GEOSCIENCES

Alumni Newsletter | Fall 2016

WE HAVE ACHIEVED LIFTOFF

BAYLOR UNIVERSITY

IN THIS ISSUE...

Faculty & Staff Articles

Dr. Stacy Atchley 3
Dr. Peter Allen 5
Dr. Kenny Befus 8
Dr. Rena Bonem 10
Sharon Browning 11
Dr. Vince Cronin 13
Dr. Steve Driese 14
Dr. John Dunbar 16
Dr. Steve Dworkin 18
Dr. Steve Forman 19
Dr. Jamey Fulton 22
Dr. Don Greene 23
Wayne Hamilton 25
Dr. Bill Hockaday 28
Dr. Scott James 31
Liliana Marin 34
Dr. Lee Nordt 37
Dr. Daniel Peppe 39
Dr. Jay Pulliam 42
Dr. Joe Yelderman 45
Dr. Ren Zhang 49

Points of Interest

Update from the BGS 51
Field Camp 2016 52
Feature Article 54
Graduates and Awards 55
Let's Stay Connected 57
Alumni Updates 59
Homecoming 2016 59
Department Directory 60

Dear Alumni and Friends of the Baylor University Department of Geosciences:

As you are aware from both my introductory sentence and cover to this newsletter, the Department of Geology formally changed its' name this past year to the Department of Geosciences. The change was necessary to better reflect the diversity of disciplines that now reside within our department, i.e., geophysics, hydrogeology, environmental geology, sequence stratigraphy, petroleum geology, structural geology, volcanology, planetary geology, paleopedology, paleoclimatology, geomorphology, paleontology, paleobotany, isotope and organic geochemistry, and geochronology. As you can see, we've greatly expanded our identity over the years.

Our faculty continues to grow, and during 2016-2017 we will add a new geophysicist/planetary scientist, Dr. Peter James. Dr. James received his Ph.D. from the Massachusetts Institute of Technology (MIT), and since his graduation in 2013 has worked as a post-doctoral researcher at the Columbia University Lamont-Doherty Earth Observatory. To date Dr. James' research interests have involved the geophysics of Venus, Mercury and the Moon, although he emphasizes that his research skills are equally applicable to Earth-bound projects. As far as faculty announcements, it is also newsworthy that both Drs. Dan Peppe and Bill Hockaday were recently awarded tenure (Peppe in 2015 and Hockaday in 2016). Both Dan and Bill are excellent teachers and highly productive scientists. Even more importantly, they are great colleagues that have excellent relationships with both our undergraduate and graduate students. The Department of Geosciences is pleased to welcome Dan and Bill as tenured faculty members of our departmental family.

Consistent with recent years, our undergraduate program continues to grow and we now have 84 majors (76 Geology, 5 Geophysics and 3 Earth Science). Our graduate program currently has an enrollment of 38 students that includes 14 M.S. and 24 Ph.D. We had few TA and RA positions to fill for Fall 2016 enrollment, and subsequently only added 3 M.S. and 3 Ph.D. students. During the 2015-2016 academic year 5 Ph.D. dissertations and 4 M.S. theses were completed, and our Ph.D. students had 10 first-author journal articles published.

As Baylor is now holding its' faculty to increasingly high standards of research productivity, I mined through my records to tabulate how the Department of Geosciences' productivity has fared over the past 13 years. For reference, the total number of faculty in 2003 was 12 and as of Spring 2016 stands at 16. Since 2010 we have also added 3 technical staff (Liliana Marin, Optically Stimulated Luminescence Laboratory; Tim Meredith, Paleomagnetism and Geophysics laboratories; Ren Zhang, Mass Spectrometry Laboratory). Over the past 13 years the publications per faculty member have increased from less than 1/year in 2003 to 2.4/year in 2015. Similarly, our total external research funding has grown from $300k ($25k/faculty/year) in 2004 to as high as $1130k ($71k/faculty/year) in 2012. Most significantly, our average M.S. graduation rate increased from approximately 5/year in the mid 2000s to 11 projected in 2016, and our Ph.D. graduation rate has increased from 1-2/year in the mid 2000s to 6 projected in 2016. These trends are all very encouraging, and we will do our best to maintain the positive trajectory.
We are all very thankful for both our students and alumni. In the end, it is ultimately you that make our work meaningful and relevant.

With my greatest appreciation,
Stacy Atchley
Geosciences Chair

Class hard at work on correlation exercise at Honaker Trail camp, San Juan River Canyon, SE Utah

Class enjoying the view of the San Juan River Canyon at the head of Honaker Trail

Class measuring section at Thompson Canyon outcrops in the Book Cliffs near Green River, Utah

Class taking notes from canyon wall vantage at Slaughter Canyon, Guadalupe Mountains. New Mexico

TA Josh Brownlow at Honaker Trail campsite at dusk

Class measuring section along Honaker Trail

DR. PETER ALLEN

Well I had the rewarding opportunity of hosting two more students through the waters so to speak, Steve Norair and more recently, Lance Auguste. Stephen has just completed his MS degree utilizing the PEST model on 5-100 square mile watershed to test the revised watershed erosion model SWAT-DEG (ARS/USDA). To assess long term erosion for model calibration, he employed dendrochronology with the help of Dr. Joseph White to assess the rate of erosion in the streambanks using the exposure impact which can be ascertained from the eroded tree roots. This method gave decadal rates of erosion without waiting for individual storms as with erosion pins. Stephen defended his work this spring and is off for more education with former students Stephanie and Dave Coffman at Freeze and Nichols in Fort Worth, a large engineering firm. Stephan gave his talk at national meetings as well as at the ARS/USDA federal Laboratory in Temple, Texas

Lance Auguste is a new student from Midwestern University and St. Lucia who is beginning a rain soaked initiation to Texas and studying the mechanics and rates of gully erosion in the Blackland Prarie. He has installed monitoring flumes, time lapse cameras, erosion pins, bedload traps and soil moisture sensors and rain gages in an attempt to analyze gully dynamics. In addition, Lance, with the help of Dr. White and students, has begun to assess the gully dynamics using structure from motion photographic methods as well as drone flights. It appears that the veil of federal drone regulation is being lifted in August which should allow more flights and data this fall. Lance has also given presentations at the Federal ARS/USDA lab in Temple and is working on calibrating a new gully model for the ARS/USDA with Dr. Jeff Arnold.

Both students applied for and received $5000.00 dollar grants for their research from the Glasscock Foundation.

On the research front I continue to attack the sneaky area of concentrated flow erosion in the field and lab using everything I can think of to get a better handle on the mechanics and rates. I have bugged Joseph White and John Dunbar who are helping me attack this problem and we seem to be making slow but constant progress. We are working with a new “minijet” which we obtained from Oklahoma State and are testing various mixtures of sand and clay to ascertain how the percent and type of clay effects erosion as well as looking at fluidization of the clay under the pressure fluctuation of the jet. As usual I am way over my head in this but that’s why I work with Drs. Dunbar and White.
Jeff Arnold has been recoding the SWAT Model over the past several years and I have been working with him on model architecture and

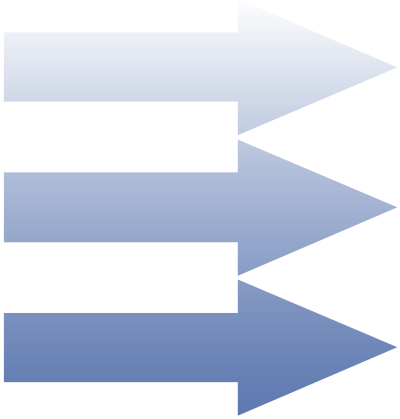
in the area of concentrated flow erosion and deposition. Jeff has the model now producing the entire sediment budget with model dynamics cascading from the agricultural fields, through the small headwater streams down through the entire system with floodplain deposition and channel erosion being modeled at each stream order. This is an amazing leap forward in unraveling the complicated watershed sediment and pollutant budget and will hopefully aid in better allocating best management practices within watersheds. This model is currently used through the United States and world wide as a major water budget model. Jeff, Mike White and others plan to run this model for the 83,000 8 digit watersheds this next year as part of a USDA assessment of Best Management Practices for the US Farm Bill. As part of this work up, we have been working with Drs. Katrin Bieger (Post-doc ARS/USDA) and Hendrik Rathjens (Post DOC Purdue) on evaluating channel bankfull dimensions for the United States through utilizing measurements from about 1860 separate sites to better model channel dimensions in large scale watershed modeling. We have also been working on subroutines to delineate floodplain boundaries within the models. IN fact, a grid scale model designed by Jeff and Dr. Srinivasan of Texas A&M is now running on a world scale at a 10 km. square grid. This model should allow better water balance assessment on a daily time step.

This Spring we were able to get Dr. Ellen Wohl from Colorado State as the 2016 O.T. Hayward Distinguished Lecturer thanks to the endowed gift from the Hudsons. This endowment continues to allow us to bring in world class speakers to give two presentations on geomorphology and the opportunity to meet with our students and faculty.

Chris Breed and I have been perfecting the Laser profiler shown in the picture below to take rapid highly accurate river cross sections in about 30 seconds. We named it the “Lasec” and are in beta testing. Chris wrote all the software to get it to collect the data on Microsoft excel for direct export to rating curve software.

On the local front, I am working with John Dunbar on a Rapid Geomorphic Assessment of a 1400 square mile watershed that controls the drainage to a major water supply reservoir for the City of Fort Worth for the Tarrant Regional Water District. This assessment evaluates the potential amount and severity of channel erosion with in the watershed. We employed several new techniques on this assessment in that we are using Google Earth in the car as we navigate from site to site using a continuous link. The watershed boundaries and modeled reaches are on the computer in the car and we are able to assess the problems as we go. IN the Dallas area we are working with Halff engineers on erosion assessment downstream of Grapevine Dam. This project involves 2-D flow modeling and very intense surveying efforts. John and I hope to get started on this project later on this summer.

At home, we have finally moved into hopefully our last home…which we have been fixing up over the past year and Im happy to say the family is now stationed permanently in Waco. Goodbye to I-35. Sarah still lives with her family (2 grandchildren) in Dallas, Maggie and “Lady Eloise” my new grandchild, and family live in Denver, and Annabel lives and works in Chicago. Yep so this past year has been one of making the circuit between the various cities. Happy to hear from you all and keep up the good work as it makes us look like we taught you something.



2016 Hydro Class measuring baseflow on Childress Creek, TX

Lance examining the gully headcut as we begin field assessment this last fall.

Here Chris Breed and Stephan Norair use the newly created Laser Profiler to get a cm resolution cross section in about 30 seconds. We were able to set up and get a new cross section in about 5 minutes. The laser is shown at the top of the guide channel and is lowered shooting 32 times a second out 60 meters in three directions.

New Mini Jet for erosion assessment of gullies and streams

DR. KENNY BEFUS

Year 1 of my career at Baylor is in the books. I have learned the Sic 'em hand gesture and generally can find most of the buildings around campus. I definitively know the locations of all of the dining halls, Stacy Atchley really helped out with that on Fridays throughout the year (Dr. Pepper floats are like water to him).

This year I was given a light teaching load so that I could better focus on research proposals and building the High Temperature Experimental Petrology lab. My only class was Petrology – taught to ~20 sophomore and junior Geology majors in the Spring semester. We covered topics like "magmagenesis," "stable and radiogenic isotopes," and "metamorphic kinematic textures." In lab, the students used hand samples and petrographic microscopes to identify and interpret a wide array of igneous and metamorphic rocks and textures.

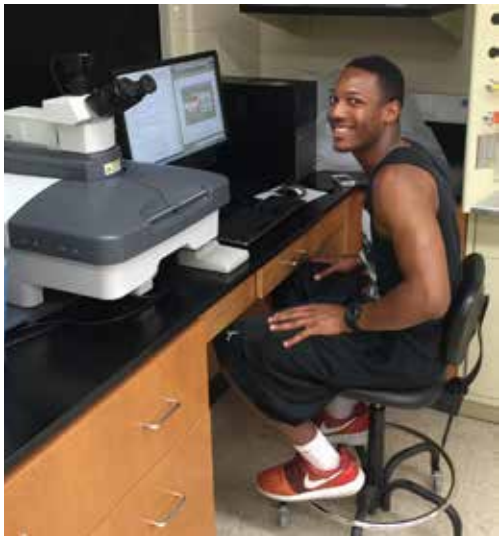
The highlight of the semester (and my year) was the Petrology class 3-day field trip to the Llano Uplift in Central Texas. The Llano Uplift is a ~60 mile diameter erosional outcrop of Precambrian granites, schists, and gneisses. For many of the students it was their first overnight geology field trip, and for a few it was their first time camping. The students were awesome on the trip. They surprised and delighted me with their engagement and curiosity. They actually used and understood the field trip guide, made connections to lecture topics, and enthusiastically went about making field observations. There were some great finds on the trip, including a hand sample of tightly folded graphite schist, radioactive minerals, black tourmaline, and thermoluminescent purple fluorite.

My light teaching load allowed me to pursue volcanology research throughout the year. That time was critical because as a new professor I must now create new, exciting, fundable projects. I am most enthusiastic about a project to characterize stresses during eruptions. Stress is poorly constrained in volcanic systems even though those stresses are the forces that cause magmas to explosively fragment or flow. To try to solve for stress I will use x-Ray microdiffraction at a national laboratory to measure the deformation of crystal lattices in minerals that were strained during volcanic eruptions.

I am also in the midst of building my High Temperature Experimental Petrology lab. The lab is about halfway completed. Eventually I will use this lab to make magma and simulate volcanic eruptions. Those experiments will all be run all at real pressures and temperatures using a system of furnaces and hydraulic pressure lines. To analyze completed experiments, I have Raman and Fourier Transform Infrared spectrometers, both of which are installed and operational. Those machines are used to specifically measure the H_2O and CO_2 contents of minerals and glasses. I have 2 undergrad geology majors working in my lab using those spectrometers to separately characterize minerals from mantle rocks in Arizona and from explosive volcanic rocks from Yellowstone.

I appreciate the opportunity to be a part of this department and community this past year. I look forward to becoming more invested and involved. You are welcome to visit "sites.baylor.edu/kenneth_befus" for more details on my teaching, research plans, or to access published work.

Petrology 2016 class on the top of Enchanted Rock. If you see any of them they can surely teach you something about granite intrusions and Rapakivi textures.



Geology major Adrian Charles working on the Raman Spectrometer to understand the magma chamber of the Yellowstone supervolcano

Caught in the act: students with midterm exam intensity

DR. RENA BONEM

The undergraduate majors in Geology and Geophysics continue to increase in numbers. The current number of majors on the books is approximately 97 (we have new transfers coming in every week during the summer). We will have 12 seniors graduate this summer, but Mineralogy has about 19 students this fall, which is down 6 from last fall. Paleontology has 30 majors with 1 biology student enrolled. That is up 12 from last fall. Field camp is still a good size at 16. I don't think we have any secondary majors yet, but we do have several students who are taking classes in geology within the Schools of Business and Engineering.

Last year we changed the undergraduate thesis requirements back so that students sign up for other courses if they are not doing a traditional thesis. All of my undergraduate thesis students have graduated and Ryan Morgan completed his Ph. D. and graduated in December. He is still teaching at Tarleton State. My teaching schedule for the fall has me back to teaching invertebrate paleontology and world oceans for a total of just over 160 students, plus continuing to do advisement for juniors and seniors. I took off this summer and have been revising power point presentations for my classes in the fall.

My brother passed away last fall, so I have been helping my sister-in-law around her house this summer. We have a Rhine River trip planned for July which was something we always wanted to do with my brother. We will be going from Amsterdam to Basel on Viking River cruises. The following year, my sister-in-law wants to do Australia and New Zealand. Other than that, Lady Bug and I have entered a few dog trials to keep busy, though she claims I do not run as fast as she can!

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.

Kinderdijk, Netherlands

Marksburg Castle, Germany

Monument at the Confluence of the Rhine with the Mosel

SHARON BROWNING

We have had another productive year in our renamed Department of Geosciences. My primary concern this past year has been to ensure we are meeting education goals of the College of Arts and Sciences with regard to our freshman lab courses. Much of my time in the fall and spring semesters is spent making sure our labs run smoothly, and that our graduate teaching assistants have the training, material, and feedback necessary to excel. The focus has been on the critical thinking and communication skills of our students using a variety of strategies appropriate for the individual course and student population. Our lab classes afford students opportunities often not feasible in a lecture section due to size or room constraints. Oral and written reports, field-based exercises, peer-teaching and assessment, and the integration of open-ended questions into both weekly lab exercises and assessments are all being utilized.

We have been able to have three fluorescent cabinets constructed with funding from both our mineral sale last year and freshman lab funds. Two of these cabinets are reserved for utilization in our teaching labs, while the third will be used for community outreach. Many of the samples we received from the Roger Waguespack collection in 2015 are well-suited for use in these cabinets. My goal with our ongoing outreach activities is to increase our impact by working with K-12 teachers or community groups when possible. This past summer, I had the opportunity to work with approximately twenty four 6th-8th teachers from Region 12 as part of the Texas Regional Collaboratives for Excellence in Science and Mathematics Teaching (TRC) grant 2015-16. The purpose of the TRC is to strengthen educator competence and confidence in commonly missed state TEKS standards. I developed and led instructional materials, activities, and field trips focused on the following standards:

6th grade (10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to:

(B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation;

7th grade (8) Earth and space. The student knows that natural events and human activity can impact Earth systems. The student is expected to:

(B) analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas;

8th grade (9) Earth and space. The student knows that natural events can impact Earth systems. The student is expected to:

(C) interpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering.

This continued in summer 2016 with a focus from our perspective on the climatic interactions between Earth, ocean, and weather systems.

Related to my work with Region 12 last summer, we were able to host Itasca Middle School as part of Earth Science Week in October 2015. Students were treated to a variety of hands-on activities related to natural disasters as well as a rock and mineral dig. Participants included Andrew Flynn, Todd Longbottom, Yohan Letourmy, Kenton Shaw, and Dr. Bill Hockaday. I also had the opportunity to speak to two community groups in fall 2015; the Waco Master Naturalists and a local church women's group. I am pleased with our balance of undergraduate education and community outreach, and look forward to the future at Baylor University.

Graduate student Kenton Shaw talking to student about seismic wave propagation

Itasca Middle School student learning how to construct an earthquake-resistant building.

Graduate students Yohan Letourmy and Andrew Flynn supervise students at the fossil identification table

DR. VINCE CRONIN

Tori Worrell and Brandon Rasaka completed and successfully defended their MS theses during the spring 2016 semester. Tori's work demonstrated that the Seismo-Lineament Analysis Method (SLAM) could have been used to identify the West Napa Fault as seismogenic before the M6 South Napa Earthquake of August 2014. The South Napa earthquake caused an estimated $400M in damage to the area. Tori also concluded that the M5 Yountville Earthquake of 2000 most likely occurred along the West Napa Fault. Brandon found that the earthquakes that he studied in Oklahoma probably occurred along old faults that cut crystalline basement, and that those faults do not seem to reach the current ground surface through the sedimentary cover sequence. It has been widely suggested that the recent significant increase in earthquake activity in Oklahoma and north Texas is due to deep injection of waste liquids from the oil and gas industry, but Brandon's thesis was not designed to evaluate that hypothesis. Both of their theses are available via http://croninprojects.org/Vince/CroninStudents/Current-Past.html. Last I spoke with her, Tori was getting ready for her wedding and working on finding a job in geoscience that interests her. Brandon moved with his growing family to Washington State, and is working as an instructor of online courses for Brigham Young University in Idaho.

Matthew Strasser is working on a MS thesis project that builds on prior work by Ryan Lindsay, Tyler Reed, and Jeremy Ashburn in the north Tahoe-Truckee area. Matthew will be using LiDAR data and field work in his search for the fault that generated the M6 Truckee Earthquake in 1966. I have no new grad students this fall.

I have been working steadily on creating the 11th edition of the AGI/NAGT Laboratory Manual in Physical Geology. I am told that it has been the most widely used physical geology textbook in the US, if not the world. But then, I am now used to being told things that turn out to be less than fully accurate. It has been an interesting process, working with a team of perhaps a dozen folks at Pearson, Dennis Tasa as art editor, external reviewers from AGI and NAGT, and various others. While this was supposed to be a light revision, it has turned into a more extensive rewrite than I had hoped/intended. The result has been that I have been working pretty much every waking hour that my brain allows me to focus on this project since December of 2015. As I write these lines in early June, I am about halfway done with my authoring work, which must be completed by mid-August. Then there are a host of production-related editorial tasks to be done. The new edition goes to press in early November, and will be in print in early January.

I continue as co-chair of the US Section, International Association for Promoting Geoethics (http://www.geoethics.org). I gave major presentations about geoethics at the annual meetings of the West Texas Geological Society and the South Texas Geological Society within the last year. In August, I will be making a similar invited presentation on geoethics at the SIPES (Society of Independent Professional Earth Scientists) annual meeting in San Diego. A major volume on geoscience ethics from AGU, edited by Linda Gunderson of the USGS, should be in print by that time. I am sole author or coauthor of two papers in that book. I was also invited to give a keynote presentation on geoethics at the International Geological Congress in South Africa this fall, but my time-intensive editorial duties prevented me from accepting the invitation. Cindy and I hope to accept an invitation to make a similar presentation at the European Geosciences Union General Assembly in Vienna next April, after the new edition of the lab manual is put to bed.

The family is well. Kelly works at the Lyric Opera of Chicago and lives a few blocks away from Wrigley Field. She tells us that she is just where she wants to be at this point in her life. Connor is doing well as a 3rd-year mechanical-engineering student at the University of Portland. He still climbs whenever time permits. Cindy and I are working on getting the house into a state where there are no major projects left to do. We are getting pretty close. We hope to finish the renovations within the year.

I would love to hear from former students, many of whom have been grappling with the effects of low oil/gas prices. For most of us, life is a long road that is full of ups and downs and unexpected turns. In the long run, a lot of what we spend our lives worrying about might not be as important as it seems at the moment. It is important to remember that honesty matters, integrity matters, how you treat others matters.

DR. STEVE DRIESE

It has been another very busy year for me with teaching, research, and professional service. In the fall semester of 2015 I taught the graduate GEO 5342 "Micromorphology" course and the graduate GEO 5V90 "Seminar on Grant Proposal-Writing". In the spring semester of 2016 I taught GEO 5339 "Sandstone Petrology". I continue to serve the GEO (now Geosciences) Department as Graduate Program Director.

This was the year of my continued direction of 5 Ph.D. dissertations. 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 had a second involving a late Pleistocene paleosol catena appear in *Quaternary Research*. Emily graduated in the Fall semester and started a post-doctoral position at Georgia State University. Current Ph.D. student Lyndsay DiPietro has a paper on a paleowind reconstruction of the Dry Creek, Alaska site that is in review in *Quaternary Research*, and she continues to tie together work at Serpentine Hot Springs site on the Seward Peninsula. Ph.D. student Bill Lukens is working on reconstructing paleoenvironments of late Miocene Ogallala Fm. fluvio-lacustrine deposits in the Canadian River region of the Texas Panhandle, as well as working on the BU PPM soil data base (generously supported with a GRA from Lee Nordt) to develop a new geochemical paleoclimate proxy for paleosol pH that is in review in *Geology*, and was involved in field work in southwestern Kansas as well as in western Kenya involving Miocene paleosols. Yohan Letourmy completed a second summer of field work at the UNESCO World Heritage site at Joggins, Nova Scotia, famous for its very large Pennsylvanian fossil trees that were buried in growth position by fluvial sandstone deposits, and he is currently preparing a manuscript on the sequence stratigraphy of over 5,000 m of strata. Logan Wiest is investigating paleosols at multiple sites, including soil animal traces at the K/T boundary at Big Bend, TX and in southwestern North Dakota, and has a paper in review in *PALAIOS* describing vertebrate scavenging traces preserved on fossil bones at the Waco Mammoth National Monument.

During Christmas break (January 2015) Dan Peppe and I travelled to Uganda where we conducted NSF-sponsored research on early Miocene paleosols at the extinct Napak and Moroto volcanoes. During June of 2015 I visited Tartu University, Estonia as an "opponent" for Tartu University Ph.D. student Sirle Liivimägi, and developed new research collaborations with her advisors, Professor Kalle Kirsimäe and Dr. Peeter Somelar. While in Estonia I was able to visit an old Soviet-era core storage facility and sample a drillcore penetrating 35 m of the Neoproterozoic "Baltic paleosol" interpreted as a paleo-Oxisol (manuscript was just submitted to *Geology* for peer review). 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. In 2015-2016 I published 9 refereed journal articles. In 2015 I made 3 professional presentations of my research (as first author), and was a co-author on 7 additional professional presentation. In June of 2015 I was awarded Honorary Membership in SEPM (The Society for Sedimentary Geology) at the AAPG/SEPM Annual Meeting in Denver.

During July of 2015 Marylaine and I stayed at a cozy cottage near Harpwell, ME on the cool Atlantic rocky coast, a phenomenal place to beat the Texas summer heat, consuming

lobsters and other seafood. 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 earned her M.S. and now continues in the Ph.D. program at Arizona State University, majoring in medical anthropology. She did research in Guatemala during the summer of 2015, and will return there again in 2016. Our oldest son Nathan is happily teaching Philosophy at Pellissippi State Community College in Knoxville, TN. Our other son Trevor also lives in Knoxville (working for a mortgage company) with his wife Lindsay. Marylaine and I continue to make frequent trips back to the southeast (Tennessee and Georgia) to visit family and friends, and are currently having a second home built in Knoxville.

Peer-Reviewed Journal Publications (2015-2016):

Driese, S.G., Li, Z.-H., Cheng, H., Harvill, J.L., and Sims, J., 2016, 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 516, p. 231-246.

Driese, S.G., and Ashley, G.M., 2016, Paleoenvironmental reconstruction of a paleosol catena, the Zinj archaeological level, Olduvai Gorge, Tanzania: Quaternary Research, v. 85, p. 133-146.

Driese, S.G., Peppe, D.J., Beverly, E.J., DiPietro, L.M., Arellano, L.N., and Lehmann, T., 2016, Paleosols and paleoenvironments of the early Miocene deposits near Karungu, Lake Victoria, Kenya: Palaeogeography, Palaeoclimatology, Palaeoecology: v. 443, p. 167-182.

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 semi-arid grassland: Implications for environments of early humans in the Lake Victoria Basin, Kenya: Sedimentology, v. 62, p. 1611-1635.

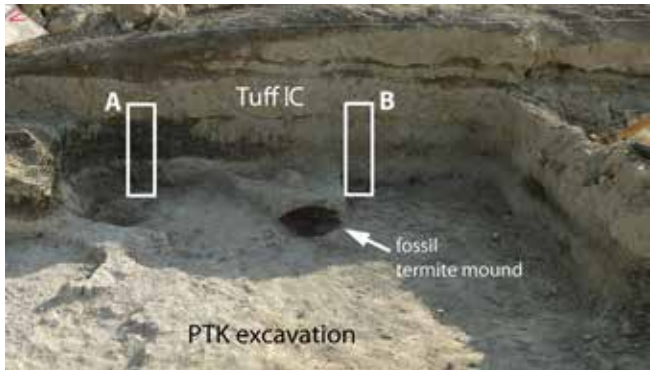
Beverly, E.J., Driese, S.G., Peppe, D.J., Arellano, L.N., Blegen, N., Tryon, C.A., and Faith, J.T., 2015, Reconstruction of a semi-arid Late Pleistocene paleocatena from the Lake Victoria Region, Kenya: Quaternary Research, v. 84, p. 368-381.

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, v. 83, p. 28–45.

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, v. 62, p. 1078-1099.

Stinchcomb, G.E., Nordt, L.C., Driese, S.G., Lukens, W.E., Williamson, F.C., and Tubbs, J.D., accepted, A data-driven spline model designed to predict paleoclimate using paleosol geochemistry: American Journal of Science.

Tryon, C.A., Faith, J.T., Peppe, D.J., Beverly, E.J., Blegen, N., Blumenthal, S., Chritz, K. Driese, S.G., Patterson, D., and Sharp, W., in press, The Pleistocene prehistory of the Lake Victoria basin: Quaternary International, http://dx.doi.org/10.1016/jquaint.2015.11.073.



Late Pleistocene (1.845 Ma) stratigraphic section at PTK site, Olduvai Gorge, Tanzania showing Zinj paleosol (A, B) developed beneath Tuff IC (Driese and Ashley, 2016).

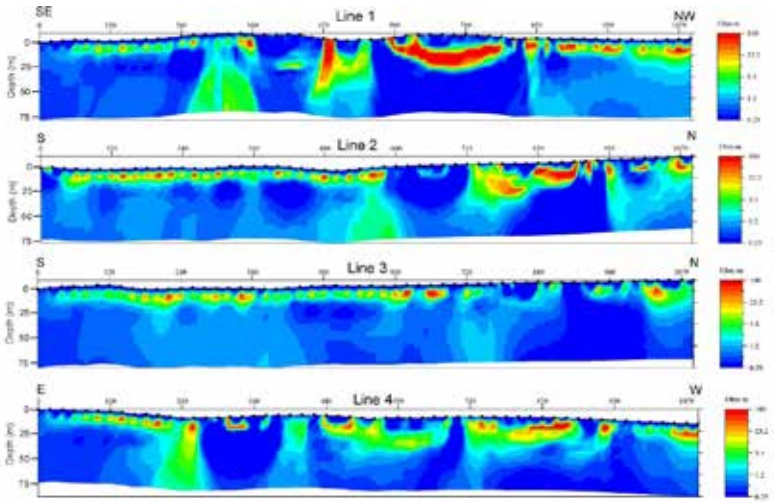
DR. JOHN DUNBAR

In fall 2015 two new graduate students started working with John Dunbar. MS student Gina Pope is working on methods for imaging fractures using direct current resistivity methods. Gina will test different fracture imaging strategies by forward modeling resistivity data sets for different combinations of observation boreholes and recording geometries. She will then invert those virtual data sets with different optimization methods and combinations of a priori constraints to see which approaches produce the best results. PhD student Bulbul Ahmmed is being jointly supervised by Scott James and John Dunbar and will work on the combined hydraulic and geophysical characteristics of rock fractures. Bulbul will collect physical samples of fractured limestone and shale, measuring the hydraulic and electrical properties of the fractured samples in the laboratory and then formulate statistical models that relate the two. Once empirical models are developed for individual fractures, numerical models will be used to extend those results to fracture networks.

In spring 2016, John reprised his once popular 3D seismic interpretation class in the Geology Department's expanded and improved geophysics teaching lab. In the summer of 2015, the Department doubled the number of student computers in the lab from six to twelve, and mounted twin, 80 inch monitors on the wall. The improvements to the lab facilitate teaching computer and graphics intensive subjects to larger numbers of students. The 3D seismic class was made possible through a grant of 15 Kingdom Suite licenses from IHS, Inc., worth $640,000. In spite of the industry downturn, in the spring 2016 semester, John had a class of seven graduate students and one undergraduate geophysics major. The class received good reviews from the students and was deemed a great success. John will repeat the class in fall 2016 for a similar size group of undergraduate geology and geophysics majors.

In summer 2016, John worked on two water reservoir studies. In work funded by the Tarrant County Water District, John participated with Peter Allen in a sedimentation and watershed study of Richland Chambers Reservoir, which is a major water supply for the DFW area. John reinterpreted subbottom acoustic data collected by the Texas Water Development Board and merged it with new acoustic and core data in delta area of the reservoir to produce a new estimate of total sedimentation. The second study was a re-survey of Peligre Reservoir, in Haiti (See pictures). Peligre Dam was built by the USACE in 1956, with funding from the Export Bank of the United States. The original purpose was flood control and agricultural irrigation. In 1971 hydroelectric power generation was added and the dam now provides one-third of Haiti's electricity. In the 60 years since impoundment, the effectiveness of the reservoir has been reduced by rapid sedimentation, due to deforestation, to the point that the reservoir has lost approximately half its original volume. The dam also suffered damage in the 2010 earthquake. The survey in which John participated was part of forty eight million dollar project funded by the Inter-American Development Bank, to repair the dam and rehabilitate the reservoir. The initial results of the survey indicate that some parts of the reservoir are filling in at the unprecedented rate of 1 meter per year.

At home, John and wife Anna's daughter, Tamura, is in graduate school at Baylor studying environmental biology. She is doing her research work at the Lake Waco Wetlands. With a high amount of spring rainfall, the field work has been a challenge. Anna has continued to work for the City of Waco in the areas of waste reduction, recycling and stormwater compliance. With the vibrant and bustling downtown development, increasing commercial and residential construction, and record rainfall, it has been a very busy year indeed! She continues to volunteer with Keep Waco Beautiful, Central Texas Audubon Society and Northwest Waco Rotary. The family continues to enjoy watching Baylor sports and taking brief vacations for hiking, fishing and birdwatching.



John Dunbar at Peligre Dam, Haiti in May 2016. The coring barge is at the base of the dam, in the foreground.

Coring operations on Lake Peligre.

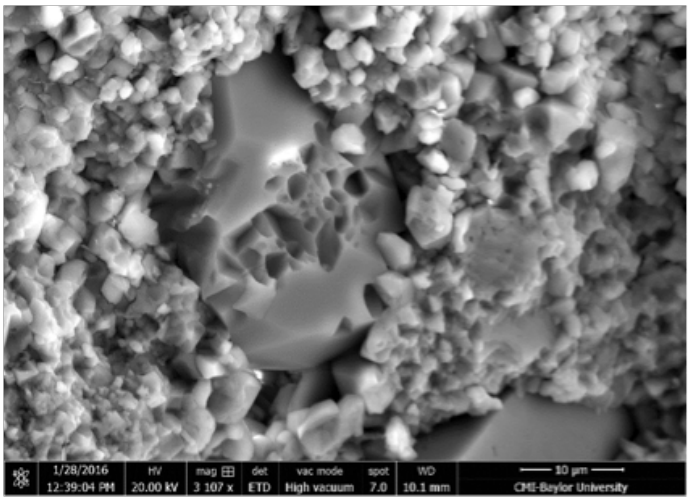
Transport of agricultural produce by dugout canoe on Lake Peligre, Haiti.

DR. STEVE DWORKIN

I just returned from teaching field camp and I still can't get used to sleeping in a bed. There were sixteen students who participated this summer and we traveled to New Mexico, Arizona, Nevada, Utah, Idaho, Wyoming, and Colorado. Notable events included campgrounds closed due to forest fires and septic tank spills; lots of rain; students losing wallets, cellphones, and the keys to one of the van; and rangers getting upset with the students for chopping wood with axes. None-the-less we still managed to do a bunch of mapping and section measuring and in general, a good time was had by all.

This year I have been working on developing laboratory methods for quantitative x-ray diffraction – a procedure used to quantify the abundance of minerals in rocks. You might think that determining mineral concentrations in a rock wouldn't be that hard, but for mudrocks, it is one of the most difficult analytical procedures that can be attempted. So far, we are making some fairly good progress and when our method is refined, we will be able to monitor stratigraphic changes in feldspar (the reactants) and clay minerals (the products) abundances throughout succession of terrestrial mudrocks in order to track weathering intensity and thus the evolution of climate. I visited the Chevron Technology Center in Houston this past semester and received training on this method – stay tuned.

My Ph.D. student Cong Jin continues to make good progress on his research. His first paper on the petrology of Chinle sandstones is almost ready for submission and he collected quite a bit of data while I was teaching field camp for his second paper, which focuses on the isotopic and molecular character of organic matter in petrified wood from the Chinle. Cong is the first person in our department to measure hydrogen isotope ratios which can be used to reconstruct the meteoric water (and thus the temperature) that the trees were exposed to. He has been working closely with Ren Zhang in the mass spec lab and he is also collaborating on this project with Bill Hockaday and Ph.D. student Todd Longbottom.



Master's students Ian Byram and Daniel Parizek are finishing their work on the Late Cretaceous Rodessa Formation in east Texas. This SEM photo (left, taken in the university's new imaging center) shows porosity reduction in the Rodessa caused by a crystal of calcite spar that grew in a micrtic matix.

My other two Master's students, Jared Hanson and Bart Yeates will describe and sample Marcellus black shale core this coming September. Access to the core is kindly being provided by Anadarko Petroleum and the project will document the evolution of middle Devonian paleoceographic conditions responsible for the accumulation of these organic-rich mudrocks. Zach Evans completed his senior thesis on the isotope chemistry of early Paleocene leaf compressions this past Spring. Zach got the fossil leaves from Ph.D. student Andrew Flynn who is working with Dan Peppe on a paleobotany project in the San Juan Basin.

Sandy and I are doing well. Our annual RV trip to Pagosa Springs has been delayed due to our road being washed out. We had a great ski trip this past winter and we both enjoyed visiting San Francisco last December for the AGU meeting.

DR. STEVE FORMAN

Our continued research drive is in paleoclimatology, particularly in better understanding how humans effect atmospheric to land surface process and surface hydrology in the past few hundred to thousands of years, often referred to as the Anthropocene. Our research has a new focus on the Great Plains, with efforts to understand better the land surface processes and source of particulates for "black-dusters" during the 1930s Dust Bowl Drought, which impacted much of Texas and adjacent states. Kasey Bolles, a PhD candidate in the Department is spearheading an unique research program in which she is retrieving original black and white aerial photographs for Dust Bowl areas in the 1930s from the National Archives, in College Park, Maryland. Kasey is then creating for the first time mega-mosaics of these photographs and through a GIS platform classifying land surface processes on cultivated to non-cultivated areas. This unique window into the Dust Bowl landscapes has yielded new insights on the source of dust. Kasey is now evaluating if agricultural practices was the sole source for particulates and/or if there were also natural sources of dust, like from the many stabilized dune fields on the Great Plains. Our knowledge of Dust Bowl surface processes are improving such that dust emissions can be inferred from various surfaces for the Dust Bowl years. The finest dust particles, ten to twenty times smaller than diameter of human hair and at concentrations comparable with chlorine in a swimming pool was a prominent factor for poor health for Great Plain denizens. Recent public health research associate fine dust with host of viral-borne and cardiovascular diseases, allergic and autoimmune disorders; and may lead to epigenetic changes that have life-long effects. Thus, as we follow this roaming path of research we realized that the land surfaces around the Dallas metropolitan area (and many others) are potent sources for these very small, health-effecting particles.

Kathy Breen, a new PhD student, who hails from Portland, Oregon with strong quantitative skills is embarking on research in western Argentina to explore why new rivers and lakes have surfaced up in the past 20 years. She is asking compelling questions like: what are the factors that control growth and geometry of these new drainage

systems? This area hosts some of the finest wines in Argentina and rainfall has intensified with strengthening of the Southern Hemisphere Monsoon, as our planet warms. These wetter conditions spurred the cultivation of cereals at the expense of deeply rooted trees with high water demands. Thus, in the collision between climate change and human land-use there is an unintended, extreme hydrologic excess that carves new rivers, where none existed previously.

The Geoluminescence Dating Research Laboratory continues to flourish 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, Victoria Tew 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. Ms. Ramsey successfully defended her undergraduate thesis in Fall 2015 based on radiocarbon project through the Lab and then immediately entered graduate school at University of Tennessee-Knoxville in Geochemistry. We are very proud of Ashley.

The Geoluminescence laboratory was fortunate to host visiting researches this year, including Prof. Korhan Etrurac from Turkey. Korhan's research focusses on better understand the complex tectonics of Turkey and the earthquake history of the North Anatolian Fault. This project has expanded to better quantify seismic hazards for a string of power plants, situated to close to this fault system. We continue to 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. Xiaohua is highly skilled in the laboratory and has become the go-to person when help is needed. Also we had extended visits of three close collaborators this year including Prof. Maria-Teresa Ramírez-Herrera from the National University of Mexico, Prof. Xioaping Yang, from the Inst. of Geology and Geophysics in Beijing, and Dr. Alfonsina Tripaldi from the University of Buenos Aries. Lastly, we opened our lab expertise for two graduate students from Texas A & M University, College Station, Kristi Hinton and Phillipe Wenette. Our research program is open to all that share a yearning for better understanding of our earth system in the recent past, present and future with climatic, hydrologic and tectonic changes.

Kasey Bolles happy in the enormity of the Southern Great Plains

Kathy Breen scrutinzing the wonders of the eolian depositional record near Childress, Texas

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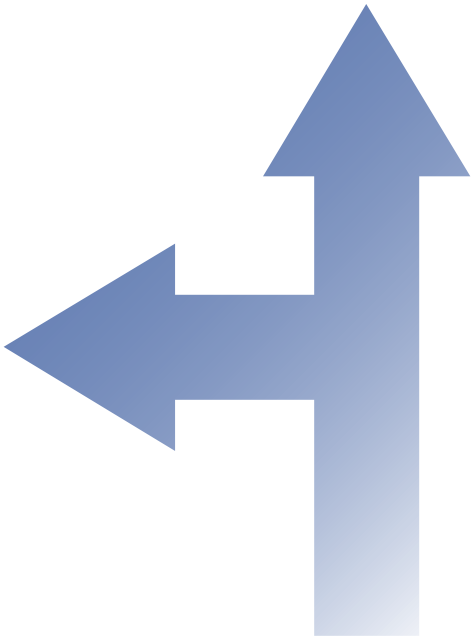


DR. JAMEY FULTON

When I started as an Assistant Research Professor at Baylor I also started a new project with the goal of developing scytonemin as a biomarker for cyanobacteria. Cyanobacteria evolved early in earth history and are found pretty much wherever there is enough sunlight for photosynthesis, especially where sporadic or frequent desiccation occurs including desert soils, stromatolites, exposed rocks, and hypersaline pools. As a UV protective compound, scytonemin might have allowed cyanobacteria to proliferate when Earth's atmosphere lacked an ozone layer and thus was less effective at screening harmful radiation. In the modern environment, scytonemin is a biomarker for tracing cyanobacteria and inputs of their biomass into biogeochemical cycles. I have one year remaining on the project, so I will highlight here some of the completed work and conclusions I have reached so far.

Biological Desert Soil Crusts

Cyanobacteria are an important component of the microbial community in desert soil crusts. Their production of scytonemin imparts UV protection to the whole community. Through stable isotope, lipid, and pigment analysis I showed that in crusts where cyanobacterial nitrogen fixation was an important source of biologically available nitrogen, there was enhanced scytonemin production relative to lipids and pigments associated with photosynthesis. Nitrogen fixation has a high metabolic cost, so this relationship suggests the cyanobacteria maintained high levels of UV protection at the cost of reduced photosynthetic capability. From a biogeochemical perspective, this finding is useful for interpreting the compound-specific stable isotopic composition of scytonemin preserved in sediments. I also identified a trend toward reduced nitrogen fixation in crusts growing where silt accumulation exceeds erosion, suggesting they are getting sufficient nitrogen from dry atmospheric deposition. This has implications for microbial ecology in arid locations. I gave a presentation on this work at the Geobiology Gordon Conference in January.

Arizona Dust Monitoring

Based on its stable isotopic composition in sediments, I proposed a model for aeolian erosion and transport of scytonemin from desert soils, though at the time it had not yet been identified in dust. I recently detected scytonemin in dust samples from Arizona, collected in a town where particulate matter concentration in the atmosphere frequently exceeds the National Ambient Air Quality Standards. At this location, atmospheric fine dust particulate matter (PM2.5) included up to 50% crustal material and coarse particles (PM>2.5) included 50-90% crustal material, though it was unknown if agricultural or native soils were the dominant source. I analyzed microbial pigment and membrane lipid biomarkers in soil crusts and ambient dust to constrain the relative inputs on agricultural and native soils to dust samples at rural and urban sampling sites. Scytonemin has significantly higher concentration in native vs. agricultural soils. I also analyzed material collected by collaborators at Arizona State University during dust resuspension experiments and found that most biomarkers were concentrated in PM2.5, the fine fraction, which can be transported longer distances in the atmosphere. The initial data analysis suggests that agricultural soils are the dominant dust source at the sample location. I submitted an abstract to present this work at the GSA Annual Meeting this fall.

Great Salt Lake

In Great Salt Lake, sedimentary scytonemin has potential sources from bioherms on the shoreline or microbiotic soil crusts from the adjacent Great Basin Desert. Scytonemin concentration was highest in the Upper Salt and Sapropel (USS) unit, deposited between 11.5-10 ka in shallow water (ca. 10 m), following deep pluvial Lake Bonneville (30-18 cal ka), the Provo lake level (ca. 18-15 cal ka), and the Gilbert transgression (11.6 cal ka). Scytonemin was essentially absent in sediments deposited during the deep lake phases, even though bioherms were prominent shoreline features. I propose that increased aridity supported the widespread occurrence and erosion of microbiotic soil crusts during deposition of the USS. This is consistent with interpretations of Great Salt Lake hydrology, pointing toward a broader regional aridity event. Holocene sediments above the USS also contain scytonemin at relatively high concentration, consistent with persistent arid/semi-arid conditions. I presented this work at the AGU Fall Meeting in 2015.

Teaching

I am currently teaching one section of GEO1401, Earthquake and Other Natural Disasters, each semester. This is a great opportunity for me to keep abreast of current research outside of geomicrobiolgy/biogeochemistry. I enjoy working with students and trying to make the class interesting and relevant. I travelled to Hawaii in May, and examined the recent lava flows near Pahoe. Students are always interested to learn about the hazard of lava flows, and I was able to photograph some of the structures set up in the town to protect against future flows. From a biogeochemical perspective, I was fascinated to see the first ferns starting to grow on flow surfaces a bit more than a year old and with no obvious sign of weathering starting. It appeared they were growing hydroponically in vesicles. I took pictures, of course, so I can inject a little biogeochemistry into the volcano discussion in class this fall!

DR. DON GREENE

The college of Arts and Sciences began a three-year pilot program for online teaching and learning during the summer of 2015. In 2016, during the second summer of this program, a few additional courses have been added along with expanded refinements to previously existing courses. One of those refinements included a “discussion board” in which Baylor students are able to virtually interact with fellow students. Dr. Don Greene integrated student interaction into the grading criteria with a rubric that includes both the frequency of interaction along with the quality of discussion. This dynamic feature has allowed the online student a shared experience with fellow classmates and removed a feeling of isolation experienced by students in the first trial year. Don also doubled the number of students this summer by offering two sections of online World Geography.

Canvas replaced Blackboard last year as our platform for communicating course materials and grades to Baylor students. While Canvas has much potential, our faculty must overcome a frustratingly steep learning curve with the result that many have not bothered to learn the system. Additional problems still exist with Canvas including the failure of “deep integration” which would enable faculty to provide teaching materials offered by book publishers. Amazingly, Canvas is still unable

to import grades generated through Excel! For Baylor faculty our "new normal" is to simply accept that our lives are made more difficult due to the short-comings of computer software.

Don and Alison have a camping tradition that began as undergraduates and still continues to the present day. By the numbers, Don recently calculated that his family has now accumulated over two years of living in the outdoors. For example, the 2016 summer field camp travelled to New Mexico and Colorado, making stops in the San Juan Basin, Mesa Verde, Rocky Mountain National Park, and the environs of Pike's Peak. Don has included here a few photographs; memories of the summer of 2016.

Macey and Hannah at Garden of the Gods near Pike's Peak

Hannah, Don, and Macey at the "North Pole" near Pike's Peak

Happy times in camp with Adriel, Macey, Hannah, and Don

Our campsite in Moraine Park: Rocky Mountain National Park

WAYNE HAMILTON

As a retiree of Shell Oil Company enjoying my second life at Baylor University, I've found numerous ways to assist the Geology Department in meeting its teaching and research goals.

Teaching

Watching Dr. Joe Yelderman teach the fall Environmental Geology class, I learned how he organized and communicated geology to this non-major class. It gave me weekly contact with the students and re-acquainted me with the basics of geology. Standing in for Dr. Joe while he attended the National Groundwater Association Meeting gave me the opportunity to practice teaching and leading a class.

With ten years experience assessing Shell's properties, I was able to contribute my hydrogeology experience "stories" in Dr. Joe's Hydrogeology class. I also assisted Dr. Joe with hydrogeology labs I created and led several sessions. I developed lab exercises related to my work experience and current research activities, allowing the students to link classroom learning and field exercises.

At the end of the Fall semester, Dr. Stacy Atchley, informed me there was a need to teach the senior level Capstone class. My involvement with Dr. Joe's Fall classes prepared me to lead and teach this Spring Capstone class which focused on bringing together all the students' learnings in addition to conducting their own research. For the first half of a two hour class, I brought in outside speakers who were practicing in the geologic field, such as an equipment vendor, multiple regulatory agencies staff, mining industry geologist and a local consultant. The students were exposed to people making their livelihoods in a variety of geologic occupations. The second hour of the class focused on student-chosen research. The research was the most demanding part of the class because it required them to create a poster, presentation and paper for the semester. The high point of the class was the creation of a poster depicting their work that was on public display in the Baylor Science Building with about a hundred other posters.

Research

When I came to Baylor I was looking for a research topic to explore. So Dr. Joe, the local water district (Southern Trinity Groundwater Conservation District: STGCD) and long time consultant stated that the Brazos River Alluvium Aquifer (BRAA) was a potential topic. Dr. Joe used the word "Initiative" with BRAA to define the research needed for the local aquifer that Waco and the Baylor campus rest upon. The Initiative's goal is to define the quantity and quality of the alluvium aquifer. The idea is the BRAA could be an additional water supply for the people of McLennan County. I made Initiative presentations to the McLennan County Judge's Water Resources Committee, Cooper Foundation, Brazos River Authority (BRA), and Texas Water Development Board. These groups have an interest in developing water supplies for our County. Out of these presentations the Brazos River Authority made a pledge of $12,000 match plus the Wallace Group contributed $1000 to start the work. The local water district has pledged an additional $12,000 to meet the total needed support of $24,000.

We held an Initiative workshop at Baylor with presentations made by Dr. Joe, STGCD and TWDB

staff. The meeting was attended by landowners, a consultant, BRA and Trinity Mining Company. The upshot of the workshop was communicating the Initiative and getting feedback from the participants to sharpen the research focus.

Dr. Joe and I created an Initiative poster for the National Ground Water Association meeting in Denver. The theme of the Initiative poster is the synergy of Baylor, STGCD, and landowners being able to define this groundwater aquifer resource that each partner alone would not be able to do.

The Initiative included outreach to a local driller, engineering firms, Texas Farm Bureau, Texas Association of Groundwater Districts, and Trinity Mining, describing Baylor's capability and field work locations. In all cases the parties were impressed with Baylor's facilities, equipment and people.
In the fall of 2015 Baylor, STGCD and the City of McGregor discussed the need and opportunity to conduct and aquifer test of the deep Trinity Hensell Aquifer sand. There was only one test of the Hensell Aquifer, so all parties thought this was an opportunity to obtain additional information on the important McLennan County water resource. So on January 7 and 8th Baylor geology students: Bulbul Ahmmed, Lance Auguste, Stephen Norair, and Joseph Phillips assisted with the 24 hours of water-level measurements. The test was a success as we measured water level changes in two monitor wells that were a mile from the site. The test data were analyzed by MS student Jim Tucker who presented the results to the STGCD Board Meeting in May 2016.

Due to my love of field work I assisted Dr. Joe's students with their outdoor data collection. For Kori Taylor's Bachelor's thesis I assisted her sampling of two springs near the Brazos River in Waco. For Jim Tucker's Master's thesis, we worked with two water districts to obtain samples from the Trinity aquifer in McLennan and Bell Counties. Then with Stephanie Wong, PhD candidate student, we continued the maintenance and deployment of water quality measuring equipment at Salado, Texas. The interaction and support I'm able to provide these students is one of the most fulfilling parts of being at Baylor.

Departmental Support

Being a person who is a car enthusiast, I like being able to help Paulette Penny on maintaining the department vehicles. It is small tasks, like annual inspections, car washes, oil changes and running vehicles to the shop for repairs that helps the department get to the field.

Safety is a core value learned while implementing projects and providing support to operations during my years at Shell. The same attitude has carried over to Baylor—striving to insure people return home safely to their families every night after working at Baylor. To assist with that, I'm the department's safety focal point and provide safety assistance for two of Dr. Joe's labs. This consists of monthly reviews of each lab and documenting observations. Furthermore, I've provided and available for reviewing department laboratories safety plans with Baylor's guidelines.

Family

My wife and I purchased a home in Lorena, Texas after renting a house in Woodway for eight months. Our Lorena home sits on 2 acres in a semi-rural area about 25 minutes from campus. We like the change from a busy Houston subdivision to a spacious semi-rural setting. Also I've transferred my Master Gardener membership to McLennan County and focused my volunteer work at the Bright Arboretum in Woodway. Finally a highlight of my week is leading pre-school music for classes at Highland Baptist Church in Waco. Week after week, the kids and teachers have learned Mr. Wayne's songs and it is a joy to watch these children grow.

So I'm living out my second life here in the Baylor Geosciences Department, grateful for the wonderful opportunity to work with students and faculty.

Kori Taylor, BS Thesis Field Research at Cameron Park Spring

Hydrogeology Field Exercise to Gauge a Trinity Aquifer Well

Stephanie Wong, PhD Candidate, Sampling at Salado, Texas

Caught a home run ball in parking lot adjacent to Baylor's Softball field

McGregor Aquifer Test Team: Dr. Joe Yelderman, Wayne Hamilton, Bulbul Ahmmed, Stephen Norair, Joseph Phillips, and Lance Auguste

Jim Tucker, MS Student, Intern at Southern Trinity Groundwater Conservation District

Wayne Hamilton's Family

DR. BILL HOCKADAY

My first 6 years at Baylor have gone by so quickly. The time flies when you're having fun! The biggest news in my work life at Baylor is a promotion from assistant professor to associate professor, with tenure. It's a privilege to continue my career here at Baylor, surrounded by excellent colleagues and talented students.

The Hockaday Family

Meanwhile, it has been an exciting year in the Hockaday household as well. Our son, William celebrated his 1st birthday, and our daughter, Abigail, turned 3 years old. I am proud to say that they will both be attending Baylor in the fall—the child development center, that is. Now that the kids are out of the baby stage and ready for new experiences, we are spending more family time enjoying Baylor athletic events, the Mayborn museum, and the Cameron park and zoo. We also recently upgraded from our pop-up tent camper, to a travel trailer. We love spending weekends outdoors, exploring Texas's state parks and lakes. During the week, Mary works as a school teacher. This was her first year working as a 3rd grade science and writing teacher. She moved from the Waco ISD, to our neighborhood school in Robinson. The transition was easier than expected and it was a great first year experience. Mary still finds the time and energy to play soccer on two different teams – a women's outdoor team on weekends and an indoor coed during the week.

Highlights from the Organic Geochemistry Research Group

Dr. Bill Hockaday (Associate Professor) – My research took me to the Jemez Mountains of New Mexico this summer for the start of an exciting new collaboration with Dr. Christopher Roos, an Anthropologist at Southern Methodist University. He has been studying the history of wildfire and land-use by the ancestral Jemez people. Over the next year I will be working with Chris to developing a biomarker library and database of native plant species for the purpose of reconstructing Holocene vegetation changes and fire intensity recorded in terrestrial sedimentary deposits across this landscape.

Dr. Nathaniel Femi Adegboyega (Postdoctoral Associate) – Nathaniel has been at Baylor for 16 months, during which his primary role has been to conduct and NSF-funded study on the nature of chemical interactions of dissolved and nanoparticulate silver with the organic matter that is naturally present in drinking water supply streams. Nathaniel has also cultivated a unique industry collaboration with the Constellation Brands (Mission Belle) wineries in Napa Valley. The company is looking for a way to recycle winery wastes (grape seeds, etc.) into carbon-based (charcoal) sorbents for on-site wastewater treatment. Nathaniel is using our lab's pyrolysis facilities to convert seeds to sorbents.

Todd Longbottom (Doctoral student in Geoscience) – I am especially proud of Todd's research accomplishments this year. By the time you read this newsletter, two of Todd's papers will likely be accepted for publication, with a third in the review process as he prepares to defend his dissertation. Todd's work has focused on the physical, chemical, and biological controls on the molecular structure of sedimentary organic matter (kerogens). Todd has also worked out quantitative model that relates kerogen molecular structure to hydrocarbon potential. We leveraged this discovery into a small research improvement grant from Baylor, to support Todd during his final

year as tests his catagenesis model further at the University of Houston's hydrous pyrolysis facility. We should hear very soon from the American Chemical Society's Petroleum Research Fund (ACS-PRF) whether they will support the project for an additional two years. If funded, the goal will be to translate Todd's catagenesis model into the realm of "petroleomics"—the science of predicting petroleum composition, structure, and behavior from first principles.

Zachary Valdez (Doctoral student in Ecological, Earth, & Environmental Science) – Zack is wrapping up his dissertation research, which is a study of soil carbon cycling in a dedicated biomass energy cropping system—the Switchgrass plantation at the Great Lakes Bioenergy Research Center in Michigan. Zack's first dissertation chapter has been submitted as a manuscript to *Global Change Biology-Bioenergy*. With a little luck and a lot of hard work, Zack should defend his dissertation this year as well.

Eugenie Schieve (Undergraduate student in Environmental Science) – Eugenie is working on a collaborative research project with Baylor colleagues Dr. Rebecca Sheesley (Environmental Science) and Dr. Joseph White (Biology), studying the effects of fire (historical and prescribed) on sediment organic matter geochemistry and carbon storage at the Balcones Canyonlands National Wildlife Refuge. Her project is jointly-funded by Baylor University and the US Fish and Wildlife Service.

Taryn Rogoff (visiting undergraduate student in Chemistry, Redlands University) – Taryn spent the past summer in our lab, participating in an NSF-funded Research Experiences for Undergraduates (REU) program hosted by the Baylor Department of Chemistry and Biochemistry. Taryn's work was a pilot project, applying our group's geochemical proxy for fire intensity to Holocene-aged lake sediments. The goal is to reconstruct the intensity of wildland fires in the watershed of Anderson Pond, Tennessee. The project is a collaboration with Dr. Steve Driese and Dr. Sally Horn (University of Tennessee) who have already conducted extensive palynology and micromorphology studies of the vegetation and sedimentation history at Anderson Pond. The hope is that Taryn's work will serve as the catalyst for a collaborative proposal and future funding to understand the role of fire intensity in climate-vegetation interactions.

Owen Craven (first year graduate student) - Owen is coming to Baylor after completing a BS degree in Geology at Brigham Young University, Idaho. He has just begun taking classes this fall, and started developing an MS thesis research project.

The Geoscience department and Baylor graduate school provide outstanding financial support for students and faculty to present their research at meetings and conferences. Our group members gave at least 15 research presentations (too many to list here) this year. You can find us most years at the national meetings of the American Chemical Society, American Geophysical Union, the Crop-Soil-Agronomy Society, Goldschmidt, and occasionally at the Geological Society of America and the Texas Water Conferences.

Research Publications

Papers recently submitted (underlining denotes Baylor student authors)

Todd L. Longbottom, W.C. Hockaday, K.S. Boling; G.Y. Li, Y. Letourmy, H.L. Dong, S.I. Dworkin, Organic structural properties of kerogen as predictors of source rock type and hydrocarbon potential, Fuel (acceptance pending major revisions)

Todd L. Longbottom, W.C. Hockaday, K.S. Boling; S.I. Dworkin, Effects of ocean oxidation on the chemical structure of marine kerogen, Organic Geochemistry, (Submitted May, 2016)

Zachary Valdez, Hockaday. W.C., Gallagher, M.E., Masiello, C.M., Robertson. G.P., Nitrogen fertilizer and harvest rates influence the accrual of soil carbon and nitrogen stocks in switchgrass cropping systems, Global Change Biology-Bioenergy (Submitted May, 2016)

James Chang, Jugeshwar Singh, Sungshil Kim, William C. Hockaday, Cheolho Sim, and Sung Joon Kim, Differential carbohydrate utilization in diapausing Culex pipiens by solid-state NMR, Nature Communications (Submitted May, 2016)

Erik Gulbranson, E. L., B. F. Jacobs, W. C. Hockaday, M.C. Wiemann, and L. A. Michel, Ancient Angiosperm nitrogen uptake strategies inferred from stable isotope analysis of fossil tree rings, Oligocene, Ethiopia, Geology (acceptance pending major revisions).

Publications *(since the last newsletter, underlining denotes student authors)*

L.A. Pyle, **W.C. Hockaday**, T. Boutton, K. Zygourakis, T. Boutton, C.A. Masiello, Chemical and isotopic thresholds in charring: implications for the interpretation of charcoal mass and isotopic data, Environmental Science & Technology, 49 (24), 14057–14064, 2015. DOI: 10.1021/acs.est.5b03087

W. Hockaday, M. Gallagher, C. Masiello, J. Baldock, C. Iversen, R. Norby, Forest soil carbon oxidation state and oxidative ratio responses to elevated CO2. Journal of Geophysical Research-Biogeoscience 120, 2015. DOI: 10.1002/2015JG003010.

S.M. Nesmith, C.J. Wynveen, E. Dixon, C.W. Matson, B.W. Brooks, **W.C. Hockaday**, M. Schaum, Exploring educators' environmental education attitudes and Efficacy: Insights from a Texas Wetland Academy, International Journal of Science Education Part B: Communication and Public Engagement. DOI: 10.1080/21548455.2015.1078519.

Jason Vogel, D. He, E. Jokela, **W. Hockaday**, E. Schuur, The effect of fertilization levels and genetic deployment on soil organic carbon constituents, chemistry, and mean residence time in managed loblolly pine (Pinus taeda L.) forests, Forest Ecology and Management (in press) DOI:10.1016/j.foreco.2015.05.020.

Markus A. Kleber, **W. Hockaday**, P.S. Nico, Characteristics of Biochar Macromolecular Properties, IN: Biochar for Environmental Management: Science and Technology, Ed. J. Lehmann, Earthscan publishers, London, 2015.

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

Bill and Mary Hockaday with Abigail (3 years) and William (1 year old).

Bill Hockaday at one of many Jemez Pueblo ruins, located in the Valles Caldera National Preserve.

DR. SCOTT JAMES

Writing these summaries is not only important but enjoyable because it provides me with an opportunity to reflect upon the past year. Even though this calendar year is only half over, much has happened in a short period of time and 2016 will be a most momentous year for me. When I write this annual update next year, I will be married. I have been asked more than a few times, "Is this your first marriage?" My tongue-in-cheek answer is, "And it will be my last." In the photo below (left), I proposed to Jane some 18 months ago (December 9, 2014). While some health complications postponed our marriage from last July 7th to this July 9th, we finally had our Engagement Party last month (photo on the right). A quote that really resonates with me is, "Hear my soul speak: The very instant that I saw you, did my heart fly to your service. " Yes, there is such a thing as true Love at first sight, for me it was May 28, 1994. I have known (and loved) Jane that long. Love is a necessary, but not sufficient condition to make a marriage work. The timing, finally, is sufficient.
My second year at Baylor has been fantastic as I continue to enjoy and appreciate the unparalleled supportive environment. I would like to extend a special thanks to my friend and mentor, Dr. Joe Yelderman. Dr. Joe takes time out of his busy schedule to meet with me weekly – his guidance has been invaluable.

As a tenure-track professor, my time was heavily focused on teaching, research, and mentoring students. I taught a graduate class called Applied Numerical Modeling in the Fall. This Spring, I taught my first undergraduate course, Environmental Geoscience (a freshman course).

I found the experience to be extremely fulfilling and it also afforded a great opportunity to recruit students for my lab. I hired Katherine White and Ryan Parker to help my post-doctoral researcher, Dr. Kaushik "Kosh" Shandilya, collect data for our algal biofuels research. Kosh joined our group in August of 2015 from the University of Toledo.

There are several notable accomplishments in the research arena. I received funding to model enhanced oil recovery by the Canadian company RII North America, Inc. The CEO of RII has become a close personal friend and I am honored that he will be attending our wedding next month. Moreover, I also received funding from a company associated with RII, MFB Concepts, Inc. to assist with their research and development efforts for liquid-metal batteries. Exponent, Inc. made funds available to model flow, sediment dynamics, and water quality on the Lower Fox River in Wisconsin. In addition, I acquired funding to model the Santa Susana Field Laboratory for the Department of Energy to help them with environmental remediation decision making at that site. I continued my research-exchange program with IBM to develop advanced simulation tools for surface water flow modeling with specific application to understanding the hydrodynamics through and around aquaculture systems (e.g., shellfish canopies).

I was fortunate to attend several conferences this academic year. In December I attended my 21st American Geophysical Union Fall Meeting in San Francisco where I chaired poster and oral sessions on Renewable Energy: Marine, Wave, and Hydrokinetic. I was excited to present additional Marine Renewable Energy research at the American Geophysical Union Ocean Science meeting in February. In May, I attended the National Groundwater Association's annual conference in Denver, where I was co-author on two student presentations, one of which received the prestigious Farvolden Award. Finally, I had the honor to serve the National Science Foundation as a proposal reviewer in Washington, DC in April.

I continue to hold a courtesy appointment with the Department of Mechanical Engineering so that I can publish papers in this field as well as in the Geosciences. I published three papers related to topics in Mechanical Engineering [1-3]. In the geosciences, I published two manuscripts [4, 5] and a conference paper [6]. Currently I have several other manuscript under development or under review.

This year I had the pleasure of working with six undergraduate researchers: Jessica Cramer, Jackson Liller, Andrew Masterson, Cary McMahon, Ryan Parker, and Samantha Simpson. They have been helping me run and calibrate flow models for marine renewable energy projects, are conducting hydrodynamics, sediment dynamics, and water-quality simulations, or are calibrating the highly parameterized Santa Susana Field Laboratory groundwater flow and transport model. I was asked to serve on the Thesis Committee for two students who recently earned their Master's Degrees, Stephen Norair and Jim Tucker. I also serve on the Dissertation Committee of a doctoral student, Josh Brownlow. Josh published his first paper, which was identified for additional media coverage because hydraulic fracturing ("fracking") is such a hot topic these days. My own doctoral students, Jiajun "Dylan" Jiang and Bulbul Ahmmed, continue their studies and survived their first year. In the Fall I will co-advise the doctoral studies of Cary McMahon with Dr. Joe Kuehl in the Mechanical Engineering Department and William Brewer with my mentor Dr. Yelderman. Cary worked with me as an undergraduate Mechanical Engineer and William comes to Baylor from Millsaps College.

Kosh and I were funded by Baylor's University Research Council for "Algae Strain Identification for Wastewater Treatment." This might sound like a stretch for someone in the Geoscience 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 focusing 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 water-related 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 2016-2017 academic year, I plan to teach two courses: a new course, Geostatistics, will be held in the Fall and Environmental Geosciences, a course I teach for the second time, is in the Spring. I will also be receiving research funding throughout this year and I anticipate several forthcoming publications, a number of which will be co-authored with my students. Under Dr. Yelderman's astute tutelage and Dr. Atchley's excellent departmental guidance, I will continue to bring many successes to Baylor University.

Publications

J.-G. Lee, Y.-H. Cha, D.-Y. Kim, J.-H. Lee, T.-K. Lee, W.-Y. Kim, J. Park, D. Lee, S. James, S. Al-Deyab, S. Yoon, Robust mechanical properties of electrically insulative alumina films by supersonic aerosol deposition, Journal of Thermal Spray Technology, 24 (2015) 1046-1051.

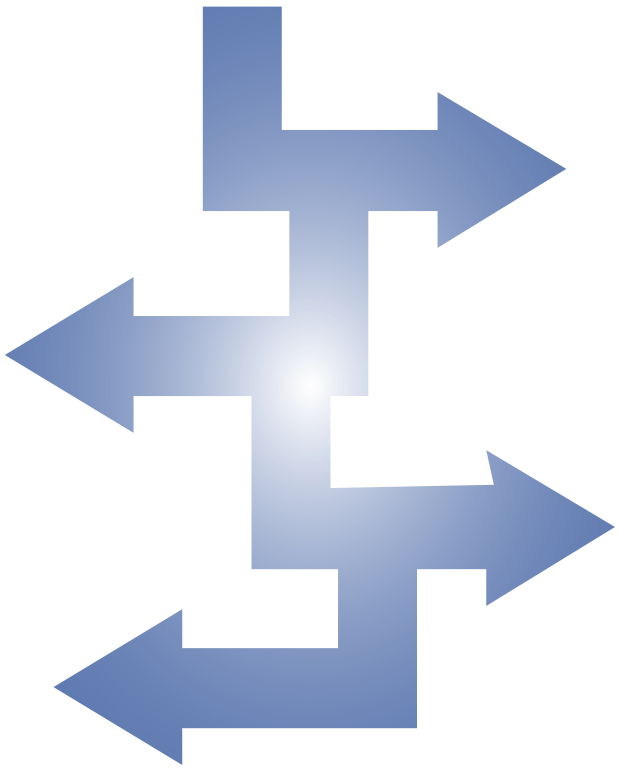
J.-G. Lee, D.-Y. Kim, B. Kang, D. Kim, S.S. Al-Deyab, S.C. James, S.S. Yoon, Thin film metallization by supersonic spraying of copper and nickel nanoparticles on a silicon substrate, Computational Materials Science, 108, Part A (2015) 114-120.

J. Seo, H. Kim, S. Park, S. James, S. Yoon, Experimental and numerical simulations of spray impingement and combustion characteristics in gasoline direct injection engines under variable driving conditions, Flow Turbulence Combust, 94 (2015) 1-25.

J.W. Brownlow, S.C. James, J.C. Yelderman, Influence of hydraulic fracturing on overlying aquifers in the presence of leaky abandoned wells, Groundwater, (2016) n/a-n/a.

R.R. Arifin, S.C. James, D.A. de Alwis Pitts, A.F. Hamlet, A. Sharma, H.J.S. Fernando, Simulating the thermal behavior in Lake Ontario using EFDC, Journal of Great Lakes Research, 42 (2016) 511-523.

F. O'Donncha, S.C. James, N. O'Brien, E. Ragnoli, Parallelisation of a hydro-environmental model for simulating marine current devices, in: Oceans 2015, Washington, DC, 2015.



LILIANA MARIN

It is my privilege to coordinate the operation of the Baylor University Geoluminescence Dating Research Laboratory (BG Lab), within the Dept. of Geoscience. This facility equipped for optically-stimulated luminescence (OSL) dating, a form of geochronology, which quantifies the radiation exposure of minerals, such as quartz and potassium feldspar, after sediment deposition and shielding from further light exposure. The signal we are measuring is reset by 5-10 seconds of sunlight exposure. This dating technique is based on the same theory as medical dosimetry used by radiologists. Mineral grains store electrons by radiation exposure and those electrons are released by light exposure from blue diodes or a green laser and the resultant photon flux is measured with photomultiplier tube. Thus, a very small light sum is related to burial time and we can date sediments as young as a few decades to about a million years.

The BG Lab has been operational since August 2014 with research, teaching and service functions. This lab is unique in Texas, one amongst the eight recognized OSL labs in the US and hosts visitors, post-doctoral scientists and students from many countries. The laboratory operates 24/7 engaged in a variety of research, supported by three Danish-made, RISØ readers. Two of these readers are dedicated to analyzing clusters of quartz or feldspar grains, whereas the third reader, installed on October 2016, has dual capabilities for sensing light-signals from clusters of grains and single-grains quartz or feldspar, that are about the size of diameter of a human hair.

The BG Lab supports graduate and undergraduate students, and visitors that advance the study of climate and environmental change, evolution, and seismic, flood and drought hazards, and the development of arid lands in the past one million years. The laboratory supports field-based studies and undertakes research-based analysis for colleagues to evaluate new frontiers in geochronology.

This year the lab hosted students and scholars from other countries:

- Turkey: Dr. Korhan Erturac an Assistant Professor from Sakarya University. As a result of his visit, the lab was recently invite to participate in the evaluation of seismic hazards for power plants across Turkey
- China: Dr. Xiaoping Yang from the Chinese Academy of Sciences in Beijing as part of research exchange with Prof. Forman, with long standing research on the evolution of deserts in N. China.
- Mexico: Dr. Maria Teresa Ramirez visiting scholar from National

University of Mexico and Univ. of California-Berkeley. A new collaboration with an international group to understand earthquake hazards with subduction in western Mexico.
- Argentina: Dr. Alfonsina Tripaldi at the University of Buenos Aires. This is a long standing collaboration over the past decade studying hydrologic variability on the western Pampas.
- USA: Dr. Edgardo Latrubesse from the Dept. of Geography, University of Texas, Austin. A new collaboration to expand research on fluvial and eolian in Brazil.

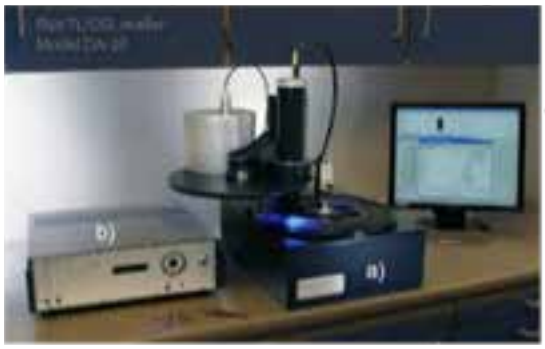
Also, the lab has provided paid research assistantships and research opportunities to four undergraduate and three graduate students. A primary focus is to support and motivate undergraduate students to achieve at Baylor and find their place as a geoscientist. We offer guidance for undergraduate and international students in the geosciences. Our goal is to have each undergraduate undertake a research project that leads to a senior thesis, like the following students:

- Ashley Ramsey: Worked for 1.5 years in the BG laboratory and graduated in December 2015 with a senior thesis entitled "Assessing Radiocarbon Landscape Reservoir Effect of Gastropods in Central Texas to Improve Accuracy and Precision of Radiocarbon Dating of Past River Systems." The laboratory experience and thesis were instrumental for Ms. Ramsey to advance to graduate School at the University of Tennessee-Knoxville. We miss Ashley!
- Chris Dickey: A US Marine veteran in his junior year at Baylor has assisted in the lab for the past 1.5 years. He is working with Dr. Forman and Dr. Mike Waters on the data from Friedken Site, Texas (the oldest evidence for humans in the US) in preparation for his senior thesis.
- Connor Mayhack: A junior student that has worked diligently in the lab for the past year, has mastered many of analytical procedures and has developed a keen interest in Quaternary stratigraphy.
- Victoria Tew: A freshman student in Baylor who is our new recruit and has worked in the lab for 5 months. Tori has a strong future due to her innate intelligence, initiative and self-directed character.

In addition, this year the lab personal have trained and supported research needs of number of visiting graduate students:

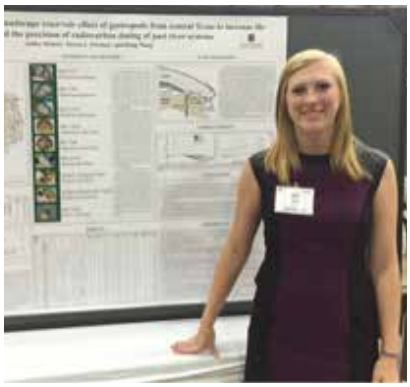
- China. PhD candidate Xiaohua Guo a research scholar that is visiting the lab for 2 years to provide age control for her dissertation in the Environmental Science Department in Chang'an University. Xiaohua is also working as a lab assistant Xiaohua will remain in the lab.
- USA. MSc. candidate Kristi Hinton provided OSL ages and stratigraphic interpretations for dune system in western Nevada her he MSc. thesis in the Geography Department at Texas A&M University.
- USA. PhD candidate Phillipe Wernette for his dissertation in the Geography Department in Texas A&M University on the South Texas Sandsheet.

Beyond my work in the lab, I also have taught Geology 1401 Earthquakes and Other Natural Disasters for the past two years. This has been a rewarding experience that allows me to maintain a connection with pedagogy and to keep up-to-date on teaching strategies that promote students' success in introductory science classes. Lastly, an important addition to the group is Luna, the canine Quaternary geologist, who's digging skills, sharp eye for paleosols, and 7.5YR coat colors has facilitated field research.



Geoluminescence Dating Research Laboratory RISØ readers; Left: Single Aliquot Regeneration; Right: Single Aliquot Regeneration and Single Grain

Dr. Alfonsina Tripaldi supporting fieldwork near the Red River border between Texas and Oklahoma



Ashley Ramsey presenting the poster related with her senior thesis in GSA

Dr. Steve Forman (left) and Connor Mayhack (right) wishing Ashley Ramsey (center) the best in her future

Visiting scholar Dr. Korhan Erturac (left) and lab assistant Chris Dickey (right) celebrating Korhan's birthday

PhD candidate Xiaohua Guo supporting fieldwork at the Yellow River on the northeast Tibetan Plateau

Luna, the canine quarternary geologist of the family, supporting fieldwork and taking care of the stratigraphy near the Arkansas River

Victoria Tew, the promising new undergraduate lab assistant

DR. LEE NORDT

I have two Ph.D. students, Don Esker and Rebecca Taormina, who recently defended their doctoral dissertation proposals. Don is working on bone isotopes and microfauna at the Waco National Monument. Rebecca is conducting an alluvial stratigraphic study of the Brazos River floodplain and terraces that intersects the mammoth site, and in addition is building a predictive model for future excavations near the Friedken archaeological site in central Texas-which happens to be the oldest documented evidence of human occupation in the Americas. Designation of the Waco mammoth site as a national monument is the best thing that has happened to Waco since Fixer Upper. Actually, for a scientist, it is even better. Consider that Mount Rushmore is also a national monument. The mammoth site is now a national treasure because it contains the ONLY preserved nursery herd of mammoths in the world that died from a single event. Site visitation has increased some threefold since the designation and NPS staff are now available to assist with the development of the site and the surrounding property.

Since I last wrote Kathy was diagnosed with breast cancer this past September. It has been quite an ordeal, but after chemo, surgery and radiation she made it through in fine fashion and with an excellent prognosis. We met many people on the cancer trail during the experience and for all that Kathy went through we also realize how blessed we are to be on the other side looking to a bright future. Fortunately, she will be around to keep me and the kids glued together with some semblance of normalcy. Recently, Kathy and Kaylee established a booth at the Craft Gallery in Waco to sell home decor items, Everlasting Joy Jewelry antiques, one of a kind finds, bath bombs, and many other fun items.

Garrison has now advanced to Head Pro at Lochinvar Golf Club in Houston. Quite a fete for someone so young at such an exclusive club. He is doing very well, but also learning that with a leadership position comes elevated responsibilities. He has adjusted to city life, but with the help of a better half-Elizabeth. It seems serious, and we are wondering why we haven't anything yet of significance about their relationship. Garrison works a lot, but also gets to play in the southern Texas PGA golf events, which he enjoys very much.

Kaylee's jewelry business continues to thrive in stores, online, at special events, and at trunk shows. Her business is based out of Fort Worth where her husband Jeff is employed as a civil engineer at Kimley-Horn. Oh, I almost forgot. Kaylee and Jeff were married back in September. I was traumatized so I don't remember much. I have been told it was a beautiful outdoor ceremony. Actually, if we could choose one person in the world for Kaylee, it would have been Jeff all along. They have been dating since like the 6th grade.

As I write this the family has just returned from vacation at 10,000 feet where oxygen is not so plentiful but the air is fresh and cool. We rented a Rubicon with double low, four wheel drive and took to the mountains. There is nothing quite like it, and as driver I did pretty well as I was ordered ahead of time that I could not stare at outcrops while driving on narrow, rocky lanes barely wide enough to fit a vehicle. I did okay but noticed when I returned the jeep there were indented finger marks on the back of the front seats, apparently placed there from those riding in the back during a white knuckle event. We stayed in a luxurious house Kathy purchased for a week at an action for the Nursing School Scholarship program back in February. And there something about Silverton that just gnaws on you-or at least me. A throwback from the old west (except for-have mercy-the cannabis shops).

Publications:

Nordt, L., Tubbs, J., and Dworkin, S. (2016). Stable carbon isotope record of terrestrial organic materials for the last 450 Ma yr. Journal of Earth-Science Reviews 159:103-117.

Nordt, L., Bongino, J., Forman, S., Esker, D., and Benedict, A. (2015). Late Quaternary environments of the Waco Mammoth site, Texas USA. Quaternary Research 84:423-438.

Nordt, L., Atchley, S., and Dworkin, S. (2015). Collapse of the Late Triassic megamonsoon in Western Equatorial Pangea of the American Southwest. Geological Society of America Bulletin 127:1798-1815.

Presentations:

Driese, S.G., and **Nordt**, L.C. (2015). Applying the Critical Zone concept to reconstruction of ancient terrestrial systems: Invited paper in "Earth history: Innovative approaches to studying critical transitions" at the 2015 Annual Meeting of the American Association for the Advancement of Science in San Jose, CA (February 13, 2015).

Driese, S.G., and **Nordt**, L.C. (2015). Applying the Critical Zone concept to reconstruction of ancient terrestrial systems: 52nd Annual Soil Survey and Land Resource Workshop in College Station, TX, on February 5, 2015.

Stinchcomb, G., **Nordt**, L., Driese, S., Lukens, W., Williamson, F., and Tubbs, J. (2015). A data driven empirical model that predicts paleoclimate for a diverse range of conditons for paleosols. Geological Society of America Conference, Abstract #266962, Baltimore, MD, November 1-4.

Cong, J., Dworkin, S., **Nordt**, L., and Atchley, S. (2015). Meteoric diagenesis of Chinle sandstones, Petrified Forest National Park (Arizona, USA): A record of Late Triassic climate change. Geological Society of America Conference, Abstract #267822, Baltimore, MD, November 1-4.

Lukens, W., Stinchcomb, G., **Nordt**, L., and Driese, S. (2015). A new pedotransfer function for estimating soil pH in paleosols. Geological Society of America Conference, Abstract #258868, Baltimore, MD, November 1-4.

Leslie, C., Atchley, S., Peppe, D., **Nordt**, L., Williamson, T., and Secord, R. (2015). Sedimentologic and stratigraphic indicators of regional paleogeography within the Lower Paleocene Nacimiento Formation, San Juan Basin, New Mexico, USA. Geological Society of America Conference, Abstract #264415, Baltimore, MD, November 1-4.

Above: Kaylee and Jeff's wedding, September 2015

Below: Lee and Kathy in Silverton, Colorado

DR. DAN PEPPE

This past year was a fun, productive, and busy one. This summer I've spent about five weeks in the field on Kenya and in the US. In fact, I'm writing this on my return trip from Kenya where I spent a little over three weeks in the field working on a large project focused on understanding the paleoclimate and paleoenvironment of several early Miocene hominoid sites across east Africa. Earlier this summer I spent about two weeks in the field in the San Juan Basin in New Mexico where we were collecting fossil leaves, paleosols and paleomagnetism samples as part of a larger project focused on understanding the relationship between changes in plant and mammal communities in the early Paleocene and changes in paleoenvironment and paleoclimate. Fieldwork on both project was a terrific success!

I spent time at three different field sites in Kenya: West Turkana, Buluk, and Koru. At the West Turkana field site, I worked with collaborators from the University of Calgary and Stony Brook University at two early Miocene field locations where important early hominoids have been found. At one of the research sites, I had terrific success and found an amazing fossil leaf locality. Based on the size and shape of the leave, I suspect that the climate was quite hot and likely pretty dry. I'm looking forward to returning to the site to collect more fossils so that we can more completely reconstruct the vegetation and climate of West Turkana during the early Miocene.

After spending a week at West Turkana, I headed across Lake Turkana to the Buluk field site along with a group of geologists, including Baylor PhD student Bill Lukens and incoming MS student Kennedy Oginga. At Buluk, we joined a large paleontology team, headed by a paleoanthropologist from Wake Forest, and spent several days describing and sampling the deposits. The Buluk sequence was a beautiful succession of fluvial and over bank deposits and paleosols that was capped by a massive deposit of ash and lava flows. Based on our preliminary fieldwork, it appears that the majority of the fossils are being found in lags at the base of meandering channel deposits and that the climate was warm and seasonally wet. Buluk was a beautiful field site, but amazingly remote. In the week that we were there, we didn't see another person outside of our research group!

From Buluk, we flew back to Nairobi for a couple of days and then me, Bill, Kennedy, and a researcher from the National Museums of Kenya in Nairobi drove out to the Koru field site in Western Kenya near Lake Victoria where we spent a couple of days in the field. Our focus at Koru was to describe a series of paleosols exposed near the flanks of the

early Miocene Tinderet volcanic complex. While trenching the section, we discovered three layers of fossil leaves, multiple layers with branches preserved and one interval covered by fossil tree stump casts! Based on all of the fossil plant remains and the features of the deposits and the paleosols, we were very likely sampling a fossil forest floor. We were really excited by the find and will likely return next summer to spend more time mapping and describing the exposures at that site and to look for other similar deposits in the Koru area. This site will form the basis of Kenney's MS thesis and he'll be working on analyzing the samples we collected this summer this year to completely characterize the paleoclimate and depositional environments of the Koru site during the early Miocene. Overall, my research trip to Kenya was a terrific one and I'm excited to continue laboratory analyses of the samples we collected while in the field.

In addition to fieldwork at Kenya, I also spent some time in the field in the San Juan Basin in New Mexico with my PhD students Andrew Flynn, Caitlin Leslie, Adam Davis, Aly Baumgartner, incoming student Joe Milligan, and our collaborators from the New Mexico Museum of Natural History, New Mexico Tech, University of Nebraska, and University of Edinburgh. While in the field we spent time collecting early Paleocene fossil leaves, describing and sampling paleosols, and collecting paleomagnetism samples. We found some amazing fossil leaf localities, including one that might be the best I've ever collected! After our fieldwork, we'll be spending a lot of time this year working in the lab to analyze the fossils and samples we collected so that we can better constrain the age, paleoclimate, and paleoenvironments of the deposits.

I also continue to work on a variety of other projects, including reconstructing the paleoenvironment and paleoclimate of the Lake Victoria basin during the late Pleistocene and developing paleoclimate and paleoecological proxies that can be applied to fossil leaves. Recent Baylor graduate Emily Beverly conducting her PhD research on deposits around Lake Victoria and demonstrated convincingly that the paleoclimate during the late Pleistocene was considerably drier than today and that Lake Victoria was likely completely dry from ~100 – 40 thousand years ago. PhD student Aly Baumgartner is working on a project focused on developing leaf based proxies for climate and ecology. This year Aly spent some time photographing leaves from Cameroon at the Missouri Botanical Gardens and will be heading back there again soon to photograph more leaves from Africa. She's been busy digitally processing the leaf images and we'll be working to use that data to develop a leaf-based paleoclimate proxy that can be applied to fossil floras from east Africa. Hopefully we'll have some exciting results to report in the next newsletter.

Overall it's been a great year! I hope to see many of you at our upcoming alumni events.

Left: Adam Davis, Aly Baumgartner, Andrew Flynn, and Joe Milligan in the Nacimiento Formation in the San Juan Basin in New Mexico

Right: Early Paleocene fossil leaves from the San Juan Basin

Our morning crossing of the Turkwel River on our way to the West Turkana fossil sites.

Ellen Miller, Bill Lukens, Kennedy Oginga, Dan Peppe, and Al Deino after our long, dusty ride to the Buluk field site.

The Buluk field crew

Early Miocene fossil leaves from the Kalodirr fossil site in West Turkana, Kenya.

Bill Lukens and Kennedy Oginga describe a paleosols sequence adjacent to a river channel deposit.

Fossil hunting at the Songhor field site in Kenya

A fossil tree stump cast with roots radiating out from the stump cast (highlighted by the black line).

Fossilized tree branch from the Koru field site.

DR. JAY PULLIUM

The 2015-16 academic year was a busy one for me and my research group. I taught two new courses, supervised research by five graduate students and one senior undergraduate, submitted several proposals for external funding, and helped four students graduate. I also continued to serve as chair of the International Development Seismology committee for the IRIS Consortium (the "Incorporated Research Institutions for Seismology") and organized several sessions at professional meetings. My main research foci are still the Texas/Oklahoma/New Mexico ("Southern Laurentia") and the northeast Caribbean, although most of my efforts are directed toward the latter.

The Greater Antilles Seismic Project (GrASP) is going well. We still have 16 broadband seismic stations in the Dominican Republic (which we installed in 2014) and will leave them in place until summer 2017. In a very positive development, I helped my colleagues at the Dominican National Seismic Network ("Centro Nacional de Sismologia") write a successful proposal to purchase and install instrumentation for 11 seismic stations. These will ensure that the network remains a robust and effective tool for monitoring seismicity, assessing seismic hazard, and mitigating that hazard after our instruments return home next year.

We are starting to get good results from GrASP data, including receiver function images presented by M.S. student Gift Ntuli at the 2015 Fall AGU meeting of the American Geophysical Union (AGU) and earthquake focal mechanisms and re-locations currently being computed by PhD student Hannah Mejia. Hannah will conduct additional analyses, including seismic body wave

tomography, to elucidate the 3D structure of this complex subduction-to-strike-slip transition, and locating small-to-moderate-magnitude seismicity, to identify active faults. Kenton Shaw studied permanent deformation and made the first measurements of arrival times from teleseismic earthquakes for use in tomography. The Centennial Professorship that I was awarded for the academic year was critical to aggregating the data and building the professional collaborations we need to make GrASP a success. I greatly appreciate the support afforded by the Centennial class and the selection committee.

PhD student Frank Sepulveda developed a device to autonomously acquire data, share it with other "nodes," and perform modeling to determine subsurface geophysical characteristics. It effectively converts a set of standalone Reftek 130 digitizer/recorders into a networked array of seismic nodes and a distributed computing facility. It is therefore well-suited to a variety of applications, including the passive-source seismic site characterization techniques that were the topic of our 2013 workshop in Santo Domingo, earthquake aftershock studies, and active-source reflection or refractin seismology. We submitted a proposal to the U.S. Department of Energy that would allow us to build 150 of the devices (which we call the **Ra**spberry **Pi**-**E**nhanced **R**EFTEK (RaPiER)) and fieldtest the array at an active geothermal site.

Mohit Agrawal submitted the third and final paper required for his PhD in March and walked across the stage in May to receive his doctoral hood. The title of his thesis is "Multi Objective Optimization for Seismology (MOOS), with Applications to the Middle East, the Texas Gulf Coast, and the Rio Grande Rift." Mohit was offered several postdoctoral research positions as well as faculty positions and has decided to become an assistant professor at the Indian Institute of Technology/ Indian School of Mines.

Undergraduate geophysics major Nathan Benton successfully defended his senior thesis, entitled "Mantle flow and lithosphere–asthenosphere coupling beneath the southwestern edge of the North American craton: Constraints from shear-wave splitting measurements." Nathan, who will pursue an M.S. degree at Louisiana State University starting in the Fall, also presented his results at the annual meeting of the Geological Society of Amerca in October 2015 and the Fall AGU meeting in December. Mohit, Frank, and Hannah each presented their research results at the annual meeting of the Seismological Society of America in Reno in early April 2016.

In the fall I taught the popular course in Exploration Seismology (GEO 4458) and had a wide range of geology and geophysics undergraduate and graduate students. This will likely be our last class that is filled to capacity since its popularity typically waxes and wanes with the hiring schedules of the energy industry. I also taught a new course called "GPS Geodesy." Geodesy originated in the centuries leading up the 20th century to determine the shape or "figure" of the Earth. It became moribund once the Earth's ellipticity was measured sufficiently accuracy for mapping purposes but has become rejuvenated with the advent of space-based observational platforms, which include Global Positioning System (GPS, in the United States, the technology is called GNSS outside the U.S.), satellite altimetry, high-precision gravity measurements, and radar. These tools allow us to measure motions of the Earth's surface to millimeter levels. High-sample-rate GPS data can be combined with broadband seismic data, which is what my group typically works with, to form a record of ground motion across the spectrum from permanent offset to 50 Hz, or higher if less-sensitive accelerometers are used. My purpose in teaching the course is to help my students become some of the first geophysicists to exploit this powerful new tool.

In the spring I taught a new course called "Seismic Tomography," which covers a fundamental tool in geophysics and other disciplines of applied science. Tomography allows us to use observations made on the Earth's surface to image volumetric variations in seismic velocity in the Earth's interior. This gives us a snapshot of the Eath's current structure from which we can infer past processes and potential for changes in the future.

Lastly, I received funding to conduct, with colleagues Randy Keller (U. Oklahoma), Harold Gurrola (Texas Tech), and Kevin Mickus (Missouri State U.), an "EarthScope Synthesis Workshop" at Baylor in the coming academic year. EarthScope is the 15-year, multi-disciplinary program funded by the National Science Foundation to study North America intensively. It is nearing its end, which means that the vast quantities of data and many new results that were produced need to be synthesized and evaluated to identify significant gains and remaining gaps. Synthesis Workshops are intended to help start working groups that will follow up with additional research, papers, or new research proposals. In addition, the workshops will identify material that can help bring EarthScope science to the public.

There are several reasons why we want to hold a synthesis workshop for the south-central U.S. As a result of deep sedimentary cover, the basement structure of the southern margin of Laurentia is the most poorly understood region of North America. This region has been affected by most of the major orogenies (e.g. Grenville/Llano, Appalachian/Ouachita, Ancestral Rockies, Laramide) to impact both the west and east coast of North America. Yet a great deal of first-order geologic information is uncertain, such as to what extent accreted terrains are continental or island arc in nature (Llano uplift, Sabine uplift, etc.), the location of the transition from continental to oceanic crust, the location of the Grenville/Llano front, the geometry of rifting vs. transform accretion and continental break up. The transit of EarthScope's Transportable Array through our states has led to deep seismic imaging that has begun to shed light on these questions, but it has caused us to recognize the complexity of the region's geology, as well, since much of it is hidden by shallow sediments. If the sedimentary cover were removed the region would have some of the most dramatic topographic relief on the planet. The sedimentary basins in eastern New Mexico and Oklahoma reach depths of 10 km and the package of sediments at the Texas/Gulf of Mexico coastline reaches 16-20 km. This sedimentary cover obscures the structures that resulted from extreme tectonic events and requires tools for remote sensing and geological inference.

Second, the southern margin of North America has recently become the most seismically active region of the continent, but earthquake patterns appear to correlate with ancient fault systems. The increased seismicity, whether it is a result of "fracking," wastewater re-injection for disposal, or other processes, thus provides an avenue for both studying the region's tectonic past as well as a pressing but data-poor issue of societal importance. For example, only certain faults seem to be affected by seismicity correlated with "enhanced" oil and gas recovery. A better understanding of fault systems, enabled by a comprehensive analysis of all available geological and seismic data, could potentially help mitigate the effects of fracking.

Third, recent studies that made use of EarthScope Transportable data, along with additional data acquired at denser station spacing, revealed anomalous crust and lithosphere beneath the ocean-continent transition from southern Laurentia to the Gulf of Mexico. These discoveries demonstrated that the southern U.S. is a good location in which to study issues related to lithospheric development and stabilization after disruption by major tectonic events. Although passive margins are common worldwide, instrumentation of the sort provided by EarthScope, is rarely brought to bear on such structures (due, most likely, to low seismic hazards), so the opportunity provided by EarthScope assets has broad significance. Despite the region's complexity, the severity of orogenies and the geographic separation between sites impacted by these events make the region a good place to study how events separated in geologic time and space influence the development, stabilization, and reactivation (or erosion) of continental lithosphere.

We intend to hold the synthesis workshop early in the Spring 2017 semester. It will provide an opportunity to bring a large number of geoscientists to the Baylor campus and to show them the world-class facilities and research activities we have here.

DR. JOE YELDERMAN

Key Words: Farvolden, NGWA, GSA, ASBOG, GIT, STGCD, psychology, Brazos River

An "El Nino" year in Hydrogeology! A flood of presentations recharged by external funds helped students pump out papers, licenses, and awards. Ph.D. student Joshua Brownlow highlighted the year by winning a **Farvolden** award (outstanding presentation) at the National Groundwater Association (**NGWA**) Summit in Denver, CO, Josh presented his already highly publicized paper "Influence of Hydraulic Fracturing on Overlying Aquifers in the Presence of Leaky Abandoned Wells" which was published in *Groundwater*. Josh also received additional funding from both Evergreen and Wintergarden Groundwater Conservation Districts and presented his research at the Geological Society of America (**GSA**) annual meeting in Baltimore, MD and at the Texas Groundwater Summit in San Marcos, TX.

Ph.D. student Stephanie Wong also had an outstanding year as she published her work from Uganda in GSA Special Publication, *Geoscience for the Public Good and Global Development*. Her paper was entitled "Time not wasted: How collaborative research and education help build groundwater sustainability in rural northern Uganda, Africa". Stephanie also received additional funding from the Clearwater Underground Water Conservation District and presented her research at GSA in Baltimore, the Bell County Water Symposium, and the University of Texas Brown Bag series in hydrology.

M.S. student Jim Tucker passed his Association of State Boards of Geology (**ASBOG**) Fundamentals Exam on the first try and is now a licensed professional Geoscientist in Training (**GIT**). Jim also received additional funding from the Southern Trinity Groundwater Conservation District (**STGCD**) and presented his work at **GSA** in Baltimore and at the Bell County Water Symposium.

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

B.S. student Kori Taylor presented her completed Senior Thesis on the **Brazos River** Alluvium aquifer in poster format at the GSA annual meeting in Baltimore.

Dr. Joe welcomes new student Will Brewer who will be working on a Ph.D. in the Institute of Ecological, Earth, and Environmental Sciences. Will comes from Millsaps College in Jackson, MS, with a double major in **psychology** and geology.

Research scientist Wayne Hamilton was instrumental in making the **Brazos River** Alluvium Aquifer Initiative (BRAAI) a reality. The BRAAI is a cooperative research effort with the **STGCD** and other stakeholders in McLennan County which has already received initial funding. Wayne prepared a poster which Dr. Joe presented at the **NGWA** Groundwater Summit in Denver. In addition to this major project, Wayne accompanied students to the field and helped STGCD general manager, Scooter Radcliffe, organize an aquifer test on the Hensell aquifer near McGregor,

Texas. Several Baylor students were able to participate in the aquifer test which doubled the known transmissivity values and produced the first 2 storativity values for the Hensell aquifer in McLennan County.

Dr. Joe's hydrogeology class attended the second Hydro-Geo Workshop near Boerne, Texas at Cave Without a Name where Dr. Joe and Stephanie Wong taught a module on Field Notes. In addition to students participating in the McGregor aquifer test, Ph.D. students Joshua Brownlow and Stephanie Wong accompanied Dr. Joe to west Texas and New Mexico for an Arid Zone Hydrology field course over spring break. Highlights of the trip included several remediation sites, visits to Angelo State and Sul Ross universities, tours at the Desert Research Institute and the R. E. Janes sand and gravel mine, radon sampling at San Solomon Spring as well as baseflow sampling in the Davis Mountains and the Salt Fork of the **Brazos River.**

Dr. Joe taught a Lifelong Learning class to Baylor retirees in the spring entitled, "You Can't Trust Water". He also advised incoming freshmen again this past summer and continued to help Dr. Bonem with undergraduate majors. Dr. Joe attended "A Water Wonk's World", a distinguished lecture by Dr. Michael E. Campana sponsored by the Edwards Aquifer Authority. Dr. Joe is currently serving as Director for The Institute of Ecological, Earth and Environmental Sciences (TIEES).

On a personal note, there is now a Dr. Yelderman 2.0! Son Logan completed his Ph.D. in Interdisciplinary Social **Psychology** from the University of Nevada at Reno. He is now an assistant professor in the **psychology** department at Prairie View ~~A&M~~ University with daughter-in-law Rachel, grandson Bryce, and grandchild "?". Son Cal has also reached a milestone as he married Rachel Ledoux on July 16. They live in Austin where he is a senior business analyst for Mitratech and Rachel is a Senior Paralegal at Thompson, Coe, Cousins & Irons L.L.P. Rachel received her Masters in Paralegal from Texas State University this past year.

Daughter Abigail and son-in-law Jared White live in Plano with grandson Hamilton (pre-school) and granddaughter Madison (1st Grade!). Diane is enjoying retirement while helping with weddings, babysitting grandchildren, and staying active in Bible study with friends. Dr. Joe continues to teach Sunday School at Columbus Avenue Baptist Church with Diane, his loving wife of 41 years. The Yeldermans still live at 706 Woodland West, Woodway, Texas and visitors are always welcome.

Publications

Brownlow, J. W., James, S. C. and Yelderman, J. C. (2016), Influence of Hydraulic Fracturing on Overlying Aquifers in the Presence of Leaky Abandoned Wells. Groundwater. doi:10.1111/gwat.12431

Wong, S.S., and Yelderman, J. C., Jr., 2016, Time not wasted: How collaborative research and education help build groundwater sustainability in rural northern Uganda, Africa, in Wessel, G.R., and Greenberg, J.K., eds., Geoscience for the Public Good and Global Development: Toward a Sustainable Future: Geological Society of America Special Paper 520, p.1-10,doi:10.1130/2016.2520(17).

Presentations

Taught Field Notes in Hydrogeology module at the Hydro-geo Workshop at Cave Without a Name in Boerne, Texas, 9-26 and 27, 2015.

Kirby, Joshua and Yelderman Jr. Joe C., 2015, Applied forensic investigation of elevated arsenic levels in a deep confined aquifer, GSA Annual Meeting, Baltimore , MD, abstract and oral presentation.

Yelderman, Joe C., Jr., Wong, Stephanie, and Wallestad, Carrie, 2016, "101 ways to calculate (estimate) recharge", Sul Ross State University, Alpine, Texas, March, 8, 2016, INVITED presentation,

Yelderman, Joe C., Jr. and Hamilton, Wayne, 2016, "Texas Brazos River Alluvium Aquifer Initiative: Working Together to Monitor and Manage Groundwater", NGWA Groundwater Summit, April 26, 2016, Denver, CO, poster presentation.

Yelderman, Joe C., Jr. and Wong, Stephanie, 2016, "Spatial Quantification of Groundwater/Surface-Water Interaction Using the FLIR Infrared Camera", NGWA Groundwater Summit, April 26, 2016, Denver, CO, oral presentation.

Yelderman, Joe C., Jr. and Wong, Stephanie, 2016, "What's happening in the Northern Segment of the Balcones Fault Zone Edwards Aquifer at Salado Springs: Radon, Salamanders and FLIR thermography", UT Hydrology Brown Bag Session, May 6, 2016, Austin, TX, INVITED oral presentation.

Yelderman, Joe C., Jr., 2016, Research, Education, and Groundwater Management: a Symbiotic Relationship between Universities and Groundwater Conservation Districts (GCDs), Texas Alliance of Groundwater Districts (TAGD) quarterly meeting, May 19, 2016, Austin TX, INVITED panel presentation.

Funding

Internship with the Southern Trinity Groundwater Conservation District (STGCD), for January-December, 2016, $22,726.

Recharge Feature Analysis and Spring Assessments, Bell, County, Texas, Clearwater Underground Water Conservation District, March, 2016, through August, 2016, $19,527.

Investigation of potential fluid pathways to the Carrizo-Wilcox aquifer in the Eagle Ford Shale Play, Wintergarden Groundwater Conservation District, March, 2016, through May, 2017, $6358 additional funds.

Investigation of potential fluid pathways to the Carrizo-Wilcox aquifer in the Eagle Ford Shale Play, Evergreen Underground Water Conservation District, April, 2016, through May, 2017, $6358 additional funds.

Scooter Radcliffe, Wayne Hamilton, and Stephanie Wong looking at bedrock fractures in the Pecan Gap Chalk along the **Brazos River**

Dr. James Ward of Angelo State University describes remediation challenges at a saline contamination site.

Above: Josh and Stephanie along the Salt Fork of the **Brazos River**.

Left: Camp site in the Davis Mountains with the RAD 7 (radon machine) setup behind the truck.

Josh Brownlow admires the hydrogeologic framework of the Ogalalla Aquifer.

Stephanie Wong photographs the tranquility of San Solomon spring water at Lake Balmorhea.

Dr. Joe trying to impart hydrogeologic knowledge to Joshua Brownlow at Salt Basin south of the Guadalupe Mountains.

Stephanie Wong uses a recently acquired SONTEK current meter to measure spring flow at Big Boiling Springs in Salado, Texas.

DR. REN ZHANG

The past year was my sixth year at Baylor, and I was as busy as before. First of all, I have managed to maintain smooth daily operations of our Stable Isotope Laboratory, which is a prerequisite for providing high-quality stable isotope analytical services to both internal and external users. To achieve this, I had to spend a lot of time working on daily tuning and calibration of the IRMS and its peripherals, regular maintenance, troubleshooting, inventory control, and lab safety. Secondly, I have arranged lab work reasonably to accommodate departmental isotope lab course and to support ongoing research programs that include Geosciences, Biology, Environmental Sciences, and other Institutes. Almost all of my time and effort was given to providing analytical and other related services to faculty and students from Baylor and other universities: I have finished 4363 isotopic analyses and generated more than enough funds to cover ordinary lab operational costs for the past year.

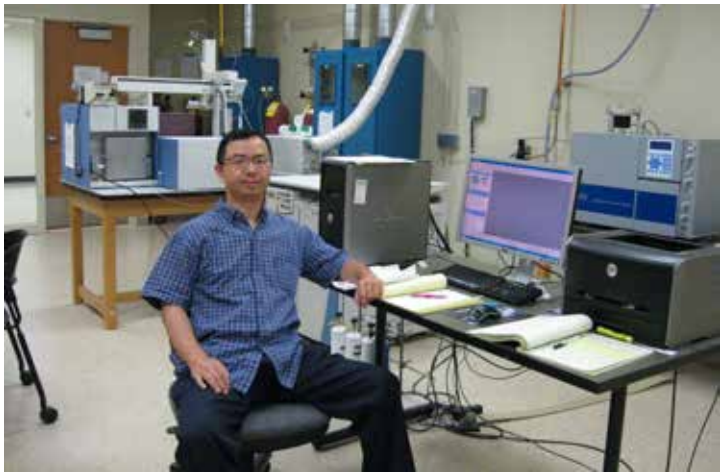
We all know that lab work is really time-consuming, and sometimes very boring, but I would like to tell you a few interesting stories about my work. The first one is about computers. Nowadays computers can work much faster than 10 years ago, and we are told that computers can complete multiple tasks at the same time because they have duo-core or quad-core CPUs. Well, this may not be true sometimes. A desktop computer controls operations of the instruments in my lab, and the isotope composition of a sample should be automatically computed by ISODAT software at the end of each analysis. However, I have seen blanks for isotope ratios at the end of some runs, and this happened every time when I was simultaneously using EXCEL to do some calculations (i.e., to normalize previous raw delta data to international VSMOW or VPDB scale): my lab computer actually cannot do two jobs at the same time. Ironically, I had to spend much longer time to manually calculate the isotope ratios of the sample. Guess computers are not all that great, don't you agree?

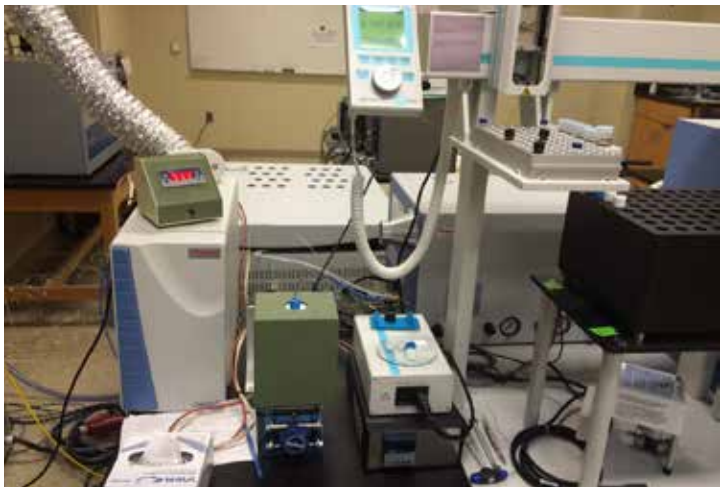
The second story is about the most common air leak problem caused by acid treatment for removing inorganic calcite from geological samples. To determine carbon isotope signals of organic matters that contained in bulk geological samples, we must first use diluted acid, usually HCl, to destroy all the inorganic calcite. We used in situ acidification method before, which left the formed secondary deposit calcium chloride remaining in tin capsules. This chemical is hygroscopic and can easily absorb moisture from atmosphere. As a result, the treated samples could become very wet, and the trapped water could be released by combustion, quickly saturate magnesium perchlorate in the water trap,

and then damage or totally destroy the bottom seal of the trap, causing air leak. The worst scenario was that calcium chloride powder might gradually accumulate in the U-tubing that connects the left and right reactors and eventually block gas flow. Sometimes I had to change the whole water trap packing and replace the destroyed seals only after one batch of analysis. To solve this problem, I worked with Dr. Steve Dworkin to develop a new method for acid treatment, which requires additional rinse procedure. The new method works very well to remove calcium chloride from the system, and I don't have to change water trap packing and seals so frequently.

The last story is about the acid pump for Gas Bench II. The acid pump is used to automatically inject H3PO4 into sample vials when analyzing carbonate samples for C & O isotope ratios. Both sample vials and the acid reservoir are placed in a heating block at 72oC under normal operation conditions. However, it is recommended to turn off the heaters to extend their life span if no carbonate samples will be analyzed for a while. As a result, the acid pump tends to get clogged around the pump head because it is not originally designed for viscous phosphoric acid. For past years, I have had to fix this same problem every time when I switched to carbonate analysis until the pump was totally broken. So here is the dilemma: if you want to extend heaters' life span, you may have to sacrifice acid pump's life span. Is there a solution for this? I simply built an exclusive heating unit and its associate temperature control unit for the acid reservoir of the pump (please see attached photo), and hopefully both life spans can be extended.

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.





Above: Dr. Zhang is Baylor proud.

Right: The stable isotope laboratory

BAYLOR UNIVERSITY

August 2016

Dear Alumni and Friends,

This year, the Baylor Geological Society/AAPG Student Chapter had an incredibly productive and successful year. We increased our membership 5% despite a significant number of members graduating in spring 2015. Our academic goals were met with great success. The BGS hosted a geosteering short course and numerous talks by industry professionals. 16 chapter members attended the Rocky Mountain Rendezvous and the AAPG/SEG Student Expo. The BGS hosted four geology-related sessions at the Waco Girl Scout STEM Fair for elementary to middle school girls, helping to spark interest in earth sciences. We also partnered with Baylor's new Sigma Gamma Epsilon chapter to form a Relay for Life team.

The BGS had another successful year of activities, outreach, and learning. We are excited to leave the organization in the highly capable hands of our newly elected committee and look forward to seeing its continued growth.

Hunter Harlow
BGS President

Caitlin Leslie
BGS Vice President

FIELD CAMP...

Left: Ryan, Meredith, and Lauren draft up their Yellowstone water chemistry map

Right: Hudson titrates while Nathan and Jeannie record the data

Left: Ryan titrating for alkalinity

Right: Dominic, Richard, Kaitlyn, and Margaret ponder the chemistry of Yellowstone waters

Left: Hudson, Mitch, Nathan, and Jeannie at Yellowstone

Right: Hobo meals cooked in tin foil on the fire - Yum!

Left: Looking at cross bedding in Zion

Right: Lyndsay and Kaitlyn finding some shade in the Grand Canyon

Left: Richard, and Dominic measuring section in the Grand Canyon

Right: Before descending into the Grand Canyon

Left: Hunter Anderson measuring sectino near Alamagordo

Right: Dominic Rizzo looks at some foram packstones

Left: Describing Pennsylvanian rocks in New Mexico

Right: Studying dune morphology with the San Andres Mountains in the backgrond

Left: Kaitlyn Hoffman keeps cool while measure the orientation of a slip face at White Sands

Right: Richard Corley taking a bearing on the dune project

FEATURING...

DOCTORAL CANDIDATE AWARDED FOR RESEARCH

Joshua Brownlow, a doctoral candidate studying geology at Baylor University, received the Farvolden Award for his research regarding the relationship between hydraulic fracturing and groundwater contamination, which he presented at the 2016 National Groundwater Association Groundwater Summit in April.

Brownlow's research focused on investigating the potential for hydraulic fracturing to contaminate groundwater through leaking or abandoned wells. He developed and used a model to predict the potential for groundwater contamination when abandoned wells were left open or filled with drilling mud.

Brownlow worked alongside Joe Yelderman, Ph.D., professor in Baylor's College of Arts and Sciences, and director of Baylor's wastewater research program and the Institute of Ecological, Earth and Environmental Sciences, as well as Scott James, Ph.D., assistant professor in Baylor's College of Arts and Sciences, for nearly a year to complete the research.

"Josh did a lot of work on this, overcame a lot of difficulties that would have set a lot of other people back, but he stayed with it and did an excellent job," Yelderman said.

The Farvolden Award is given to the most outstanding student research papers presented at the summit. It is judged on both scientific content and presentation style.

"It's quite prestigious because it was a national meeting, and it was one of the best student papers there. I'm very proud of him. He did an excellent job," Yelderman said.

In addition to the Groundwater Summit, Brownlow presented his data at the Geological Society of America meeting and plans to speak about his research at the Texas Association of Groundwater Districts in August. His work will also be published in the coming issue of the journal *Groundwater*.

Brownlow is currently researching topics for several other papers he hopes to publish in the coming year.

Article written by Karyn Simpson, student newswriter

Photo courtesy of Joshua Brownlow

GRADUATES...

December 2015 Graduates

Master of Science in Geology

Adam Collard – Remote Estimation of Aquatic Sediment Density in the Presence of Scatter

Tanner Mills – Paleoceanographic Conditions that Resulted in the Accumulation of Organic Matter in the Middle Pennsylvanian Hermosa Group, Southwestern Shelf, Paradox Basin, Utah

Doctor of Philosophy

Emily Beverly – Reconstruction of Late Pleistocene Paleoenvironments of the Lake Victoria Region Using Paleosols and Freshwater Tufa

Ryan Morgan – Investigations in Blastoid Phylogenetics, Speciation, and the Sedimentology of an Echinoderm-defined Stratotype

Joseph Sang – A Semi-Empirical Model to Predict Erosion Rate of Cohesive Soil, Determination of Critical Shear Stress of non-Cohesive Soils, and Field Prediction of Watershed Erosion Rate under Drought and Low Data Conditions

May 2016 Graduates

Bachelor of Science in Geology

Brittany Abbuhl
Kenneth Cassady
Luke Pajer
Hayden Ross
Kolton Sundquist

Master of Science in Geology

Brandon M. Rasaka – Correlation of Selected Earthquakes with Seismogenic Faults, Central Oklahoma

Doctor of Philosophy

Mohit Agrawal – Multiple Objective Optimization for Seismology (MOOS), with Applications to the Middle East, the Texas Gulf Coast, and the Rio Grande Rift

Tian Xu – Application of Direct Current Resistivity Method to Environmental and Hydrological Problems

August 2016 Graduates

Master of Science in Geology

Kenton Shaw – Geodetic Constraints on Motions in the Northeastern Carribbean and Seismogram Cross-correlations Using AIMBAT Software

Gift Ntulli - Ps receiver function imaging of crustal structure and Moho topography beneath the Northeast Caribbean

Stephen Norair – Streambank Erosion Assessment: Application of Dendrogeomorphology, Numerical Watershed Modeling, and Model Characterization

Daniel Parizek – Depositional and Stratigraphic Controls on Reservoir Distribution within the Rodessa Formation in Northwest Louisiana.

Victoria Worrell - The Seismo-Lineament Analysis Method (SLAM) Applied to the South Napa Earthquake and Antecedent Events

AWARDS...

Dr. Steven Driese and Nicky Arellano at the Spring Honors Convocation

Nathan Benton, Dr. Steven Driese and Brittany Abbuhl at the Spring Honors Convocation

At the annual Doctoral Dinner

Brittany M. Abbuhl (BS, 2015) – 2016 recipient of the Robert T. Hill Award for Academic Excellence in Geology

Brittany M. Abbuhl (BS, 2015) & Nathan Benton (BS, 2015) - Chosen to represent the Geology Department at the 2016 College of Arts & Sciences Honors Convocation

Nicky Arellano (BS, 2015) received the Ray Wilson Award in the Physical and Life Sciences in the Honors College for Outstanding BS Thesis. Congratulations Nicky!

Josh Brownlow (current PhD Student) – awarded a grant by the National Ground Water Research and Education Foundation

Kori Taylor (BS, 2015) – 2015 recipient of an L. Austin Weeks Undergraduate Grant by the AAPG Foundation

<u>Dixon Field Scholarship</u>
Marlee Haralson – current undergraduate student
Michaela Donahoo – current undergraduate student

<u>Hayward Field Scholarship</u>
Matthew Strasser – current MS Student
Logan Wiest – current PhD Student

<u>Hazelwood Scholarship</u>
Matthew Strasser – current MS Student

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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_____

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PLACE
STAMP
HERE

Baylor University
Department of Geosciences
One Bear Place #97354
Waco, TX 76798-7354

PERSONAL INFORMATION SHEET
DEPARTMENT OF GEOSCIENCES

Name: _____ Class: _____

Degree(s): _____

Phone: _____ Email: _____

Mailing Address: _____

_____

Type of Work: _____ Location: _____

Company Name: _____

Family Information: _____

_____

Hobbies: _____

Interests: _____

Spare Time Activities: _____

_____

Would you like to share information in the Homecoming Newsletter Section, "Let's Stay Connected?" Yes ___ No ___ If yes, write information here: _____

_____

_____

Are you willing to speak to the Department?

Yes ___No ___If yes, write topic here: _____

_____

_____

Suggestions: _____

_____

_____

ALUMNI UPDATES...

Lauren (Dubuisson) Boldrick (B.S., 2007)
"Life is pretty great. I married my college sweetheart, Zach (BS Mechanical Engineering). We moved to Alaska after getting laid off after the 2008 recession, but have ended up with great jobs. I am working for the US DOI Bureau of Ocean Energy Management, I manage the shallow hazards analyses and am the Project Manager for the only proposal the agency had going at the moment in AK. It's pretty fun and interesting, much less field work than I would like but we have two boys, Sam (5) and Ellis (2) so I'd rather be able to be home with them. They are joyful little scamps." *(See Boldrick family photo below.)*

Robyn (Marchand) Hillerman (M.S. 2005)
"I am still at Marathon Oil and currently working in the Planning Group overseeing International and Offshore Production operations. We had another baby too!! Matthieu Russell Hillerman was born on March 19 2015. He decided to join us on our wedding anniversary of course. He's such a happy smiley guy! His older brother Michael (2 years old) is well on his way to becoming a geologist: he collects rocks ALL THE TIME and he absolutely LOVES dinosaurs! He's at such a fun age right now!

Congratulations to:
Hunter Harlow (B.S. 2010 and Current PhD student) and his wife, Rachel, on the birth of their son, Hayes, on April 10, 2016.

Cimarron Parker, daughter of Dr. Don Parker, who was married in Paris in a civil ceremony to Gregoire Bruneau this past February.

Mike and Alison Nguyen (BS, 1997 and MS, 2006) on the birth of their daughter, Brooke Anh-Vy, on March 4, 2016.

BAYLOR UNIVERSITY Homecoming est.1909

Please join us!

GEOSCIENCES OPEN HOUSE

Friday October 14, 2016
7:00-9:00 p.m.
Baylor Sciences Building, E401

BAYLOR UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

Department of Geosciences
One Bear Place #97354
Waco, TX 76798-7354

Change Service Requested

Department of Geosciences • 254-710-2361 (ph) • 254-710-2673 (fax) • baylor.edu/geology

Dr. Stacy Atchley, Chairman
Petroleum & Stratigraphy

Dr. Peter Allen, Professor
Hydrology & Engineering Geology

Dr. Kenny Befus, Assistant Professor
Mineralogy & Petrology

Dr. Rena Bonem, Professor
Paleoecology & Coral Reef Studies

Dr. Vince Cronin, Professor
Structure & Neotectonics

Dr. Steven Driese, Professor
Paleopedology & Sedimentology

Dr. John Dunbar, Professor
Near-Surface Geophysical Methods

Dr. Steve Dworkin, Professor
Geochemistry & Sedimentary Petrology

Dr. Steve Forman, Professor
Paleoclimate, Geohydrology Tectonics

Dr. Jamey Fulton, Assistant Research Professor, Stable Isotope Geochemistry, Organic Geochemistry & Geomicrobiology

Dr. Don Greene, Professor
Meteorology & Geography

Dr. William (Bill) Hockaday, Assistant Professor
Organic Geochemistry & Biogeochemistry

Dr. Scott C. James, Assistant Professor
Groundwater Modeling

Dr. Lee Nordt, Professor & Dean, College of Arts & Sciences,
Pedology & Geoarchaeology

Dr. Daniel Peppe, Associate Professor
Graduate Program Director
Paleomagnetism & Paleobotany

Dr. Jay Pulliam, W.M. Keck Foundation Professor of Geophysics, Solid-Earth Geophysics, Seismology

Dr. Joe Yelderman, Professor
Hydrogeology & Wastewater

Dr. Harold Beaver, Emeritus Professor

Dr. Bill Brown, Emeritus Professor

Dr. Tom Goforth, Emeritus Professor

Dr. Don Parker, Emeritus Professor

Sharon Browning, Geology Freshman Laboratory Coordinator

Wayne Hamilton, Laboratory Safety Coordinator

Liliana Marin, Geoluminescence Research Lab Manager

Tim Meredith, Research Technician, Paleomagnetism Lab

Dr. Ren Zhang
Stable Isotope Spectrometry Lab Managers

Paulette Penney, Office Manager

Janelle Atchley, Administrative Assistant

Jamie Ruth, Administrative Associate