@baylor.edu or Vince\_Cronin@ CroninProjects.org. Prospective students who might want to work with me towards a Masters degree in geology should visit http://CroninProjects.org/Vince/CroninStudents/index.htm



Jeremy Ashburn rappelling off a faulted outcrop above Stampede Dam, California



Jeremy Ashburn working to measure the orientation of a fault above Stampede Dam, California



Sophie the blue-eyed catahoula at her new home

### Dr. Steven Driese



It has been another very busy year for me with teaching, research, and professional service, but with far less administration now that I am no longer Department Chair. In the fall semester of 2014 I taught the graduate GEO 5340 "Paleopedology" course and the graduate GEO 5V90 "Seminar on Grant Proposal-Writing". In the spring semester of 2015 I co-taught GEO 43C1 "Senior Capstone Colloquium" with Dan Peppe. I had planned to introduce "Speleothem Paleoclimatology" in the spring semester of 2015, but had to cancel the course because of insufficient enrollment. The diversity our curriculum in Terrestrial Paleoclimatology continues to attract the best and brightest students to our Department.

Miocene stratigraphic section at Karungu, western Kenya, showing polygenetic Ngira paleosol at base of profile, with Dan Peppe for scale (Driese et al., in review)

This was the year of my continued direction of 5 Ph.D. dissertations. Current Ph.D. student Emily



Beverly (co-advised with Dan Peppe) published one paper in Sedimentology involving late Pleistocene paleosols and associated freshwater carbonates in Karungu, Kenya and she has a second involving a late Pleistocene paleosol catena currently in review in Quaternary Research. Current Ph.D. student Lyndsay DiPietro has a paper on the Serpentine-



During the summer of 2014, I conducted field work in Nova Scotia with Ph.D. student Yohan Letourmy, and then afterwards in central Alaska with Ph.D. student Lyndsay DiPietro. I also added a side trip to Anchorage, AK to visit old friends (from UW-Madison) Jim and Liese Munter, and do a little site-seeing around the many glaciers. My own research continues to focus on interdisciplinary paleoclimate and paleolandscape reconstructions using fossil soils, or paleosols, as well as conducting studies of modern soil systems (especially Vertisols) to develop climate proxies and analogs of ancient soils. I also continue interest in using speleothems (cave deposits) as high-resolution archives of late Pleistocene to Holocene climate. In 2014 I published 8 refereed journal articles and have 5 peer-reviewed journal articles published, accepted or in press for 2015. In 2014 I made 6 professional presentations of my research (as first author), and was a coauthor on 16 additional professional presentation. During Christmas break Dan Peppe and I travelled to Uganda where we conducted NSFsponsored research on early Miocene paleosols at the extinct Napak and Moroto volcanoes. In April of 2014 I was informed that I was elected to receive Honorary Membership in SEPM (The Society for Sedimentary Geology) and will travel to the AAPG/SEPM Annual Meeting in Denver in June of 2015 to receive that award.

On the Waco home front, Marylaine and I continue to enjoy the vibrancy of living downtown in our condominium - we really like being within walking distance to everything, and I especially enjoy being able to bicycle to work. Marylaine continues her part-time job as archivist for McLennan Community College. Mary Catherine and I caravanned from Austin, TX, in July of 2014, to Tempe, AZ, so that she could start graduate school at Arizona State University, majoring in medical anthropology. She is doing research in Guatemala during the summer of 2015. In August of 2014 our oldest son Nathan left Waco after living with us for a year, and returned to Knoxville, where he is happily teaching Philosophy at Pellissippi State Community College. Our other son Trevor also lives in Knoxville and, with his wife Lindsay, bought a new house in west Knoxville that is perfect for family get-togethers, especially nice because Marylaine and I continue to make frequent trips back to the southeast (Tennessee and Georgia) to visit family and friends. Marylaine vacationed in 2014 with the Baylor in Great Britain program and, in addition to staying in London, travelled with her friend

Lisa Weaver to Cornwall and to Barcelona, Spain. During the summer of 2015, I am squeezing in a trip to the University of Tartu in Estonia, where I will serve as an "opponent" on a Ph.D. dissertation committee. In July of 2015 Marylaine and I will be staying at a cozy cottage near Harpwell.

#### **Peer-Reviewed Journal Publications (2014-15):**

- Driese, S.G., Li, Z.-H., Cheng, H., Harvill, J.L., and Sims, J., accepted, High-resolution rainfall records for Middle and Late Holocene based on speleothem annual UV fluorescent layers integrated with stable isotopes and U/Th dating, Raccoon Mountain Cave, TN, USA: in Feinberg, J., Gao, Y., and Alexander, E.C., Jr., (eds.) Caves and Karst Across Time: Geological Society of America, Special Paper Volume.
- Ashley, G.M., Beverly, E.J., Sikes, N.E., and Driese, S.G., 2014, Paleosol diversity in the Olduvai Basin, Tanzania: effects of geomorphology, parent material, depositional environment, and groundwater: Quaternary International, v. 322-323, p. 66-77.
- Beverly, E.J., Ashley, G.M., and Driese, S.G., 2014, Reconstruction of a Pleistocene paleocatena using micromorphology and geochemistry of lake margin paleo-Vertisols, Olduvai Gorge, Tanzania: Quaternary International, v. 322-323, p. 78-94.
- Beverly, E.J., Driese, S.G., Peppe, D.J., Michel, L.A., Johnson, C.R., Faith, J.T., Tryon, C.A., and Sharp, W.D., 2015, Recurrent spring-fed rivers in a Middle to Late Pleistocene semiarid grassland: Implications for environments of early humans in the Lake Victoria Basin, Kenya: Sedimentology: doi: 10.1111/ sed.12199.
- Faith, J.T., Tryon, C.A., Peppe, D.J., Beverly,
  E.J., Blegen, N., Blumenthal, S., Chritz,
  K.L., Driese, S.G., and Patterson, D., 2015,
  Paleoenvironmental context of the Middle
  Stone Age record from Karungu, Lake
  Victoria Basin, Kenya, and its implications for
  human and faunal dispersals in East Africa:
  Journal of Human Evolution: http://dx.doi.
  org/10.1016/j.jhevol.2015.03.004.

- Li, Z.-H., Driese, S.G., and Cheng, H., 2014, A multiple cave deposit assessment of suitability of speleothem isotopes for reconstructing palaeo-vegetation and palaeo-temperature: A case study in Raccoon Mountain Cave, USA: Sedimentology: v. 61, p. 749-766.
- Jennings, D.S., and Driese, S.G., 2014, Understanding barite and gypsum precipitation in upland acid-sulfate soils: an example from the Lufkin Series toposequence, south- central Texas, USA: Sedimentary Geology, v. 299, p. 106-118.
- Jennings, D.S., Driese, S.G., and Dworkin, S.I., 2015, Comparison of modern and ancient barite-bearing acid-sulfate soils using micromorphology, geochemistry, and field relationships: Sedimentology, DOI: 10.1111/ sed.12177.
- Meier, H.A., Driese, S.G., Nordt, L.C., Forman, S.L., and Dworkin, S.I., 2014, Interpretation of Late Quaternary climate and landscape variability based upon buried soil macro- and micromorphology, geochemistry, and stable isotopes of soil organic matter, Owl Creek, central Texas, USA: Catena, v. 114, p. 157-168.
- Michel, L.A., Peppe, D.J., Lutz, J.A., Driese, S.G., Dunsworth, H.M., Harcourt-Smith, W.E.H.,

Horner, W.H., Lehmann, T., Nightingale, S., and McNulty, K.P., 2014, Remnants of an ancient forest provide ecological context for Early Miocene fossil apes: Nature Communications: doi: 10.1038/ncomms4236.

- Stinchcomb, G.E., Driese, S.G., Nordt, L.C.,
  DiPietro, L.M., and Messner, T.C., 2014, Early
  Holocene cryoturbation in northeastern USA:
  Implications for archaeological site formation:
  Quaternary International, v. 342, p. 186-198.
- Stinchcomb, G.E., Messner, T.C., Stewart, R.M., and Driese, S.G., 2015, Estimating fluxes in anthropogenic lead using alluvial soil mass-balance geochemistry, geochronology and archaeology in eastern USA: Anthropocene: http://dx.doi.org/10.1016/j. ancene.2015.03.001.
- Tryon, C.A., Faith, J.T., Peppe, D.J., Keegan, W.F., Keegan, K.N., Jenkins, K.H., Nightingale,
  S., Patterson, D., Van Plantinga, A., Driese,
  S.G., Johnson, C.R., and Beverly, E.J., 2014,
  Sites on the landscape: Paleoenvironmental reconstruction of late Pleistocene archaeological sites from the Lake Victoria Basin, equatorial East Africa: Quaternary International, v. 331, p. 20-30.



### Dr. John Dunbar

All three of John Dunbar's graduate students made great progress in 2014-2015. John and PhD student Tian Xu made a return trip to Mississippi Canyon Block 118 in the Gulf of Mexico to continue their seafloor methane hydrate research. On the cruise, the first step was recovering a resistivity instrument from the seafloor at a depth of 1 km, where it had been deployed for four months to monitor changes in the sub-bottom hydrate distribution. The recovery was accomplished with an underwater device operated by the University of Mississippi, called the ISpider (see photos right). It took 24 hours to find and latch onto the instrument package. They were happy to get it back. Tian summarized the results of the time-lapse study as well as two previous resistivity surveys at the site in a Leading Edge paper that came out in spring, 2015. Unfortunately, further research on seafloor hydrates has been put on hold, due to a series of equipment problems. The 1.1 km electrode array John has used since 2009 to collect seafloor resistivity data was damaged beyond repair by corrosion during the long deployment in 2014. Also, both

underwater devices they have used to deploy the resistivity system have been damaged or lost at sea in other projects. Such are the challenges and heartaches of working on the deep seafloor. As a fall back, Tian has been working on a study of resistivity anisotropy due to fractures in the local Taylor Marl and plans to complete his third and final paper required for the PhD in Fall 2015.

John's masters students have been busy as well. Jeffrey Jex completed a geodynamics thesis on the mechanics of lithospheric delamination. Continental delamination is a subduction-like tectonic process in which the mantle part of the lithosphere detaches from the lower continental crust and sinks into the underlying asthenosphere. Delamination has been used to explain the high heat flow and high elevation of the Basin and Range Province of Western North America, for example. Jeffrey's models showed that delamination is mechanically feasible during the late stage of continental rifting and may explain evidence of late-stage uplift, compression, and volcanism during rifting observed along the US Atlantic coast. Jeffrey defended his thesis in Spring 2015 and now works at Exxon. Adam Collard is doing a geophysics thesis on processing methods for extracting the water bottom reflection coefficient from high-frequency acoustic data. Reflection amplitude has long been used as a direct hydrocarbon indicator in the petroleum industry. Adam is attempting to use the same methodology to estimate sediment density from high-frequency acoustic records in support of dredging operations in harbors and water reservoirs. However, at frequencies of tens of kilohertz used to measure water depth for dredging operations much of the returning signal from the bottom is scatter, rather than reflection. Adam used signal processing methods to extract the specular reflection from the scatter, and used the amplitude of the reflection to estimate sediment density. During the summer of 2015 Adam worked as an intern at Anadarko while writing his thesis.



PhD student Tian Xu beside the ISpider underwater device used to deploy and recover the Seafloor Lander and resistivity instrument. The ISpider has eight video cameras and lights that point in all directions to provide real-time video feed during seafloor operations.



John Dunbar (left) and Tian Xu (right) helping to deploy the ISider to recover the Seafloor Lander



The Seafloor Lander back on deck after spending four months on the seafloor at 1 km water depth. The resistivity instrument is contained in the larger black cylinder in the middle of the lander. The large white box on the bottom of the lander contains the battery.



End-cap of the resistivity instrument showing some corrosion and fouling after its long stay on the seafloor

In Spring 2015, John took part in two teamteaching efforts, which was a new experience for him. At Baylor, John joined with new faculty member, Scott James, in a graduate-level course on numerical model applied to the geosciences. Scott covered finite difference methods during the first half of the semester and John followed with finite element methods in the second half. Five brave graduate students and two even braver undergraduates pored over complex equations and MATLAB codes all semester. It was intense, but they all learned a lot, students and professors alike. Also in Spring 2015, John teamed with Jason Greenwood of Advanced Geoscience, Inc. and Paul Higley of Specialty Devices, Inc. to give a two-day short course in marine geophysics at the annual Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP), held in Austin, Texas. The class covered deep marine resistivity investigation of the seafloor (John), resistivity profiling in shallow water (Jason), and sub-bottom acoustic profiling in shallow water (Paul). On the second day the class collected

both resistivity and sub-bottom profiling data on Lake Lady Bird in downtown Austin (see photo below). John enjoyed meeting people of like interests from around the world and everyone enjoyed spending a beautiful spring day on the lake doing geophysics in a fantastic setting.

On the home front, John and wife Anna's daughter, Tamura, graduated from Trinity University in San Antonio with a Bachelor of Science in Biology. She begins graduate school at Baylor in the Biology Department in the fall. Her parents feel lucky to have her nearby. Anna has had an eventful year of health challenges. She was diagnosed with breast cancer in the fall and has completed surgery and chemo. She feels lucky and blessed to have so many friends and family helping her during this process. She is now a proud breast cancer survivor and encourages her female friends to remember their annual mammogram. She has remained active in Keep Waco Beautiful, Central Texas Audubon Society and Northwest Waco Rotary. She has taken a leadership role in those organizations and continues to enjoy volunteering.



Participants in SAGEEP short course in marine geophysics, Spring 2015. As part of the course, participants collected resistivity and sub-bottom acoustic reflection data in Lady Bird Lake, downtown Austin, TX. The left-most person is Captain Jack, of Lone Star River boat Cruises, Co-instructor, Jason Greenwood of Advanced Geosciences, Inc. is forth from the left, John Dunbar is fifth from the left, PhD student Tian Xu is fifth from the right, Co-instructor Paul Higley, of Specialty Devices, Inc. is forth from the right, and Markus Langmanson, of Advanced Geoscience, Inc. is the rightmost person. Approximately half of the attendees of the course were able to join John, Jason, and Paul on the lake.

### Dr. Steve Dworkin



This past year I was kept busy by teaching mineralogy and petrology while we searched for a new petrologist. I hadn't given

much thought about olivine or Bowen's reaction series since I was an undergraduate but it was an interesting and challenging year. I also chaired the search committee for the new petrologist and was highly motivated to see that the search was a success! I am thrilled that Kenny Befus is joining us in the Fall and that he will teach the students about olivine in the future. We had 16 students in the field course this summer and we went to New Mexico, Nevada, Utah, Idaho, Wyoming, and Colorado.

My Master's students continue to be involved in the Applied Petroleum Research Program. Tanner Mills just gave me a great first draft of his study on the geochemistry of organic rich mudrocks



Petrology class field trip to Enchanted Rock on a cold rainy day



Sandy with graduate students Lyndsay DiPietro and Stephanie Wong



Honaker Trail in Utah. Erin Idleman has analyzed over 400 samples of Haynesville Formation black mudrocks from 3 cores and is currently writing up her results. Ian Byram and Daniel Parizek are doing a joint project studying the Cretaceous Rodessa Formation and are both in a summer internship with Camterra Resourses in Marshall, Texas. I will have two new Master's student joining the program in the Fall and they will be working together studying the geochemistry of black shales from the Marcellus Formation. My Ph.D. student Cong Jin is making good progress on his dissertation and is currently working on the meteoric diagenesis of Chinle Formation sandstones and its relationship to climate change during the late Triassic. Zach Evans is working on a senior thesis on the the isotope chemistry of leaf compressions and is working on material collected by one of Dan Peppe's Ph.D. students.

from the Hermosa Formation that he studied at

Sandy and I are doing well. We now have three Silken Windhounds and about ten feral cats. We trapped all the cats and had them spayed and neutered and they really have helped keep the copper heads in control – I haven't had to kill a snake this summer. Sandy and I went skiing during Christmas break and we had a great time. We went to Pagosa Springs, Colorado for a month this summer to escape the Texas heat.

### Dr. Steve Forman



It has been an exciting first year as we settled in to research, teaching, advising and service activities within the Department. In the Fall I

was on Research Fellowship through the Chinese Academy of Sciences, based at the Institute of Geology and Geophysics in Beijing, under the auspices of Prof. Xiaoping Yang. Xiaoping and I share a passion for understanding the age and origin of the deserts in northern and western China. Through this fellowship we completed a month of fieldwork in the Tengger Desert and other "sandy lands" within Inner Mongolia and uncovered evidence for much wetter conditions in the recent past with the identification of paleosols and lake sediments. This research provides needed insight in how and when the East Asian Monsoon down modulated in the past 5000 years with the onset of widespread aridity across Asia and East and North Africa.

Our collaboration continues with Dr. Alfonsina Tripaldi from the Univ. of Buenos Aries in western Argentina which is an exciting "laboratory" for climate change research. There eolian systems span the past 40,000 years with pronounced paleosols in which we hypothesize occurred with strengthening of the South American Monsoon associated with large meltwater events from Northern Hemisphere ice sheets. A semi-arid climate persisted with final global deglaciation and for much of the past 10,000 years. More recently there was a profound anthropogenic-induced drought in the 1930s and surprisingly wet conditions in the past two decades with new rivers and lakes forming. We are now using drone aerial surveys to quantify landscape elements and develop sub-meterscale digital elevation models. These climatic and hydrologic mysteries are the focus of a new entering PhD-student, Kathy Breen, who hails from U.S. Geologic Survey in Portland, Oregon.

A new frontier for us is the deciphering the changes in fluvial dynamics of the Red River and adjacent eolian depositional system during the past 5000 years with severe drought variability, like Texas has faced in the 21st century. Kasey Bolles, a PhD student is digging into this record in the field and through the analysis of remotelysensed data and making new discoveries. Kasey has developed new tools for analyzing the firstgeneration of black and white aerial photography from the 1930s on the southern Great Plains. Through this innovative analysis new data is provided on the potential sources for "black dusters" from cultivated fields and/or reactivated dune systems that resulted in a respiratory health-crisis on the Great Plains. This research should provide new insight on the collusion of human-induced and climate-related landscapescale changes that resulted in an environmental catastrophe, like the Dust Bowl Drought. The Geoluminescence Dating Research Laboratory has flourished largely from the fine efforts and student mentoring of Liliana Marin. We have a crew of invaluable and lively undergraduate research assistances including Ashley Ramsey, Chris Dickey, and Connor Mayhack who assist with mineral and particle-size separations and associated laboratory analyses. We encourage these students to undertake a research project as part of their undergraduate experience from the bevy of research strengths in the Department. For example, Ms. Ramsey has a grant from Baylor-URSA to examine the landscape radiocarbon reservoir effect for land snails in the Brazos River catchment to develop a better geochonometer for older deposits. She is tapping an unique resource at Baylor, which is the collection of 1000s of gastropods collected by faculty between 1900 and 1945 and curated by the Mayborn Museum. This collection is an important international resource because the shells were collected prior to contamination by atomic bomb-derived carbon and with lower levels of "dead" carbon from fossil fuel emissions.

The Geoluminescence laboratory is fortunate to host visiting researches this year, including Prof. Korhan Etrurac from Turkey. Korhn's research focusses on better understand the complex tectonics of Turkey and the earthquake history of the North Anatolian Fault. He has concentrated while at Baylor on assessing the chronologic potential of quartz and feldspar minerals from a variety of metamorphic terrains. Starting in August the lab will host a visiting PhD student, Xiaohua Guo from Chang'an University in Xian, China, who is study the fluvial dynamics of the Yellow River and landslide history at the margin of the Tibetan Plateau. We welcome students and visitors to learn and collaborate with us at the endless frontier of Quaternary paleoclimatology, paleoseismology and paleohydrology.

#### **Publications:**

- Meier, H. A., Driese, S. G., Nordt, L. C., Forman, S.L. and Dworkin, S. I., 2014. Interpretation of Lake Quaternary climate and landscape variability based upon paleosol macro-and micromorphology, and stable isotopes of soil organic matter, Owl Creek, central Texas, Catena 114,.157-168.
- Hoffecker, J. F., Holliday V. T., Stepanchuk, V. N., Brugère, A., Forman, S.L., Goldberg, P., Tubolzev, O., and Pisarev, I., 2014.
  Geoarchaeological and bioarchaeological studies at Mira, an early Upper Paleolithic site in the Lower Dnepr Valley, Ukraine.
  Geoarchaeology 29, 61-77.
- Schaetzl, R. L., Forman, S.L., Attig, J., 2014. Optical ages on loess derived from outwash surfaces constrain Chippewa Lobe glacial history, Wisconsin, USA. Quaternary Research 81(2), 318-329.
- Yang, S., Forman, S.L., Song, Y. Pierson, J., and Mazzocco J., Shi, Z. and Fang, X. 2014.
  Evaluating OSL-SAR protocols for dating quartz grains from the loess in Ili Basin, Central Asia. Quaternary Geochronology 20, 78-88.
- Wright, D.K., Thompson, J., Mackay, A. Welling, M. Forman, S. L., Price, G. Cohen, A. Greaves, A. and Gomani-Chindebvu, E. 2014. Renewed geoarchaeological investigations

of Mwanganda's Village (Elephant Site), Karongo, Malawi. Geoarchaeology 29(2), 98-120.

- Waitukaitus, S., Lee, V. Pierson, J. Forman, S.L., and Jaeger, H. M., 2014. Size-dependent, same-material tribicharging in insulating grains. Physical Review Letters, v.112, 21, 10.1103/PhysRevLett.112.218001.
- Forman, S.L., Tripaldi, A. Ciccioli, P.L, 2014. Sand sheet deposition in the San Luis paleodune field, western Argentina as an indicator of a semi-arid environment through the Holocene. Paleogeography, Paleoclimatology, Paleoecology 411, 122-135,
- Forman, S.L., Wright, D.W and Blozsies, C., 2014. Variations in Lake Turkana water levels in the past 9000 years near Mt. Porr, Kenya and potential linkages to variability in the East African Monsoon. Quaternary Science Reviews 97, 81-101.
- Vargas, G., Klinger, Y., Rockwell, T. Forman, S.L., Rebolledo, S., Lacassin, R., and Armijo, R., 2014. Potential for a large earthquake rupture of the West Andean Thrust in Santiago, Chile. Geology 42, 1083-1086.
- Bloszies, C., Forman, S.L. 2015. Potential controls of equatorial sea surface temperatures on historic water level variability for Lake Turkana, Kenya. Journal of Hydrology. doi:10.1016/j.jhydrol.2014.10.001.



Liliana Marin, Steve Forman, and Shengli Yang pointing out contacts in an alluvial fan sequence on the edge of the Tibetan Plateau

### Dr. Jamey Fulton



My second year in the Baylor Geology Department was spent developing new research collaborations and new analytical methods in the Baylor Mass Spectrometry Center and at the Woods Hole Oceanographic Institution in Massachusetts, where I am a visiting researcher. I completed the second year of a three-year NSFfunded project and am developing new proposals for future projects.

I also was appointed to the Geology Department Graduate Faculty in the spring, so I am now able to recruit and co-advise graduate students and serve on thesis committees. I look forward to continuing to expand my role in both education and research in the Geology Department and College of Arts and Sciences. On the home front, my family and I are settled in Hewitt and are members of Calvary Baptist Church in Waco.

#### **Research:**

My primary research focus is currently on the biomarker potential of a compound called scytonemin. It is produced by many species of cyanobacteria, which were probably the first organisms to evolve oxygenic photosynthesis during the Precambrian. Scytonemin helps protect cyanobacteria from exposure to harmful ultraviolet radiation, which was probably more intense early in the Precambrian prior to the development of the ozone layer. Thus, scytonemin may be a useful biomarker for understanding the early evolution of life on Earth.

I am using scytonemin as a cyanobacterial biomarker in lake sediments, where it appears to accumulate as a product of wind erosion of desert soils. I have hypothesized that sedimentary intervals with increased scytonemin are associated with times of widespread arid conditions. Scytonemin hasn't been used previously as a proxy for the spread of aridity, and I am currently making the necessary connection between microbiotic desert soil crusts and eroded dust particles entrained in the atmosphere during dust storms. I am collaborating with atmospheric chemists Dr. Pierre Herckes and Dr. Matt Fraser of Arizona State University to analyze atmospheric dust samples for scytonemin and other microbial biomarkers. We also conducted laboratory-based particle suspension experiments using desert soil crust samples to compare scytonemin concentration in different size fractions, to estimate the potential distance that scytonemin in dust can travel from source to sink.

I am also working with Dr. Mike Brookfield of the University of Guelph to examine ancient geological samples for scytonemin. We are targeting a range of shale and carbonate samples with ages ranging from Ordovician to Triassic, many having been deposited in lakes that formed in extensional basins similar to the modern Great Basin. I have found abundant scytonemin in analogous modern Great Salt Lake sediments, where it may have come from the Great Basin Desert, and deserts appear to have been widespread when many of the ancient samples were deposited. If we are successful in detecting scytonemin in ancient samples, we will open the door for its use in studying the evolution of cyanobacteria, both in the Precambrian as well as during Phanerozoic mass extinction events.

I am also starting a new geoarchaeology project using stable isotopes to trace the movement of grazing animals prior to slaughter in the Philistine city of Ashkelon, which is located on the Mediterranean coast in Israel. This is collaboration with my wife, Dr. Deirdre Fulton, Assistant Professor of Old Testament in the Baylor Religion Department and Dr. Elizabeth Arnold, Assistant Professor of Anthropology at Grand Valley State University. We are analyzing strontium, carbon and oxygen isotopes on sheep, goat, pig and bovine teeth, which can help us interpret how far inland the animals were feeding prior to coming to the city, and how long the animals spent in the city prior to slaughter. Ultimately, these data will help develop a model for the ancient trading economy.

#### **Teaching:**

I enjoyed teaching two introductory geology classes during the 2014-2015 academic year, GEO1401: Earthquakes and Other Natural Disasters in the fall and GEO1403: Environmental Geology in the spring. This was my second time teaching GEO1403, so I was able to focus on improving lecture content, presentations and assessments. I included more references to my own research as it relates to climate and environmental change as well as the deposition of organicmatter-rich sediments that become fossil fuels. While research is the primary focus in my current position, having the opportunity to interact with undergrad students helps me remember that the fundamental role of the university is education.

#### 2014 Publications:

Fulton, J. M., Fredricks, H. F., Bidle, K. D., Vardi, A., Kendrick, B. J., DiTullio, G. R., and Van Mooy, B. A. S., 2014, Novel molecular determinants of viral susceptibility and resistance in the lipidome of Emiliania huxleyi: Environmental Microbiology, v. 16, no. 4, p. 1137-1149.

- Rose, S. L., Fulton, J. M., Brown, C. M., Natale, F., Van Mooy, B. A. S., and Bidle, K. D., 2014, Isolation and characterization of lipid rafts in Emiliania huxleyi: a role for membrane microdomains in host-virus interactions: Environmental Microbiology, v. 16, no. 4, p. 1150-1166.
- Kendrick, B. J., Ditullio, G. R., Cyronak, T. J., Lee, P. A., Fulton, J. M., Van Mooy, B. A. S., and Bidle, K. D., 2014, Temperatureinduced viral resistance in Emiliania huxleyi (Prymnesiophyceae): PLOS ONE, v. 9, e112134.

#### **2014 Presentations:**

- Fulton, J.M., Michel, L.A., and Van Mooy, B.A.S. Pigment and lipid desiccation proxies from cyanobacteria in desert soil and Great Salt Lake sediments. GSA Annual Meeting. Vancouver, BC, Canada.
- Fulton, J.M., Michel, L.A., Van Mooy, B.A.S., and Oviatt, G. Scytonemin in Pleistocene and Holocene sediments from Great Salt Lake, Utah. Gordon Research Conference on Organic Geochemistry. Holderness, NH.
- Bird, L.R., Fulton, J.M., Dawson, K.S., Orphan, V.J., and Freeman, K.H. Coenzyme F430: Quantification and isotope analysis from Hydrate Ridge, California. Goldschmidt. Sacramento, CA.
- Fulton, J.M., Van Mooy, B.A.S., Collins, J.R., Hunter, J.E., Ossolinski, J.E., Fredricks, H.F., and Bidle, K.D. Lipid connections between viral termination of coccolithophore blooms and carbon export. ASLO Ocean Sciences Meeting. Honolulu, HI.
- Kendrick, B.J., DiTullio, G.R., Fulton, J.M., Van Mooy, B.A.S., and Bidle, K.D. Temperature induced viral resistance in the coccolithophorid Emiliania huxleyi (Prymnesophyceae). ASLO Ocean Sciences Meeting. Honolulu, HI.

### Dr. Don Greene

The College classes with a Geography of for this pilot into overdriv section beyo

Top: Don, Hannah, Macey, and Alison at the Bright Angel Trailhead

Bottom: Meredith and her twins. You may remember Meredith gave us a seminar talk on grant writing last fall. The College of Arts and Sciences recently decided to offer distance-learning classes with inaugural classes beginning in summer, 2015. Our World Geography course was included among a select group of classes chosen for this pilot program. For this reason, Don Greene shifted his work load into overdrive to accomplish three goals at once: 1) add one more class section beyond his normal teaching load, 2) receive training and prepare the online course, and 3) build a new place to stay overnight in Waco. Although Don and Alison live in Georgetown, Texas, a second home in Waco has allowed Don to work late nights at school twice a week.

Looking ahead to the 2015-2016 academic year, Don hopes to expand his online course development in two ways. It is hoped that Baylor's Instructional Technology group will be able to conquer security concerns and permit the "deep integration" necessary to fully implement all of the features an online course can provide. If "deep integration" is accomplished, Don will be investing considerably more time to take World Geography to an even higher performance level. Secondly, Don hopes to deliver an online GEO 1408 Earth Science course complete with a laboratory experience.



For the third consecutive year Don and Alison introduced their granddaughters Macey and Hannah to field camp in the American west. In the summer of 2013 it was Rocky Mountain National Park, in 2014 it was the geology of New Mexico and the culture of Santa Fe. With the wetter, cooler weather conditions of 2015, it was time for Grand Canyon National Park. The eight year old twins really gained an appreciation for the immense size of the canyon with three different hikes along the Bright Angel, Kaibab, and Rim Trails. In addition, this camping trip took on a distinctive astronomical flavor with stops at the Air and Space Museum in Alamogordo, the Very Large Array, and Meteor Crater, Arizona.





Don's micro home during construction

### Wayne Hamilton

My lifelong dream was to work in a university geology program. That dream came true on January 12th when Baylor accepted me as a volunteer research faculty with my work being supervised by Dr. Joe Yelderman. My passion is to work with students and faculty in their research and bring my industry environmental experience to their work.

I started my "second life" at Baylor after a 34-year environmental career with Shell Oil Company. My Shell career mostly consisted of providing environmental support to various business units and working as a Geological Engineer, Hydrogeologist, and Environmental Engineer and Environmental Manager. I worked in many parts of Shell's businesses from the oil well to the gasoline pump. These businesses included Mining, Retail, Distribution Plants, Refineries, Pipelines, plus Exploration and Production.

My education consists of a Bachelor's in Geology (1977) from University of South Florida and Master's in Geological Engineering (1980) and Professional Development Geological Engineering (1999) from University of Missouri-Rolla. In addition, I'm a Professional Geologist (1984) and Professional Engineer (1986). I've been married for 33 years and have three grown children who live in Austin, Dallas and Chicago. My wife and I made the plunge to move to Waco and sold our house in Katy, Texas. Now we are renting a home in Woodway with a Golden "Oldie" Retriever and searching for a permanent home.

My first taste of university teaching came from substitute teaching introductory geology classes and labs when faculty were out of town. This allowed for the teaching material to be delivered on time and class schedules to stay on track. Teaching these four classes has given me a desire to become a better communicator to inspire students to learn.

Dr. Joe asked me to inventory equipment in his Carlile Hydrogeology lab. I'm learning how to operate, maintain, and calibrate various field groundwater and chemistry instruments. In addition, I assisted with researching and procuring new equipment that will help students in their research and classroom learning. It is great to see the practical learning gained by the students using the field equipment that will be applicable to their careers.

As Laboratory Safety Coordinator, I assisted the Geology Department by reviewing practices and writing documents to meet Baylor requirements. In addition I worked with Dr. Joe on the Elan Allen Safety program that is focused on improving field geology safety practices.



Wayne and Mary Hamilton moving to Waco





Josh Kirby and Dr. Joe groundwater quality sampling at Homestead Heritage



Kori Taylor near Stillhouse Hollow Lake, Texas conducting karst field survey on a cold day

I encouraged four hydrogeology graduate students with their MS and PhD research. The support ranged from "sounding board" discussions to reviewing/commenting/attending formal research proposals, plus trade associations and water district presentations to multiple field trips to provide another pair of hands to collect data, and even providing snacks in the hydrogeology lab.

I met with four Texas water districts to understand and support their work. In particular, I documented two water districts' monthly water level gauging practices. The monthly gauging included work to compare wireline versus sonic water level measuring devices. The water districts provide a great opportunity for applied research and graduate student financial support that develops employable skills.

In January 2015, the American Institute of Professional Geologists published my article entitled: *Pouring My Cup Into Yours: What to Expect in Your Career.* In addition, I delivered a parallel Geology 5050 presentation: *What to Expect in Your Geologic Career.* 

I'm looking forward assisting Dr. Joe with field and laboratory teaching of Groundwater Hydrology in the Fall of 2015. In addition, Dr. Joe and I will be investigating the creation of a Brazos River Alluvium Aquifer Initiative so Baylor students and faculty are the experts in the application of alluvium groundwater for irrigation and potable use. One goal of the Initiative would be to obtain funding from groundwater districts and local/state agencies.

In conclusion, I'm grateful for this opportunity to live my dream by working at Baylor University. My desire is to add value by helping the geology students and faculty meet their educational and research goals.



Wayne Hamilton, Research Faculty with students in hydrogeology lab



Stephanie Wong and Lindsey DePietro during springs tracer test in Salado



Dr. John Dunbar and Tian Xu, PhD Student during resistivity survey near Riesel, Texas

### Dr. Bill Hockaday



#### The Hockaday Family:

This has been another eventful year for the Hockaday family. Mary and I celebrated our 10th wedding anniversary, and were blessed with the birth of our second child on April 8th—William Coleman Hockaday. William spent his first 3 days in neonatal intensive care at the hospital, but has since been a very healthy and happy baby boy. The joy that our two children have brought is tempered by sadness over the loss of three important people in our lives. My father passed tragically in an accident at the age of 67, while my grandmother and Mary's grandfather passed peacefully at the ages of 88 and 102. We spent many days this year with our families in Ohio and Pennsylvania, remembering and celebrating the lives of these loved ones. We feel fortunate to have the support of many wonderful friends in Texas and the sympathies of many colleagues at Baylor.

Mary continues her work as an elementary school teacher. Last year was her 5th year at Mountainview



Elementary school in the Waco ISD. This fall, she will start a new position as a 4th grade science and writing teacher at the Robinson elementary school. This was an exciting opportunity for Mary because it is near our home, and is the school that our children will attend a few years from now. Though she stays plenty busy teaching 4th grade and mothering two young children, Mary still finds the time and energy to play soccer for two different teams – a women's outdoor team on weekends and an indoor coed team during the week.

#### The Organic Geochemistry Research Group:

The organic geochemistry continues to grow through the addition of new members who bring new expertise, and through new instrumentation which add to the analytical capabilities of the lab. This year, we are most fortunate to be joined by a new postdoctoral scientist, Dr. Nathaniel Femi Adegboyega. Dr. Adegboyega recently completed a Ph.D in chemistry at the Florida Institute of Technology, where his dissertation research comprised an impressive study of the interactions between natural organic matter (humic substances) and dissolved metals (iron and silver). Prior to his PhD, Nathaniel completed and MS degree in light metal production at the Norwegian University of Science and Technology.

Bill and Mary Hockaday with Abigail (2 years old) and William (2 months old)



Dr. Nathaniel Adegboyega

Since joining the group in March, Dr. Adegboyega is making substantial progress on an NSF-funded study of natural organic matter interactions with man-made silver nanoparticles. Silver nanoparticles are antimicrobial agents found in thousands of consumer products ranging from clothing, to cosmetics, and paints. These nanoparticles are potential carcinogens, and their removal from drinking water is a major concern, especially when their transport through water filters is facilitated by dissolved organic matter. We are working on this project with Dr. Desmond Lawler, a drinking water treatment expert at University of Texas and Dr. Boris Lau at University of Massachusetts. It is my hope that Dr. Adegboyega will work with us for (at least) two years.

In building the analytical capacity of the organic geochemistry lab, we have recently added 2 (gently used) pieces of instrumentation: (1) an Agilent gas chromatograph that is interfaced to a mass spectrometer (GC/MS), and (2) a Dionex accelerated solvent extractor (ACE). These pieces of instrumentation work in-tandem to extract, identify, and quantify small molecules from soil, sediment, and rock samples. This instrumentation will serve both teaching and research needs. Graduate students enrolled in my courses in Organic Geochemistry (GEO5322) and Biogeochemistry (GEO4322) use these instruments as we learn about the lipid "biomarkers" and the utility of other molecular fossils in paleovegetation reconstruction, paleoclimate studies, and oil/ source rock typing. Organic Geochemistry graduate student, Todd Longbottom, has spent the past 2 years developing expertise in the extraction, purification, analysis,

and interpretation of lipid biomarkers. It is his exciting work that convinced me that our lab needed to have these capabilities "in house".

#### **Graduate Student Awards**

I consider it an honor when students that I mentor receive awards for their research, or the communication of their research findings. I am proud to highlight some of the recent awards bestowed upon the graduate students in the Organic Geochemistry Lab.

Doctoral student, **Zachary P. Valdez**, was awarded the prestigious **Graduate Research Fellowship by the National Science Foundation** in recognition of his research accomplishments and the scientific importance of the research he is conducting at Baylor University. The award is accompanied by stipend support (\$32,000/yr) plus tuition reimbursement (\$12,000/yr) for 3 years. The dates of the fellowship are 8/15/2013 – 5/31/2016.

Geology doctoral student **Michael Nguyen** (whom I co-advise with Dr. Boris Lau) was awarded the **NSF Graduate Research Fellowship.** The award is accompanied by stipend support (\$33,000/yr) plus tuition reimbursement (\$12,000/yr) for 3 years. The dates of the fellowship are 6/1/2014 – 5/31/2017. Michael Nguyen has recently transferred to University of Massachusetts Amherst with Dr. Boris Lau. The award has gone with him, but I am still an official part of his dissertation committee.

Geology doctoral student **Todd Longbottom** received the Graduate Student Award of \$1,500 from the **Gulf Coast Association of Geological Societies** to support his research on the Eagle Ford mudrocks in central Texas.

Zack Valdez received the Soil Science Society of America, best graduate student "elevator" speech. A first place award was given to Zack for describing the significance of his research in 60 seconds at the national meeting in Long Beach, CA, Nov. 2-5, 2014. Zack Valdez received the Glasscock Award for Graduate Student in the Environmental Sciences where \$7500 was granted to cover the expenses associated with stable isotope <sup>13</sup>C, <sup>15</sup>N, and radiocarbon <sup>14</sup>C isotope measurement in soils as part of his dissertation research.

Zack also received the **Future Leaders in Science Award**. The Agronomy, Crop Science, and Soil Science Societies of America created this award as an opportunity for graduate students to engage with policy-makers in order to raise awareness and support for science, technology and research funding. Recipients of the Future Leaders in Science award receive a trip to DC to participate in the annual ASA, CSSA, and SSSA Congressional Visits Day. Recipients also receive policy, communications, and advocacy training to learn how to effectively work with members of Congress and their staff.

#### **Presentations and Publications:**

The organic geochemistry group has have been actively disseminating our research by publishing papers and giving scientific presentations at national and international conferences. Underlining denotes Baylor student authors.

#### Publications (since the last newsletter):

- J. Miesel, W. Hockaday, R. Kolka, P. Townsend. Soil organic matter composition and quality across fire severity gradients in coniferous and deciduous forests of the southern boreal region, Journal of Geophysical Research-Biogeosciences (in press) DOI: 10.1002/2015JG002959.
- <u>B. Dhugana</u>, C. Becker, B. Zekavat, **W. Hockaday**, C.K. Chambliss, Characterization of slow pyrolysis bio-oil from pine shavings and corn stover feedstocks by negative electrospray ionization-ion mobility high-resolution mass spectrometry, Energy and Fuels, 29(2), 744-753, 2015.
- D.B. Wiedemeier, S. Abvien, **W. Hockaday**, M. Keiluweit, M. Kleber, C. Masiello, A.V. McBeath, P.S. Nico, L.A. Pyle, M.P.W. Schneider, R.J. Smernik, G.L. Wiesenberg,

M.W.I. Schmidt, Aromaticity and degree of aromatic condensation of chars, Organic Geochemistry, 78, 135-143, 2015.

- J. Yao, W. Hockaday, D. Murray, J. White, The storage change of fire-derived soil charcoal in a sub-humid woodland, Journal of Geophysical Research-Biogeosciences, 119, 9, 1807-1819, 2014.
- M.E. Gallagher, C.A. Masiello, **W. Hockaday**, J.A. Baldock, S. Snapp, C.P. McSwiney, Controls on the Oxidative Ratio of Net Primary Production in Agricultural Ecosystems, Biogeochemistry, DOI 10.1007/s10533-014-0024-9, 2014.

#### Presentations (since the last newsletter):

- W.C. Hockaday, M.E. Gallagher, C.A. Masiello, W. Polley, C.M. Iversen, R.J. Norby, Molecular (proxy) estimates of changes in soil organic matter stability with changes in atmospheric CO2 concentration, Goldschmidt Conference, Sacramento, CA, June 8-13, 2014. Poster
- Lacey Pyle, **W.C. Hockaday**, Thomas W Boutton, Kyriacos Zygourakis, Timothy Kinney, Caroline A Masiello, Chemical and Isotopic Thresholds in Charring: Implications for the Interpretation of Charcoal Mass and Isotopic Data, American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014 (poster)
- Joseph D. White, Jian Yao, Darrel B. Murray, W.C. Hockaday, Changes in Fire-Derived Soil Black Carbon Storage in a Sub-humid Woodland, American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014. poster
- Madeleine Stone, **W.C. Hockaday**, Alain F Plante, Changes in Carbon Chemistry and Stability Along Deep Tropical Soil Profiles at the Luquillo Critical Zone Observatory, American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014. Poster
- Jessica R Miesel, **W.C. Hockaday**, Randy K Kolka, How does Wildfire Severity Influence Soil Black Carbon in a Minnesota Boreal Forest?, American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014. talk

- W.C. Hockaday, Evan S Kane, Mikael Ohlson, <u>Rixiang Huang</u>, <u>Justin Von Bargen</u>, <u>Rebecca</u> <u>Davis</u>. Chemical Structure and Molecular Dimension As Controls on the Inherent Stability of Charcoal in Boreal Forest Soil. American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014, invited talk.
- W.C. Hockaday, The fate of soil organic matter upon erosion, transport, and deposition: concepts, Mechanisms, and uncertainties. Soil survey and land resources workshop, College Station, TX, Feb 5, 2015. Talk
- W. Hockaday, Solving mysteries of the Global C cycle using isotopic and molecular tools, University of Texas – San Antonio, Department of Geoscience, March 25, 2015, invited talk.
- W. Hockaday, The Role of Fire in the Climate System: Hypotheses and tools for testing fire-climate feedbacks in deep time, Southern Methodist University, Department of Geology, April 24, 2015, invited talk.
- <u>Todd Longbottom</u>, **W.C. Hockaday**, <u>K.S. Boling</u>, S.I. Dworkin, Evaluating the effects of redox conditions on kerogen composition of the

Eagleford formation of Central Texas by 13C Nuclear Magnetic Resonance Spectroscopy, Goldschmidt Conference, Sacramento, CA, June 8-13, 2014. Poster

- <u>Todd Longbottom</u>, **W.C. Hockaday**, <u>K.S. Boling</u>, S.I. Dworkin. Effects of ocean reductionoxidation conditions on organic matter preservation in the upper Eagle Ford formation: Molecular characterization of kerogen, Geological Society of America Annual Meeting, Vancouver, British Columbia, 19–22 October 2014. Poster 31-4
- Zachary Valdez, W.C. Hockaday, Soil C Dynamics for Bioenergy Agriculture under Different Fertilization and Harvesting Treatments, Soil Science Society of America, Long Beach, CA, Nov. 2 – 5, 2014. talk
- <u>Todd Longbottom</u>, W.C. Hockaday, <u>K.S. Boling</u>, S.I. Dworkin, Estimates of Oil and Gas Potential of Source Rock by 13C Nuclear Magnetic Resonance (NMR) Spectroscopy, American Geophysical Union, Fall Meeting, San Francisco, CA, Dec. 15-19, 2014. poster

For more news about our research, visit our website: http://hockadaylab.wikispaces.com/



I am happy to report that I survived my first year as a professor at Baylor. The analogy I used to describe the experience was,

Dr. Scott James

"Drinking from a fire hose." However, I could not ask to work at a better University than Baylor; the supportive environment is unparalleled. I would like to extend a special thanks to my friend and mentor, Dr. Joe Yelderman. Dr. Joe met with me weekly to help get me up to speed with the culture here at Baylor – his guidance has been invaluable. As a new professor, my time was heavily focused on teaching, research, and mentoring students. I taught a graduate class called Special Topics in Environmental Geoscience in the Fall. In addition to organizing the GEO5050 Seminar Series this Spring, I co-taught Introduction to Numerical Methods with Professor John Dunbar, another graduate course.

In the area of research I had several successes. I was funded to model enhanced oil recovery by the Canadian company RII North America, Inc. Sandia National laboratories provided funding to model marine renewable energy research projects. Exponent, Inc. made funds available to model flow, sediment dynamics, and water quality on the Lower Fox River in Wisconsin. I also established a research exchange program with IBM to develop advanced simulation tools for surface water flow modeling. I was fortunate to attend several conferences this academic year. In December, I attended my 20th American Geophysical Union Fall Meeting in San Francisco where I chaired poster and oral sessions on Renewable Energy: Marine, Wave, and Hydrokinetic. In April, I attended the National Groundwater Association's annual conference in San Antonio. In May, I presented a paper and talk on marine renewable energy modeling at the American Society of Civil Engineers' Environmental & Water Resources Congress in Austin. In June, I attended the National Science Foundation's Grants Writing Workshop in Tampa, which, as a new faculty member, I found very useful. Finally, as I write I am attending the Association of Environmental Engineering and Science Professors and participating in formulating Grand Challenges, attending workshops on proposal writing, and will listen to presentations for the next two days.

I hold a courtesy appointment with the Department of Mechanical Engineering so that I can continue to publish papers in this field as well as in the Geosciences. I published several papers related to topics in Mechanical Engineering [1-5]. In the geosciences, I continue to work on manuscripts, but also had two conference papers published [6, 7]. Several other manuscript are under development and under review.

This year I had the pleasure of working with five undergraduate researchers: Andrew Duke, Nicklas Keller, Jackson Liller, Andrew Masterson, and Samantha Simpson. They have been helping me run and calibrate flow models for marine renewable energy projects or are conducting hydrodynamics, sediment dynamics, and waterquality simulations. This Summer I welcomed my first graduate student, Jiajun "Dylan" Jiang. Dylan comes to us with a Master's Degree in Geology from the University of Houston (Thesis: Using GPS and extensometers to study rapid land subsidence associated with severe drought) and a BS in Integrated Petroleum Geology Studies from Xi'an Shiyou University. He will be working on simulations of enhanced oil recovery related to

the work being done by RII North America. He will simulate the performance of an innovative downhole steam generation process with an eye toward optimizing the process. For the Fall semester, Dr. John Dunbar and I welcome in Bulbul Ahmed; we will co-advise his studies on the evolution of fractured-rock flow systems (e.g., for geologic sequestration of CO2, hydraulic fracturing, or deep borehole disposal of wastes).

Also, I will welcome Dr. Kaushik Shandilya as a Postdoctoral Fellow who will be studying algal biofuels grown at our local wastewater treatment plant, Waco Metropolitan Area Regional Sewerage System (WMARSS). This might sound like a stretch for someone in the Geology Department, but this research will be conducted in affiliation with the Center for Reservoir and Aquatic Systems Research (CRASR), which is a research and education partnership between Baylor University and the City of Waco focused on aquatic resources. This Center is a natural outflow of many years of collaboration between these institutions as over the years Baylor and the City have each developed significant waterrelated expertise and capabilities. At Baylor, the focus for almost four decades has been on understanding the basic scientific principles that control the structure and function of aquatic environments. The City has dealt primarily with applied management issues. I was fortunate to be hired under the auspices of CRASR – its fifth academic hire. The goal for this project will be to help WMARSS cut its energy requirements by growing biofuels from the influent wastewater and using these biofuels to power the plant.

For the 2015-2016 academic year, I plan to teach two courses, one in the Fall (Applied Numerical Modeling) and one in the Spring (to be determined). I will also have research funding continue through this year and I anticipate several publications forthcoming, some of which will be co-authored with my students. Under Dr. Yelderman's astute tutelage, I expect continued success here at Baylor.

- S. An, M.W. Lee, N.Y. Kim, C. Lee, S.S. Al-Deyab, S.C. James, S.S. Yoon, Effect of viscosity, electrical conductivity, and surface tension on direct-current-pulsed drop-on-demand electrohydrodynamic printing frequency, Applied Physics Letters, 105 (2014) 214102.
- M. Salloum, S.C. James, D.B. Robinson, Effects of surface thermodynamics on hydrogen isotope exchange kinetics in palladium: Particle and flow models, Chemical Engineering Science, 122 (2015) 474-490.
- J.-J. Park, J.-G. Lee, S.C. James, S.S. Al-Deyab, S. Ahn, S.S. Yoon, Thin-film metallization of CuInGaSe2 nanoparticles by supersonic kinetic spraying, Computational Materials Science, 101 (2015) 66-76.
- J.-G. Lee, D.-Y. Kim, B. Kang, D. Kim, H.-E. Song, J. Kim, W. Jung, D. Lee, S.S. Al-Deyab, S.C. James, S.S. Yoon, Nickel–copper hybrid

electrodes self-adhered onto a silicon wafer by supersonic cold-spray, Acta Materialia, 93 (2015) 156-163.

- H. Yoon, M.-W. Kim, H. Kim, S.S. Al-Deyab, S.C. James, S. Ahn, S.S. Yoon, Three dimensional web-like fibrous CuInS2 film, Applied Surface Science, 351 (2015) 588-593.
- S. James, M. Cardenas, C. Hirlinger, Validating and Applying SNL-EFDC to Current Energy Capture Devices Simulation, in: World Environmental and Water Resources Congress 2015, American Society of Civil Engineers, 2015, pp. 1368-1377.
- F. O'Donncha, S.C. James, E. Ragnoli, Numerical modelling study of the effects of suspended aquaculture farms on tidal stream energy generation, in: G. Casalino (Ed.) Oceans 2015, Genova, Italy, 2015, pp. 1-10.



### Liliana Marin

This year marked a new chapter in my life, by being part of the Baylor Family within the Geology Department. It is my role to coordinate and supervise the newly established Geoluminescence Dating Research Laboratory (BG Lab), under the purview of Dr. Steven Forman. The BG lab is a research and teaching facility and it is equipped for optically-stimulated luminescence dating (OSL). OSL dating provides a measure of time since sediment grains were deposited and shielded from further light or heat exposure, which often effectively resets the luminescence signal. This technique dates the time since sediment was deposited in the past 1 to 2 million years.

Baylor University Geoluminescence Research Lab (before it went operational and went dark)

The lab became operational in August 2014 with the transfer of Risø technology from the University of Illinois to Baylor. The BG Lab is an unique facility, the only one in Texas, and one amongst about 10 labs in the US. The Lab is involved with a variety of research that provides new insights on the timing of past droughts, floods, volcanic eruptions, paleoseismic events and many other geologic and anthropogenic events.



Sample Preparation Area

We are currently awaiting the import of a state-ofthe-art Risø Single Grain OSL system from Denmark, with will lend the lab new analytical capabilities.

The lab enjoys collaborating with students and scholars from near and afar. This past year we hosted scholars from Canada and Turkey. April Dalton, a Ph.D. student from the University of Toronto-Canada, visited the lab in August 2014, to evaluate the potential of OSL to date glacialfluvial sequences at the heart of the former Laurentide ice sheet in the Hudson Bay Lowlands. Dr. Korhan Erturac from the University of Sakarya in Turkey visited during the spring semester to acquire expertise to decipher more fully the timing of past earthquakes along the Anatolian Fault. We have also a cadre of Baylor students working in the lab, most notably three geology undergraduate majors Ashley Ramsey, Chris Dickey and Connor Mayhack.

I was fortunate to re-enter the classroom by teaching in the spring semester a section of Geology 1401 (Earthquakes and Natural Disasters). It was enjoyable to interact with students in class and to share my passion for geology. Also, I

participated in a service trip over Spring Break to the Santa Helena School in Costa Rica, an institution sponsored by Baylor (sixth graders pictured right). I joined an



interdisciplinary team from Baylor and McLennan Community College to enhance educational resources. This elementary school is populated with low-income children, many have been displaced by violence in Central America. During this time, I assisted with translation from English to Spanish and vice-versa, preparing bilingual science classes, visits to museums and geological state parks with children from kindergarten to six grade.

It is my long-term goal to continuously improve BG lab research with the quality of data produced, advent of new analytical approaches and train students in new research directions. I look forward to continue teaching undergraduate classes and serve the Geology Department in any capacity according to my abilities.

### Dr. Lee Nordt



This past summer we vacationed in Durango, Colorado and stayed at the Purgatory Resort. The high point of the trip was hiking from the lodge up to 10,000 feet elevation. We also enjoyed spending time with Steve and Sandy Dworkin at their vacation spot at Pagosa Springs.

Garrison is still working as first assistant pro at Lochinvar Golf Club in Houston. He is fortunate to have landed so early in his career at such a prestigious club. Working with the rich and famous continues to be an eye opener. He is making progress on his PGA card, having recently completed his last level at the Florida PGA school. As always, he enjoys playing in golf tournaments, attending Rockets and Astros games, and playing golf at Top Golf. He has been in a couple of friends weddings this past year. Garrison now has a girlfriend, Elizabeth, who lives in Austin. So needless to say they keep Hwy290W busy!

Kaylee graduates in August, 2015 from Baylor as an Apparel Merchandising major with an Entrepreneurship minor. She will marry Jeff Landon, her long-time sweetheart, on September 19, 2015. Jeff graduated in May, 2015 from Texas A&M (civil engineer). He will be working at Kimley-Horn in Fort Worth where he and Kaylee will make their home. Kaylee recently completed her internship at the Wacoan Magazine as the stylist. She has also launched her own jewelry line called Everlasting Joy –all handmade. A portion of her proceeds are donated to help fight human trafficking and slavery. Check out her website at shopeverlasting joy.com.

Kathy recently resigned her position as outpatient surgery admitting nurse at Providence Hospital. She had emergency surgery on Mother's Day and is recovering well. She is staying very busy helping Kaylee with jewelry making, wedding planning, shopping, traveling to visit Garrison, and keeping the home fires going! Kathy and Lee have been able to travel some to conferences, especially enjoying Canada at GSA this past year. She still likes planning family vacations for us and this summer we are planning a river trip to Concan, Texas. It should be a great float with all the recent rain!

I look forward to seeing you all during homecoming weekend!

#### **Publications:**

- Nordt, L.C., and Driese, S.G. 2013. Application of the Critical Zone Concept to the Deep-Time Sedimentary Record. The Sedimentary Record 11:4-9.
- Trendell, A.M., Nordt, L.C., Atchley, S.C., LeBlanc,
  S.L. and Dworkin, S.I. 2013. Determining
  Floodplain Plant Distributions and
  Populations using Paleopedology and Fossil
  Root Traces: Upper Triassic Sonsela Member
  of the Chinle Formation at Petrified Forest
  National Park, Arizona: Palaios 28:471-490.
- Meier, H.A., **Nordt**, L.C., Forman, S.L., and Driese, S.G. 2013. Late Quaternary alluvial history of the middle Owl Creek drainage basin in central Texas: A record of geomorphic response to environmental change. Quaternary International 306:24-41.
- Atchley, S.C., **Nordt**, L.C., Dworkin, S.I., Ramezani, J., Parker, W.C., Ash, S.R., and Bowering, S.A., 2013. A linkage among

Pangean tectonism, cyclic alluviation, climate change, and biologic turnover in the Late Triassic: The record from the Chinle Formation, Southwestern United States. Journal of Sedimentary Research 83:1147-1161.

Trendell, A.M., Atchley, S. C., and Nordt, L.C. 2013. Facies analysis of a probable large fluvial fan depositional system: the Upper Triassic Chinle Formation at Petrified Forest National Park, Arizona: Journal of Sedimentary Research: 83:873-895.

#### **Presentations:**

- **Nordt**, L.C. 2013. Geochemical thresholds bracket pH stability fields in Vertisols, GSA, Denver, CO. November.
- Driese, S.G., **Nordt**, L.C., Breecker, D., Beverly, E., Michel, L., Okafor, B. 2013. Micromorphology of type Trinity Series at Richland Creek Wildlife Management Area. South-Central GSA, Austin, TX. April.
- Driese, S.G., **Nordt**, L.C., Culbertson, A., Beverly, E. 2013. Multi-Proxy approaches to interpreting climate and soil duration in the deep-time geologic record using Vertisols. South-Central GSA, Austin, TX. April.
- Breecker, D., Driese, S., **Nordt**, L., Beverly, E., Huntington, K. 2013. Seasonal variations in the carbon isotope composition of soilrespired CO2 and the dominance of root/ rhizsophere respiration in desert soils, American Geophysical Union, San Francisco, CA. December.
- Okafor, B., Breecker, D., Driese, S., **Nordt**, L., Warden, J. 2013. Investigation evaoporation and soil water movement by measuring the isotopic composition of water in Vertisols, GSA, Denver, CO. November.

#### Grants:

Peppe, D., Atchley, S., **Nordt**, L.: EAR #1325552 (\$211,392): Collaborative Research: testing the link between climate and mammalian faunal dynamics in the early Paleocene record of the San Juan Basin, New Mexico. (Awarded)



### Dr. Dan Peppe



The past year was an exciting one in the Peppe household. On March 11, we welcomed our second child, James Vincent Peppe. James is truly a bundle of joy - always smiling, cooing, and shrieking. If only we could get him to sleep a bit more regularly! Anna, who just turned three in August, loves being a big sister to "baby James" and is excited for when James will be big enough to play with her. Having two children has been a bit of a transition (adding an extra child to the household certainly keeps you busy!), but we are all doing wonderfully. Before James was born, Sholly and I went on a "babymoon" to Hong Kong over winter break and had an amazing time. We went on a guided tour around the city, went on two different food tours where we got a chance to sample a huge variety of foods from snake soup to smoked duck to pineapple buns, and spent time exploring markets, parks, and temples. After our trip to Hong Kong and before James was born, we also had our kitchen and master

James Vincent Peppe, born on March 11, 2015



bathroom remodeled. The winter and spring were definitely pretty hectic because of it, but we are really enjoying the remodeled spaces and hope to for years to come.

Professionally, I had a pretty great year as well. In March I found out that I was Sholly and Dan at the Peak on Hong Kong Island overlooking Hong Kong Island and Kowloon



awarded tenure and promoted to Associate Professor! It's been gratifying to see that my hard work over the past six years has paid off and been recognized by the department and the university. I look forward to continuing to expand my research program in new and interesting directions in the future.

My research program remained very active this year. In January, Steve Driese and I spent two weeks in Uganda working on our NSF funded project focused on reconstructing the paleoenvironment and paleoclimate of early Miocene fossil primate and hominoid sites across East Africa. This field research was part of a 5-year, multi-institutional project in which we are working to test how regional temporal and spatial environmental variability in the Miocene influenced the evolution of early hominids. Steve and I, along with Baylor students, and international collaborators, have a paper in review in which we reconstruct the paleoenvironment at Karungu, Kenya, which is one of the major research sites. The research team, without Steve and I, is gearing up for a field season in July and August at a few of the other fossil sites in

Sholly, Dan, and Anna at Disneyland

Steve Driese collecting samples from a series of paleosols at Moroto, Uganda



Kenya. Steve's student, Bill Lukens, is joining the team and will be collecting paleosol and paleomagnetism samples that we'll work on over the next year. Our research trip to Uganda was very productive and I expect that the upcoming fieldwork in Kenya will be equally fruitful. Next year we'll likely have some interesting results to report.

I also continue to work in Kenya on a collaborative project to investigate the paleoenvironment of equatorial East Africa during the Pleistocene and its impact on the behavioral evolution of early Homo sapiens in the Lake Victoria region in Kenya. The results of our work thus far indicate that the Lake Victoria region was significantly more arid than at present during the late Pleistocene causing a major expansion of C4 grassland communities across equatorial Africa. PhD student Emily Beverly, who is co-advised by me and Steve Driese, has focused her dissertation research on using paleosols and fresh-water spring deposits to reconstruct the paleoenvironment and paleoclimate of the region. Emily just had her second dissertation chapter accepted pending minor revisions in Quaternary Research and is working on finishing up the third and final paper of her dissertation. She's planning to defend her dissertation later this summer or early in the fall and will be starting a post-doc at Georgia State University with Dan Deocampo this fall. Over the past two years Emily worked with undergraduate Nicky Arellano on Nicky's undergraduate honors thesis. Nicky used clay mineralogy and bulk geochemistry of paleosols to reconstruct the paleoclimate and paleoenvironment of one of our major research sites. Nicky presented the results of her thesis at GSA in fall 2014 and at the URSA Scholar's Week in spring 2015. Nicky completed an excellent thesis is headed on to graduate school for her Masters.

I also have continued to conduct research on Paleocene deposits in the San Juan Basin in New Mexico. My research in the San Juan Basin is funded by the American Chemical Society, Petroleum Research Fund and NSF and has supported PhD students Caitlin Leslie, Adam Davis, and Andrew Flynn and several undergraduate field assistants and laboratory assistants. The overarching goal of the research project is to explore changes in plant and mammal communities and the relationship between those changes to climate. In this project we are using fossil leaves, alluvial stacking pattern analysis, and qualitative and quantitative analyses of paleosols to reconstruct the paleoenvironment and paleoclimate and magnetostratigraphy and ash dates to determine the age of the deposits and to precisely date the fossil-bearing units. Stacy Atchley and I are co-advising PhD student Adam Davis on his project focused on reconstructing the paleoenvironment of the earliest Paleocene in the San Juan Basin using sedimentology and stratigraphy. Adam's results so far indicate some interesting patterns of autocyclic landscape change in one location in the San Juan Basin. He spent several weeks this summer working at two other sites in the basin to examine regional patterns of landscape change and paleoenvironmental evolution.

PhD student Caitlin Leslie, who is co-advised by me and Stacy Atchley, is also working in the San Juan Basin for part of her dissertation. She is also working to refine the age model for Cretaceous and Paleocene rocks in the Big Bend area using magnetostratigraphy. Her results from Big Bend are very interesting and indicate that the existing age model incorrectly identified the duration of several unconformities in the section. In addition to her magnetostratigraphy work at Baylor, Caitlin spent a week at New Mexico Tech in the winter picking sanidine grains for detrital Ar-Ar dating. We hope to have those results back soon so that Caitlin can write up the results for her first dissertation chapter.

This summer, Caitlin has been in the San Juan Basin and is focusing on an interesting interval in the early middle Paleocene where there is a significant turnover in mammalian species. She is using alluvial stacking pattern analysis and assessments of the paleosols to conduct her work.

Andrew Flynn came to Baylor as an MS student, but decided after his 2014 field season during which he collected a huge number of fossil leaves, to switch to the PhD program. Andrew's dissertation is focused on reconstructing fossil plant communities of the early Paleocene in the San Juan Basin and using the fossil leaves to estimate paleoclimate. His results to date are very interesting and indicate that the floras of the San Juan Basin are much more diverse than contemporaneous floras across North America.

This summer he's focused on collecting a slew of new fossil localities so that we can better understand this pattern of increased floral diversity. Last summer undergraduate Brittany Abbuhl went to the field as Andrew's field assistant, and she has continued to work with Andrew on the fossil leaves they collected in summer 2014. Brittany is now working on developing a senior thesis project where she will be identifying and describing fossil leaves from a few localities to see if she can understand the influence of different facies on the distribution and diversity of plant species.

Napak field site near Iriri, Uganda

Overall, it's been a great year and I'm excited for our next one at Baylor and in Waco. I hope to see many of you at our upcoming alumni events!



Sipi Falls overlook near Mbale, Uganda

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- **Peppe, D.J.** and Hickey, L.J., 2014, Fort Union Formation fossil leaves (Paleocene, Williston Basin, North Dakota, USA) indicate evolutionary relationships between Paleocene and Eocene plant species: Peabody Museum of Natural History Bulletin 55(2): 171-189.
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### Dr. Jay Pullium

Our Greater Antilles Seismic Project (GrASP) got off to a strong start this year. We installed 16 broadband seismic stations in the Dominican Republic in 2014 and will leave them in place until summer 2016, at least. We have retrieved about ten months' of data from all stations and they appear to be of high quality. We will have a closer look at them this summer; three graduate students are working on the project and two (PhD student Hannah Mejia and M.S. student Gift Ntuli) will be at Baylor this summer to analyze the data. Hannah will conduct a range of analyses, including seismic body wave tomography to elucidate the 3D structure of this complex subduction-tostrike-slip transition and locating small-to-moderate-magnitude seismicity to identify active faults. Gift is computing receiver functions to determine crustal and lithospheric structure. After his summer internship with Devon Energy, M.S. student Kenton Shaw will study permanent deformation and co-seismic slip by jointly modeling seismic and highsample-rate GPS data. All three of these first-year students presented their thesis projects in April and are now ready to focus on their research.

Our plan is to jointly analyze data recorded in the Dominican Republic, Puerto Rico, the Virgin Islands, Haiti, Jamaica, the Cayman Islands, and Cuba (the "Greater Antilles"). I visited Cuba in May to launch a collaboration with seismologists there and was able to come back with fifteen months' of continuous waveform data. We will combine those data with the data we have recorded ourselves or retrieved from other networks to build images of the lithosphere in the NE Caribbean. The images will be used to address unresolved tectonic issues in the region and to estimate seismic hazard.

PhD student Mohit Agrawal is developing and applying techniques for jointly modeling receiver functions, surface wave dispersion, and waveforms to constrain lithospheric structure. His first manuscript, an application to the Middle East, was published in *Geophysical Journal International* in February. His second paper is an application to the densely-spaced set of broadband across the Texas margin using data we recorded from 2010-13, was accepted for publication in Geochemistry, Geophysics, Geosystems (G-Cubed) in May.

PhD student Frank Sepulveda, in addition to working full-time for Pioneer Resources in Dallas, is devising a technique to autonomously acquire data and perform modeling to determine subsurface geophysical characteristics. The knowledge and experience he gained during the 2013 workshop in Santo Domingo was critical to his formulating the project. We intend to fieldtest his device, and the software he is writing to operate it, with the instruments currently installed in the Dominican Republic. Lastly, I was honored to be chosen as a Baylor Centennial professor for the academic year 2015-16. Each year a tenured faculty member is designated the "Baylor Centennial Professor" and is provided with an award from an endowment created by the Class of 1945, the Baylor Centennial Class. The award is intended to underwrite a scholarly project or activity that will benefit the individual and the University. My award will pay for a research trip to Cuba in which I will exchange data and begin a collaboration with Cuban seismologists to study Earth structure and seismic hazard in their portion of the northeast Caribbean.



Downtown Santiago, Chile, where I helped lead a workshop entitled "National Geophysical Networks in Latin America: Best Practices, Challenges and Opportunities for Collaboration" in late May 2015





The Malecon (waterfront) in Havana, Cuba, where I attended Cuba's bi-annual Earth Sciences Convention in early May 2015



View of Parque Cespedes, Santiago de Cuba, where Cuba's national seismic network is headquartered



Girl in Havana, Cuba





1950's era American cars in Havana, Cuba

Street scenes in colonial Havana, Cuba



### Dr. Joe Yelderman

What a year in Hydrogeology! The number for this past year was TWO! Ph.D. student Stephanie Wong highlighted the year by winning TWO outstanding paper awards for TWO different papers presented at TWO different conferences. She presented, Time Not wasted: How Collaboratiove Research and Education Help Build groundwater Sustainability in Rural Northern Uganda, Africa, at the Annual Geological Society of America meeting in Vancouver, Canada (her home country) which was selected as the outstanding paper in the session Geoscience for the Public Good: Toward a Sustainable Future. She will receive the award in Baltimore at the GSA Annual Meeting in

November. She presented her paper, "Insights into karst groundwaterstream interactions using dissolved radon concentrations, Central Texas," and received a Farvolden award for an outstanding presentation at the National Groundwater Summit in San Antonio in April. Stephanie's work in the Northern Segment of the **Balcones Fault Zone Edwards** aquifer contributed to the Salado Salamander being officially listed as threatened rather than endangered. A major contribution was the dye tracing Stephanie has conducted at Salado Springs proving all the springs were connected.

Ph.D. student Joshua Brownlow was also impressive as he received TWO grants of \$25,000 each from TWO groundwater districts to study the potential impacts of unconventional oil and gas production in the Eagle Ford play below the Carrizo aquifer in South Texas. Perhaps even more impressively Josh received his Professional Geoscientist License after passing the ASBOG practice exam on the first try!

Recent geology department addition, Assistant Professor Dr. Scott James, has been essential in the preparation and use of the numerical groundwater model in Josh's dissertation research.

M.S. student Jim Tucker also received funding from TWO groundwater districts. His research involves the potential for co-mingling between TWO groundwater units, the Upper Glen Rose and the Hensel aquifer in Bell County and the possible



over-production of the Hensel aquifer in McLennan County. Jim is interning at the Southern Trinity Groundwater Conservation District (STGCD) in McLennan County which recently separated the Hensel and Hosston aquifers into TWO different management zones based on a recommendation from former M.S. student and STGCD intern Michelle Diehl who is now working for Conoco-Phillips in New Mexico.

Josh Kirby graduated in TWO years with his M.S degree in August after completing his thesis, Applied Forensic Investigation of Elevated Arsenic Levels in the Central Texas Trinity Aquifer System and interned at Whiting Energy in the summer. Results from Josh's work were presented to the FHLM group and the STGWD as well as the AAPG and the NGWA.

M.S. student Andrew Worsely is working for Wet Rock consulting and finishing his degree on the Brazos River Alluvium Aquifer.

Dr. Joe was invited to give TWO keynote addresses this year. He presented The Anthropocene Water Dye Tracing Team at Salado Springs



Dr. Rainer H. Helmig – Darcy Lecturer

Cycle at the 15th annual College of Science & Mathematics Banquet, at Midwestern State University, Wichita Falls, Texas and On-Site Wastewater: Re-usable Water, Groundwater, at the TOWA 23rd annual conference, March 10, 2015, in Waco, Texas.

Dr. Joe hosted the NGWA Darcy Lecturer, Dr. Rainer H. Helmig, who presented Modeling and Analysis of Soil-Moisture Processes in the Subsurface: The Influence of **Evaporation and Salt Precipitation** in Groundwater. This distinguished scientist visit was supported by the Geology Department and The Institute for Ecological, Earth and Environmental Sciences. Dr. Joe's hydrogeology class attended the first Hydro-Geo Workshop near Boerne, Texas at Cave Without a Name where Dr. Joe taught a module on Field Notes and Jonathan Weiss competed in the yodeling and hogcalling contest held in the cave.

Dr. Joe had a strong contingent of students making presentations this past year. Graduate students Stephanie Wong, Josh Brownlow, Josh Kirby, Jim Tucker, and

undergraduate students Shelby Ball and Shannon Florian presented their work at the National Groundwater Summit in San Antonio. Stephanie Wong and Josh Bownlow presented their work at the GSA meeting in Vancouver while Josh Kirby and Josh Brownlow presented their research at the AAPG Student Expo in Houston. In addition, Josh Brownlow made several progress reports to the Winter Garden and Evergreen groundwater districts and Stephanie Wong presented at the Bell County Water Symposium as well as the Eurycea Symposium at Southwestern University.

Dr. Joe advised incoming freshmen again this past summer and continues to help Dr. Bonem advise undergraduate geology majors. Dr. Joe also is serving as Director for The Institute of Ecological, Earth and Environmental Sciences (TIEES). Dr. Joe continues to teach Sunday School at Columbus Avenue Baptist Church with Diane, his loving wife of 40 years. The Yeldermans still live at 706 Woodland West, Woodway, Texas and visitors are always welcome.

Jonathan Weiss (on left) competing in the yodeling and hog-calling contest in Cave Without a Name





### Dr. Ren Zhang

Last year was my fifth year at Baylor, and I was much busier than before. I have completed 4597 C/H/N/O stable isotopic analyses with satisfied precisions for the past year, and this is the highest number I have ever made since I moved to Baylor in 2010. Once again, in order to provide such high-quality analytical services to faculty and students from Baylor and other universities, I had to spend almost all of my time trying to maintain a safe, stable, and smooth daily operation of all the instruments at the Stable Isotope Laboratory. To achieve this, I first need to ensure that all lab equipment is maintained, tuned, and calibrated properly on a regular basis and is in good working condition. The second thing is to solve various operational problems associated with aging IRMS and its peripherals. I fixed a number of serious operational errors last year, such as abnormal background and system parameters, acid pump failure, open split failure, peak center failure, isotope ratio computation failure, air leak, sample peak tailing, mass jump failure, etc. I could solve most of the occurred problems on my own. However, sometimes help from my supervisor Dr. Steve Dworkin and other external experts were also needed for identifying the source of a very specific problem. Here I would like to share with you a story about how a TC/EA problem was fixed.

For quite a long time I have been puzzled by a parameter reading problem associated with TC/ EA during manual injection reproducibility test and the tuning/ calibration of our speleothem fluid inclusion extraction device: the hydrogen peaks for internal water standard were too small and too broad, which further caused H2-CO mass jump problem. TC/ EA has three key components: furnace, reactor, and GC column.

I thought I could use exclusion method to find out what causes the problem. I first changed system parameter settings (i.e. temperature, carrier gas pressure, flow rate), but the problem was still there. Then I used a new reactor packing for high-temperature conversion, the problem remained unchanged. Because reactor packing depth is very important for pyrolysis, I even replaced with a tested reactor pre-packed by Thermo, the problem didn't go away.

So I suspected that this might result from a contaminated GC column, but a new GC column ordered from Thermo didn't solve the problem. Would the same problem also occur to solid samples? I removed the speleothem fluid inclusion extraction device and switched to solid sample analysis, and I observed the same problem. As I installed a bottom feed adaptor for the TC/EA before all these tests, what would happen if I detach the adaptor and restore its original flow pattern? The answer was still a big "NO".

After I continued to discuss this issue with many external experts,





including two service engineers from the Thermo for many rounds, I eventually found out what caused the problem: the Tee splitter that connects TC/EA with Conflo IV was somehow clogged, which is really rare according to Thermo. Ultimately the problem has been solved after I installed a new Tee obtained from Thermo. Nevertheless, this is not the end of the story. Another problem occurred after this: I couldn't obtain the desired reproducibility for international standard IAEA-602 no matter how hard I tried. Thus an on-site service visit was called, and the Thermo Service Engineer Mr. Burt Wolff helped me identify the source of the problem after many rounds of various tests. Surprisingly, the problem was just caused by reference itself: the IAEA-602 I planned to use for reproducibility test and normalization was just a bad batch. The problem has gone away after I switched to another standard. I further used this on-site visit for a free preventative maintenance, which included vacuum pump change, pump oil change, filament change, and ion source cleaning. If we haven't purchased the Limited Academic Support Plan

from Thermo, the actual price for fixing this TC/EA problem and preventative maintenance would be over \$9000.00 (labor/travel excluded). Therefore, the Thermo Support Plan does help us a lot.

My goals for the coming new fiscal year are still the same: continue to maintain an uninterrupted and efficient daily operation of the Stable Isotope Laboratory, schedule all lab work to accommodate departmental isotope lab course and support ongoing internal and external research programs. Hopefully I can make more isotope analyses next year.

Finally, I would like to thank our Department professors and office staff for all their help and support. It really is a great pleasure to work here at Baylor and I love my job.



#### Dear Alumni and Friends,

It has been an exceptional year for the Baylor Geological Society Student AAPG Chapter. We have experienced growth and learning over the past two semesters, and we continue to strive to expand the BGS brand built by our previous Presidents. Our executive committee came into the 2014-2015 academic year with the goal of increasing and expanding club involvement in academic, service, social, and fundraising events, as well as to increase undergraduate club membership.

We successfully met our academic goals this semester, and even went well beyond our expectations. Industry and academic professionals gave a total of 10 recruiting and/or technical talks to club members. Club growth included a 40% increase in graduate student membership and a 90% increase in undergraduate membership. We established the inaugural semester of the Undergraduate Mentor Program, which included 13 participants ranging from freshman to seniors. We also hosted an in-house AAPG short course, and two undergraduate information sessions: "How to Get Into Grad School" and "Senior Thesis Info Night."

The BGS was very dedicated to service, and officially participated in 8 community service events. Members lent their hands building homes, helping home builders find supplies, donating cans, fighting heart disease, wrapping Christmas presents, relaying for cancer awareness and research, and hosting local elementary schools for geology field trips

Socially, we held regular meetings with "Pizza Nights," backyard concerts, football "sailgates," and bowling nights. Finally, our fundraising experienced great success this year. We designed T-shirts, hats, polo's, and customized BU drill bits for the Baylor Geology community to order. We then packaged this merchandise into a "BGS Sponsorship" opportunity for our alumni; and with sincere gratitude to those that participated, we raised over \$6,000 for the club this academic year.

I am honored to say that this has been a busy year for the Baylor Geological Society. Collectively, these efforts received national recognition at the annual AAPG meeting in Denver, where the BGS was announced the "AAPG Student Chapter of the Year." As this chapter of 2014-2015 comes to a close, I hope you find we have successfully embodied and represented Baylor Geology, Baylor University, and the Baylor Geologic Society. We can't wait to see what next year has in store!

Hunter Harlow BGS President Caitlin Leslie BGS Vice President



Left: Looking at rocks in the Permian Basin

Right: Ashley and Caleb giving a big "Sic Em"





Left: Field camp can always make you go a bit crazy.

Right: Jeremy let everyone know that Baylor had arrived at the campground.

Left: Drafting up a measured section in New Mexico

Right: Ashley cooking dinner for a famished field camp











Left: We got some rain at Petrified Forest.

Right: Andrew and Thomas keeping up good spirits while measuring section

### Camp







Left: This outcrop in Red Rock canyon was hard to get to!

Right: The park rangers restricted how many tents we could set up at the Grand Canyon.

Left: At Bright Angel point in the Grand Canyon, the students had no fear!

Right: Kolton rests on the Kaibab Formation.





Left: Sandy Dworkin and Lyndsay DiPietro in the lodge at the Grand Canyon

Right: The entire class before descending into the Grand Canyon

Left: Making our way back up the North Kaibab trail

Right: Field camp creates friends for life!







Left: Drafting up a map at Ogden, Utah

Right: Mapping glacial geomorphology near Stanley, Idaho











Right: Zach and Kori measuring conductivity of hydrothermal waters at Yellowstone

Left: Titrating for alkalinity at Yellowstone

Right: Lyndsay and Caleb at Dinosaur National Monument





Left: Shelby, Kori, and Joey measuring section in the San Juan mountains

Right: Shelby is smiling because it was the last day of field camp!





### Doctoral Candidate Receives Prestigious Award for Groundwater Research

Stephanie Wong, a doctoral candidate in the department of geology in Baylor University's College of Arts & Sciences, has received her third Farvolden Award for a presentation on groundwater and stream interactions at the 2015 National Groundwater Association Summit.

"I felt honored when I heard that I won," Wong said. "It humbles me when people recognize what I'm doing and believe I'm doing it well." The award includes a \$1,000 prize and is presented to four students from across the nation each year. Wong, a native of Ottawa, Canada, also received the award in 2010 and 2011.

Wong, whose concentration is in hydrogeology, wrote a paper titled "Insights in Karst Groundwater-Stream Interactions Using Dissolved Natural Radon Concentrations, Central Texas."

"I examined groundwater and stream interactions in Bell County in Central Texas," Wong said. "Our study area, the northern segment of the Edwards Aquifer, is important to study because it represents a local drinking water source as well as a critical habitat for a federally-listed threatened species of salamander."

The Farvolden Award is presented in honor of former National Groundwater Association scientist Robert Farvolden, Ph.D., a pioneer in the development of modern hydrogeology. NGWA's goal is to advocate responsible management and use of groundwater.

Students were judged on the extent that their work contributed to groundwater science, engineering, management or policy. Wong received her B.S. from Carleton University in Ottawa, Canada, and her M.S. in geology from Baylor University in 2012.

"I think that water is a very important issue as it is a basic need for survival," Wong said. "I'm interested in helping people understand their water resources, gain access to them and manage them and!"

them well."

Published on April 28, 2015 by Ashton Brown, student newswriter

Photo courtesy of Stephanie Wong



### Baylor geologists receive national honors

Faculty and students from Baylor University's Department of Geology have received national honors and recognition for a variety of projects.

#### Paper of the Year

During the 2015 annual meeting of SEPM, the Society for Sedimentary Geology, on June 2, a group of Baylor faculty members received recognition for co-authoring the 2013 Outstanding Paper in the Journal of Sedimentary Research. The paper, titled "A Linkage among Pangean Tectonism, Cyclic Alluviation, Climate Change and Biologic Turnover in the Late Triassic: The Record from the Chinle Formation, Southwestern United States," was published in the December 2013 issue of the journal. Among the



seven co-authors are Baylor faculty members Dr. Stacy C. Atchley, chair and professor of geology, Dr. Lee C. Nordt, dean of the College of Arts & Sciences and professor of geology, and Dr. Stephen I. Dworkin, professor of geology.

#### SEPM Membership

Also at the 2015 annual meeting of SEPM, Baylor's Dr. Steven G. Driese, professor of geology, was



award honorary membership in SEPM for his sustained, outstanding contributions to the Society and to science. The meeting awards program notes that Driese has graduated more than 30 MS and PhD students and has a strong record of mentoring undergraduate research projects. "Steve is internationally recognized for his contributions in paleopedology and clastic sedimentology," it adds. "(He) has a laudable record of service to SEPM, to the broader sedimentary geology community, and to students. His career combines academic achievements, distinguished research accomplishments, successful student mentoring and exceptional professional leadership."

#### Climate Change Article Published

Dr. Daniel J. Peppe, assistant professor of geology at Baylor, had a co-authored article titled *"Can Climate Feel the Pressure?"* published in the June 12, 2015, issue of Science magazine, one of the most prestigious science publications in America. The co-author is Dana L. Royer of Wesleyan University.



#### Geology Student Chapter Award

The Baylor University student chapter of the American Association of Petroleum Geologists has been named National Student Chapter of the Year for 2015. The chapter is led by geology doctoral students Hunter Harlow (president, pictured left below) and Caitlin Leslie (vice president, right).



"The American Association of Petroleum Geologists is the world's largest petroleum geoscience organization," said Dr. Stacy Atchley, chair and professor of geology. "This is quite an honor for our students."

Published on June 17, 2015 on the blog of the Baylor University College of Arts & Sciences

### Two Faculty Members Receive 2015 Centennial Professors Awards

Kevin J. Gutzwiller, Ph.D., professor of biology, and Jay Pulliam, Ph.D., The W.M. Keck Foundation Professor of Geophysics, both in Baylor's College of Arts & Sciences, have been selected as the 2015 Baylor Centennial Professors by the Centennial Faculty Development Review Committee.

Created by the Baylor Centennial Class of 1945, the award provides tenured professors with \$5,000 for research projects that will facilitate more indepth study in his or her field.

The committee selected Gutzwiller's proposal to research the ecological impact of whitebark pine decline in the northern Rocky Mountains and Pulliam's proposal to participate in a delegation to Cuba to assess earthquake hazards and earthquake response preparations. In addition, Pulliam and the delegation will exchange data and work with Cuban seismologists to improve understanding of the structure, tectonics and seismic hazard of the northeast Caribbean.

Gutzwiller's trip will provide data for one or more peer-reviewed journal articles, the ability to secure significant federal funding and an increase in the number of Ph.D. students that he can mentor each year.

"The Baylor Centennial Professor Award will enable me to work on an issue with significant ecological ramifications, collaborate with scientists who are knowledgeable about the natural and human-altered systems that support whitebark pine and inform the conservation of this tree and the animal species that use its nuts for food," Gutzwiller said. "I am deeply grateful for this award and delighted with the research and conservation opportunities it provides."

Pulliam's trip will provide at least three Ph.D. and M.S. theses, at least five papers published in peer-reviewed journals and a series of presentations concerning Cuba to Baylor faculty and students.

"It is a great honor to be recognized by a committee of my faculty colleagues for the 2015-16 Centennial Professor Award," Pulliam said. "This award makes it possible for me to meet in person with Cuban seismologists, see their operations firsthand, and build the sort of trust that is required for collaborative scientific investigations. I have worked hard to build these relationships in the Dominican Republic, Puerto Rico, Haiti and Jamaica, so I am enormously grateful that this award will allow me to welcome Cuban seismologists to our seismology working group."

Published on June 26, 2015 by Spencer Cutright, student newswriter



### Graduates

#### December 2014 Graduates

**Bachelor of Science in Geology** Rebecca Davis

#### Master of Science in Geology

Garrett Felda – Paleodepositonal Controls on Late Triassic Fluvial and Lacustrine Strata of the Owl Rock Member (Chinle Formation), Petrified Forest National Park, Arizona

#### May 2015 Graduates

#### **Bachelor of Science in Geology**

Lisabeth Arellano Kolin Beam Joy Craig Jordan Dickinson Daniel Gaskell Christina Jeane Donavan Lewis Jonathon Weiss, Jr.

**Bachelor of Science in Geophysics** Andres Alvarez

Hunter Haston

#### Master of Science in Geology

Jeffrey A. Jex – Mechanics of Lithospheric Delamination in Extensional Settings

#### August 2015 Graduates

**Bachelor of Science in Geology** Jeremy A. Ashburn Brian Diehl Andrew Watson

#### Master of Science in Geology

Brian Crass – Petrophysical Lithofacies Modeling of the Upper Pennsylvanian Cline shale in the Midland Basin, West Texas

Josh Kirby- Applied Forensic Investigation of Elevated Arsenic Levels in the Central Texas Trinity Aquifer System

Kieron Prince - Petrophysical Facies Mapping of the Pennsylvanian Cline Shale, Midland Basin, West Texas

### Awards

**Brian C. Diehl** – 2015 recipient of the Robert T. Hill Award for Academic Excellence in Geology

#### Lisabeth (Nicky) Arellano & Daniel E. Gaskell

Chosen to represent the Geology Department at the 2015 College of Arts & Sciences Honors Convocation.

#### Dixon Field Scholarship

Caleb Teasdale – working with Hunter Harlow Mitch Barton – working with Yohan Letourmy

#### Hayward Field Scholarship

David Roper - working with Adam Davis Tyler Leggett - working with Caitlin Leslie Parker Wright - working with Andrew Flynn



Nicky Arellano and Daniel Gaskell with Dr. Atchley at the 2015 College of Arts & Sciences Honors Convocation

### Alumni Updates

#### Chris Cuyler (BS, 1992)

I am living in Midland now (since 2007) and am Exploration Manager for Concho Resources, an independent O&G Company. I have been married to my wife Wendy for 18 years and have 3 children (ages 23, 17 and 15) and a daughter-in-law.

#### Jordan Dubuisson (BS, 2009)

After graduation I married my college sweetheart, Whitney Harrington (B.S. Child & Family Studies, 2009) in the Texas Hill Country. We moved to Dallas where I worked as a midstream



Jordan and Whitney Dubuisson with the daughter, Vivienne Joy, born in February 2015

Congratulations to: **Tyler (MS, 2014)** and Marina Reed on the birth of their son, Owen, in September, 2014.





Jason Weckbacher (MS, 2007) and Rachel Erlich are now Jason and Rachel Erbach, parents to Talia Rose Erbach, born on March 5, 2015 (left).

**Dr. Dan Peppe** and his wife Sholly Gunter on the birth of their son, James Vincent, on March 11, 2015.

**Dave (MS, 2009) and Stephanie (Capello) Coffman (MS, 2008)** on the birth of their son, Hayes, on March 17, 2015.

**Dr. Bill & Mary Hockaday** on the birth on their son, William Coleman, on April 8, 2015.

#### Condolences to:

To the family of **Glen Kenton Merrill** who passed away on December 2, 2014.

To the family of **Johnnie Boyd Brown (MS, 1960)** who passed away on February 10, 2015.

To **Dr. James Fulton** and family on the passing of his mother, Janet Fulton, on February 18, 2015.

**Sharon Browning** and family on the passing of her father, Edward Browning, on June 11, 2015.

To **Dr. Rena Bonem** and family on the passing of her brother, David William "Bill" Bonem, on August 4, 2015.

#### Wishing a speedy recovery to:

**Claretta Brown**, wife of Dr. Bill Brown, who is recuperating from a stoke that happened in May.

environmental consultant and she pursued her career at Children's Health hospital. In 2014 I graduated from The Univeristy of Texas at Dallas with a M.S. in geophysics. We now live in the Houston area where I work as a geophysicist in Anadarko's technology group. I have the unique opportunity to assist in oil and gas exploration and development activites in many different basins around the world. Most recently we celebrated the birth of our first child, Vivienne Joy, on Febraury 6, 2015. I thank the Department of Geology for a great undergraduate experience and high-quality education, and wish everyone the best in their future endeavors!

#### Donald E. Wandling (BS, 1984)

After a successful 25 year career beginning with petroleum exploration and transitioning into environmental consulting, Don now enjoys the challenges of combining both of these specialties as a geologist for the Pennsylvania Game Commission. The Commissions primary role is to ensure attractive oil/gas leasing on state owned public game lands and to oversee the responsible development of these 1.5 million acres of land by numerous oil/gas operators.

Grant, Don's oldest, is enrolled as a biomedical engineering undergraduate at Penn State University; Nolan is 17 and will graduate from Cumberland Valley High School this year and plans to pursue a nursing degree at Bloomsburg University; Lukas is 14 and entering Cumberland Valley High School this year; and my daughter, Evelyn, is 12 and a 7th grader at Eagle View Middle School. Don looks forward to (hopefully) seeing everyone at Homecoming!



## Please join us! GEOLOGY OPENHOUSE

Friday October 23, 2015 7:00-9:00 p.m. Baylor Sciences Building, E401

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# LET'S STAY CONNECTED...

We would love to know where you are and what you're doing! Please complete the form on the back, fold in half, place a stamp, and put it in the mail. We will use this information to update our departmental files. You can also email your information to: Paulette\_Penney@baylor.edu.

Also, remember we have the "Geokid" bulletin board in the office with photos of children of Alumni, so send your pictures to Paulette\_Penney@baylor.edu.

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Dr. Vince Cronin, Professor Structure & Neotectonics

Dr. Steven Driese, Professor Graduate Program Director Paleopedology & Sedimentology

Dr. John Dunbar, Professor Near-Surface Geophysical Methods

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Dr. Daniel Peppe, Associate Professor Paleomagnetism & Paleobotany

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