

2014 Newsletter

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The *Newsletter*, a tradition since 1950, is published annually for friends and alumni of the Jackson School of Geosciences at the University of Texas at Austin.

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On the cover: Jackson School of Geosciences research professor Ian Dalziel with Eugenia Sangines at Siccar Point in Scotland. See pages 82-83 for more about the 2014 Texas Exes trip.

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WELCOME



Jackson School alumni, staff and friends with the Texas Exes in Scotland during a field trip in summer 2014.



Dear Alumni and Friends,

As you browse this year's alumni *Newsletter*, I think you will agree that it has been another tremendous year of scientific discovery at the Jackson School of Geosciences.

Our mission at the Jackson School is to advance understanding of the earth and its resources, systems and environment, for the lasting benefit of humankind. The work featured in this magazine is doing just that.

The research you will read about shows a tremendous range of science, plus the integration of research and education. Among the highlights are the ongoing work that Don Blankenship and colleagues are doing on the West Antarctic Ice Sheet (page 42), and closer to home, Bayani Cardenas's research on the Mississippi River's limitations to filter out nitrates flowing to the Gulf of Mexico (page 46). Also highlighted is Mark Helper's preparation of the next generation of astronauts to conduct field geology in space, continuing Bill Muehlberger's legacy (page 39).

And proving that big ideas can come in deceptively small packages is the cutting-edge research on nanoparticles being conducted by BEG's Advanced Energy Consortium (page 44), and Danny Stockli's research teasing out a wealth of geological knowledge from a single zircon (page 30).

As exciting as these projects are, they represent only a small fraction of the science being pursued at the Jackson School. To really get a feel for the breadth and depth of JSG research and student involvement, I invite you to attend one of my favorite events of the year, the student-led research symposium. I encourage you to look at the

photos of the 2014 symposium at which graduate and undergraduate students displayed their research (page 14). This academic year's symposium is Feb. 7, 2015, in the Texas Union Ballroom. Please attend. You won't regret it.

As many of you are well aware, the field of geosciences is expanding and changing rapidly. The evolving landscape offers exciting opportunities and challenges. Among the most important issues we face is how to arm young geoscientists with the skills needed to thrive in the new environment and economy.

In January 2014, we hosted a National Science Foundation sponsored Summit on the Future of Undergraduate Geoscience Education to foster a dialogue on this crucial issue (page 15). The three-day summit brought together about 200 educators from R1 research universities with undergraduate programs, four-year private and state colleges and two-year community colleges. This vital work will be ongoing, but the summit was a great start.

I hope you take pride in the Jackson School as you read this year's *Newsletter*. You should, because none of this would be possible without the support of an active and caring network of alumni and friends. Thank you so much for helping make the Jackson School the great place it is.

Sharon Mosher
Dean

RESEARCH HIGHLIGHTS

See this edition's feature articles for additional coverage of selected research highlights.

Battered But Not Broken

Hurricane Sandy may have wreaked havoc throughout Long Island in October 2012, but the massive storm did not seriously damage the offshore barrier system that controls the island's erosion, found researchers with the University of Texas at Austin's Institute for Geophysics (UTIG) and other scientific institutions.

The findings are based on pre-storm survey data compared with post-storm data acquired through a collaborative rapid response science mission to the south shore of Long Island led by scientists at UTIG, Adelphi University, Stony Brook University and other institutions in the New York metro area.

The purpose of the mission, conducted January 2013, was to assess the post-Sandy health of the offshore barrier system that protects New York Harbor and the southwestern Long Island region against damage from future storms. The team conducted marine geophysical surveys of the seafloor and shallow subsurface to map the sedimentary impact of the hurricane on the beach/barrier systems of selected bay, inlet and nearshore areas of the south shore of Long Island.

Using a CHIRP (compressed high-intensity radar pulse) sonar system and an even



Above: A New Jersey neighborhood in the aftermath of Hurricane Sandy. Credit: U.S. Navy. Below: Members of the rapid response research team included, from left to right, Jamie Austin, John Goff, Steffen Saustrup, Cassandra Browne, Beth Christensen and Roger Flood.

higher frequency seafloor mapping system supplied by Stony Brook University, the scientists used two research vessels to profile the seafloor and upper sediment layers of the ocean bottom. They surveyed three representative segments of the shoreface that protects Long Island, each segment about 15 meters deep, 1 mile offshore and roughly 6 square miles in size.

The storm, they found, did not significantly erode these sampled segments of shoreface.

"The shape of the bedforms that make up the barrier system did not change a whole lot," said co-principal investigator John Goff, of UTIG. "Where we might have expected to see significant erosion based on long-term history, not a lot happened—nothing that ate into the shoreface."

"The sand largely took the blow," added co-principal investigator Jamie Austin, also of UTIG. "Like a good barricade, the barrier system absorbed the significant blow, but held."

This was not the case in other storm-ravaged zones the Texas team has surveyed. When Hurricane Ike hit Galveston in 2008, the storm significantly disrupted the thin finer-grained sediment layer offshore, removing material underneath the shoreline in a way that exacerbated long-term problems of erosion.

Compared with Galveston, Long Island has a greater abundance of sand in its overall system. The storm churned up much of this sand and moved bedforms, but the scientists speculate that the greater abundance of sand helped the offshore barriers maintain their overall shape and integrity as erosional barriers.

Tempering this good news, the survey team also found evidence the storm brought new pollutants into the waters off Long Island. Heavy metals were detected in a layer of mud that the storm deposited offshore. Beth Christensen, of Adelphi University, traced the metals back to muds from Long Island's South Shore Estuary Reserve, which has a long history of pollution from industry and human habitation.

The mission was the sixth rapid response science mission funded by the Jackson School of Geosciences at UT-Austin. (UTIG is a research unit within the Jackson School of Geosciences.) The missions place geoscientists on the scenes of natural disasters as quickly as possible to measure the often vanishing traces of hurricanes, earthquakes, tsunamis and other disasters.

"The faster we get out into the field to measure Earth's response to naturally destructive events, the better we can relate data to the disasters," said Austin.



Bountiful Supply

The Fayetteville Shale, one of the nation's most productive shale gas basins, will continue to be a major contributor to U.S. natural gas supplies for years to come, according to a forecast from the Bureau of Economic Geology (BEG) released in January 2014.

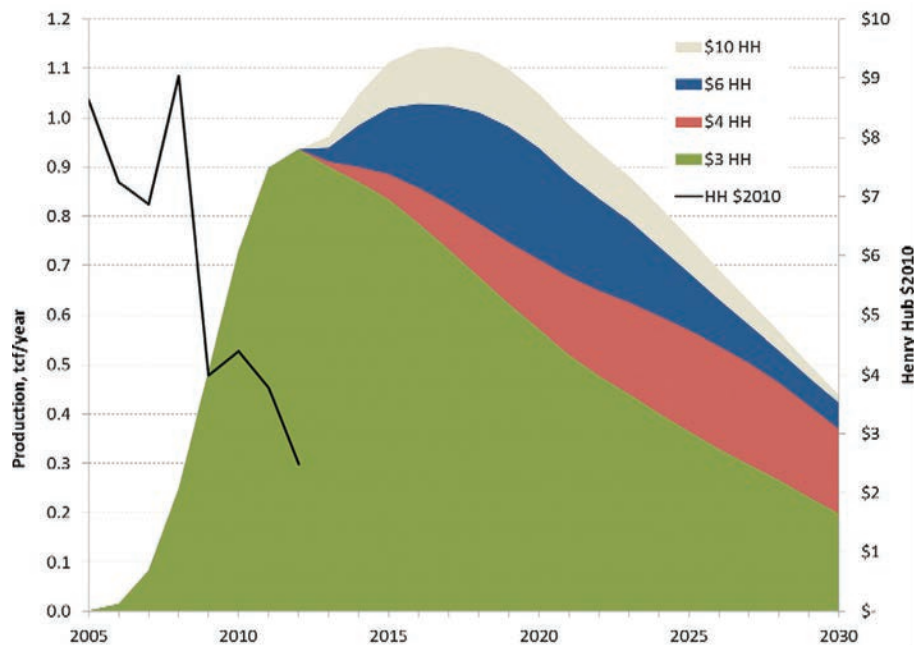
The BEG found recoverable reserves of 18 trillion cubic feet (tcf) through 2050. A summary of the report was released in the *Oil & Gas Journal*.

The assessment of the Fayetteville Shale was part of a four-basin study of shale gas reserves funded by the Alfred P. Sloan Foundation. It followed the same methodology as the BEG's 2013 assessment of natural gas production in the Barnett Shale, the nation's most commercially developed unconventional gas play. Both studies integrated engineering, geology and economics and were designed to be among the most rigorous assessments to date of production in U.S. shale gas basins.

Drawing on production data from all of the individual wells drilled in the Fayetteville Shale from 2005 to 2011, the assessment estimates technically recoverable gas reserves for the region at 38 tcf, of which 18 tcf will be economically feasible to recover at natural gas prices near \$4 per million cubic feet. (For perspective, the United States consumed about 25 tcf of natural gas in 2012, according to the U.S. Energy Information Administration.)

The BEG is moving forward with assessments of two other major U.S. shale gas basins, the Haynesville (in Arkansas, Louisiana and Texas) and Marcellus (in the Appalachian region), followed by a study of U.S. shale oil reserves, all funded by the Sloan Foundation, which makes grants to support original research and broad-based education related to science, technology and economic performance.

Most other assessments of shale gas reserves have taken a top down view of production, relying on aggregate views of average production. In contrast, this study takes a bottom up approach, starting with the production history of every well and then determining what areas remain to be drilled, said Scott Tinker, the BEG's director and co-principal investigator of the assessment. The result yields a more accurate and comprehensive view of the basin.



Fayetteville Shale production forecast based on a Bureau of Economic Geology assessment.

For more information on the BEG assessments of the Fayetteville and Barnett shales and upcoming studies on the Haynesville and Marcellus shales, please visit the BEG-Sloan Foundation Shale Gas Assessment Study website at www.beg.utexas.edu/info/shale_rsrvs_prod.php. The website includes free links to the summary reports in the *Oil & Gas Journal*.

Looking for Life

In a finding relevant to the search for life in our solar system, researchers at the University of Texas at Austin's Institute for Geophysics, the Georgia Institute of Technology and the Max Planck Institute for Solar System Research showed that the subsurface ocean on Jupiter's moon Europa may have deep currents and circulation patterns with heat and energy transfers capable of sustaining biological life.

Scientists believe Europa is one of the planetary bodies in our solar system most likely to have conditions that could sustain life, an idea reinforced by magnetometer readings from the Galileo spacecraft detecting signs of a salty, global ocean below the moon's icy shell.

Without direct measurements of the ocean, scientists have to rely on magnetometer data and observations of the moon's icy surface to account for oceanic conditions below the ice.

Regions of disrupted ice on the surface, known as chaos terrains, are one of Europa's

most prominent features. As lead author Krista Soderlund and colleagues explained in the online edition of the journal *Nature Geoscience*, the chaos terrains, which are concentrated in Europa's equatorial region, could result from convection in Europa's ice shell, accelerated by heat from the ocean. The heat transfer and possible marine ice formation may be helping form diapirs, or warm compositionally buoyant plumes of ice that rise through the shell.

In a numerical model of Europa's ocean circulation, the researchers found that warm rising ocean currents near the equator and subsiding currents in latitudes closer to the poles could account for the location of chaos terrains and other features of Europa's surface. Such a pattern coupled with regionally more vigorous turbulence intensifies heat transfer near the equator, which could help initiate upwelling ice pulses that create features such as the chaos terrains.

"The processes we are modeling on Europa remind us of processes on Earth," said Soderlund, referring to a similar process that has been observed in the patterns creating marine ice in parts of Antarctica.

Redefining Relationships

Michelle Stocker (Ph.D. '13), former graduate student in the University of Texas at Austin's Jackson School of Geosciences, dramatically rearranged the evolutionary tree for several extinct crocodile-like animals that lived over 200 million years ago in present-

Drilling Deep for Fire and Ice

Jackson School of Geosciences researchers to lead major methane hydrate study

The U.S. Department of Energy (DOE) will fund a project led by the University of Texas at Austin's Institute for Geophysics (UTIG) to drill, sample and analyze deposits of frozen methane under the Gulf of Mexico that hold enormous potential to increase the world's energy supply.

The agreement, which was still being finalized at press time, includes roughly \$41 million in DOE funding and \$12 million from industry interested in the project and the research partners.

The grant funding will allow researchers to advance scientific understanding of methane hydrate, a substance found in abundance beneath the ocean floor and under Arctic permafrost. In addition to UTIG, the study includes researchers from The Ohio State University, Columbia University's Lamont Doherty Earth Observatory, the Consortium for Ocean Leadership and the U.S. Geological Survey.

Estimates vary on the amount of energy that could be produced from methane hydrate worldwide, but the potential is huge.

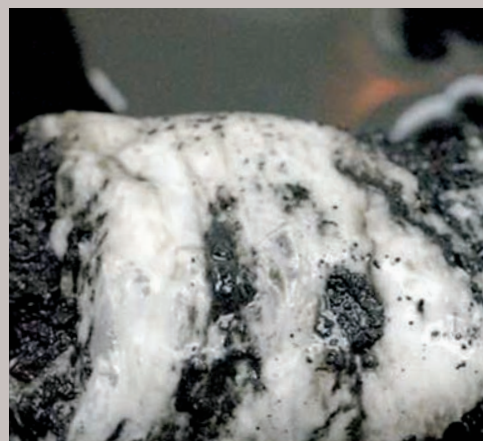
In the Gulf of Mexico, where the team will be sampling, there is estimated to be about 7,000 trillion cubic feet (tcf) of methane in sand-dominated reservoirs located near the seafloor. For comparison, the United States used about 26 tcf of natural gas in 2013. Many large global economies lack clean and secure energy supplies but have potentially enormous hydrate resources, so methane hydrates have the potential to contribute to long-term energy security within the United States and abroad.

Methane hydrate is stable under high pressure and low temperatures but melts quickly when it is warmed or depressurized, causing the methane to bubble away. This poses significant technical and scientific challenges to those working to eventually produce energy from the deepwater deposits.

"The heart of this project is to acquire intact samples of this stuff so that we can better understand how to produce these deposits," said Peter Flemings, a professor and UTIG research scientist who is the project's principal investigator.

Data gathered during the four-year project will help scientists to more accurately estimate the occurrence and distribution of marine hydrates and lay the groundwork for future production efforts.

"I think methane hydrates are one of the most fascinating materials in the planet," Flemings said. "They store energy, they look like ice but burn, they may impact climate, and they may cause submarine landslides."



Above: A methane hydrate core sample from India. Photo courtesy of USGS. Right: Peter Flemings, professor and UTIG research scientist, will lead the study.



day Texas, Wyoming and Germany. Based on this new understanding, she renamed one of the specimens *Wannia scurriensis* in honor of the paleontologist who first described it in 1949, Wann Langston, Jr., an internationally renowned professor at UT-Austin who died in 2013.

Since the first of these crocodile-like specimens was described in 1904, they were sometimes assigned to one species and sometimes to three or four distinct species, yet always within a single genus called *Paleorhinus*. According to Stocker's analysis, the *Paleorhinus* specimens represent at least four distinct species in three genera. This work, which appears in a special volume honoring Langston published online in several installments in September and October 2013 in the journal *Earth and Environmental Science Transactions of the Royal Society of Edinburgh*, has important implications for dating several fossil sites.

"Specimens from a wide geographic range and potentially a wide time range were all lumped into the same group," said Stocker. "That means those sites were all thought to be about the same age. But now we see they might not be."

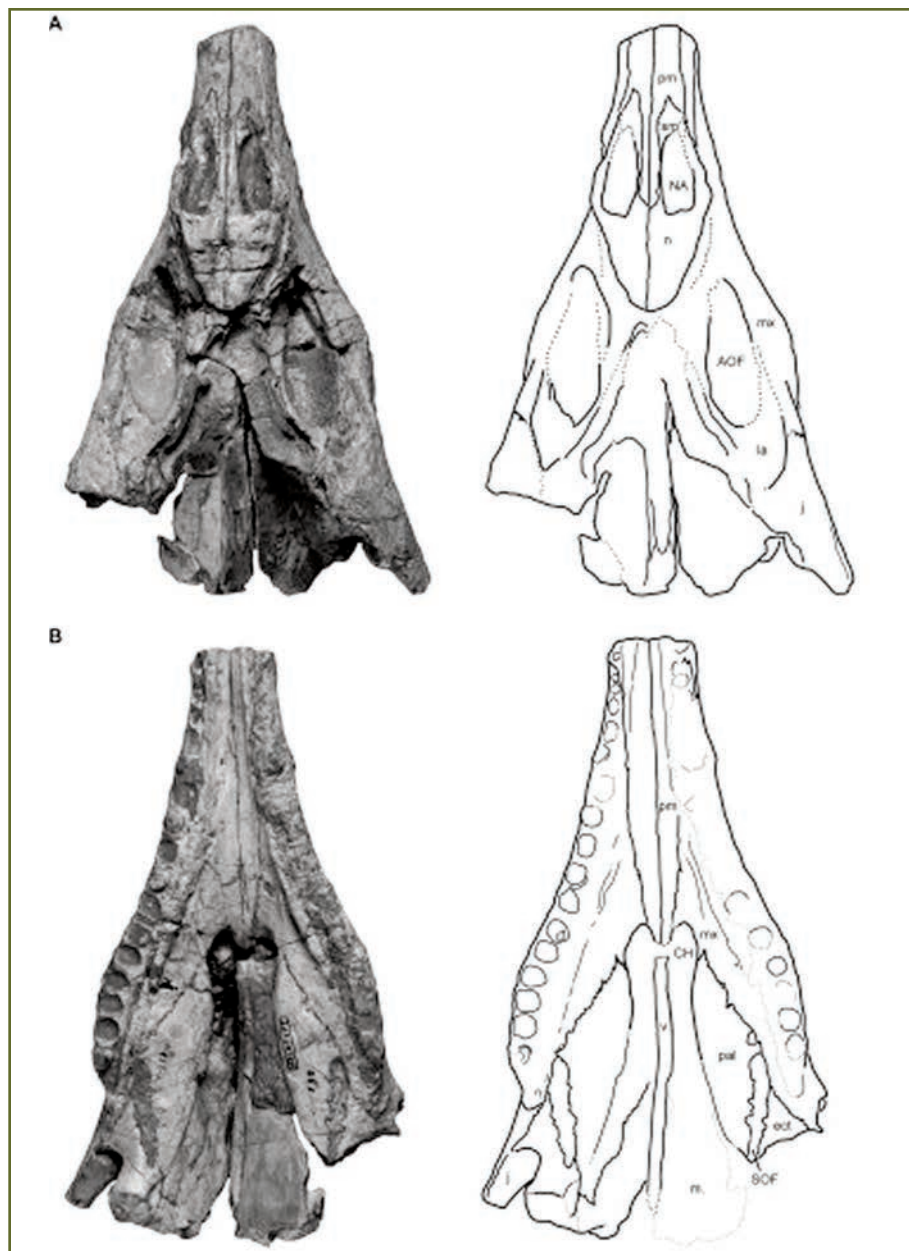
Stocker said this work demonstrates the importance of preserving and maintaining fossil collections. Even when a specimen like *Wannia scurriensis* has been carefully analyzed and described in the scientific literature, new technologies, methodologies and comparative specimens allow scientists to continue to glean new insights.

"It's a historic specimen—Langston described it back in 1949," said Stocker. "And we're still finding out new things about it today."

Climate Connections

Forecasting long-term climate variability has been challenging in the Pacific Ocean, but findings by a researcher at the University of Texas at Austin's Institute for Geophysics could help future efforts.

Slow changes in sea surface temperatures in the tropical Pacific Ocean are known to affect the atmospheric circulation and hydrological cycle around the world, including Texas. A new study by research associate Yuko Okumura indicates that Pacific decadal variability originates in the South Pacific, not the North Pacific. The findings have important implications for long-term climate monitoring and predictions.



Michelle Stocker renamed this crocodile-like specimen *Wannia scurriensis* in honor of professor Wann Langston, Jr. (A) dorsal view of skull (B) ventral view. Scale bar = 1 cm

Previous studies of Pacific decadal variability have paid more attention to the North Pacific, partly because historical ocean-atmosphere data is more abundant in the North than the South Pacific. The new analysis, however, indicates that random atmospheric variability over the South Pacific Ocean modifies sea surface temperatures in the southeast tropical Pacific, which in turn affect the North Pacific Ocean through atmospheric teleconnections.

The findings were published in the American Meteorological Society online journal in December 2013. The strong decadal linkage between the tropical Pacific and South Pacific is also supported by Okumura's previous

analysis of tropical coral and Antarctic ice core records from the past two centuries.

Shaking the Ground

Researchers from the University of Texas at Austin's Institute for Geophysics (UTIG) correlated a series of small earthquakes near Snyder, Texas, between 2006 and 2011 with the underground injection of large volumes of gas, primarily carbon dioxide (CO₂)—a finding that is relevant to the process of capturing and storing CO₂ underground.

Although the study suggests that underground injection of gas triggered the Snyder earthquakes, it also points out that similar rates of injections have not triggered

comparable quakes in other fields, bolstering the idea that underground gas injection does not cause significant seismic events in many geologic settings.

No injuries or severe damage were reported from the quakes identified in the study.

The study represents the first time underground gas injection has been correlated with earthquakes greater than magnitude 3.

The results, from UTIG's Wei Gan and Cliff Frohlich, appeared in the journal *Proceedings of the National Academy of Sciences*.

Water-wise Power

Bridget Scanlon, a senior research scientist at the University of Texas at Austin's Bureau of Economic Geology (BEG), led a study that found using natural gas for electricity generation in Texas saves water and makes the state less vulnerable to drought.

Even though exploration for natural gas requires significant water in Texas, the consumption is easily offset by the overall water efficiencies of generating electricity from natural gas, the study found. The researchers estimated the water saved by shifting a power plant from coal to natural gas is 25 to 50 times as great as the amount of water used in hydraulic fracturing to extract the natural gas. Natural gas also enhances drought resilience by providing so-called peaking plants

to complement wind generation, which doesn't consume water.

The results of study were published in the journal *Environmental Research Letters* in December 2013.

"The bottom line is that boosting natural gas production and using more natural gas in power generation makes our electric grid more drought-resilient," Scanlon said.

The study focused exclusively on Texas, but the authors believe the results should be applicable to other regions of the United States, where water consumption rates for the key technologies evaluated are generally similar.

Ian Duncan, research scientist at the BEG, and Robert Reedy, a BEG research scientist associate, were co-authors.

To study the drought resilience of Texas power plants, Scanlon and her colleagues collected water use data for all 423 of the state's power plants from the Energy Information Administration and from state agencies such as the Texas Commission on Environmental Quality and the Texas Water Development Board, as well as other data.

The Jackson School of Geosciences helped fund the research along with the State of Texas Advanced Resource Recovery program, a state-funded program managed by the BEG.

Remote-control Submarines

In June 2014, scientists with the University of Texas at Austin's Institute for Geophysics (UTIG) and the U.S. Cold Regions Research and Engineering Laboratory teamed up with Bluefin Robotics to conduct an underwater survey near Alaska's Hubbard Glacier.

The team used an autonomous underwater vehicle, or AUV, to survey the glacier's debris-laden bank in areas that surface vessels can't safely operate. In question was whether these remote-control vehicles could be used for research in such harsh environments. The project, according to the scientists, clearly proved they can.

"The data collected along the morainal bank were truly spectacular, providing phenomenal, centimeter-scale seafloor detail close to the glacier in regions that could not be surveyed with surface vessels," said John Goff, a UTIG senior research scientist.

AUVs have the potential to reduce the risk of conducting research in dangerous environments. The Hubbard Glacier, for instance, is one of the few advancing tidewater glaciers in the world. It is readily accessible from Yakutat, Alaska, and offers a premier opportunity for studying ice, sediment and seawater interactions at a tidewater glacier front in contact with the stabilizing submarine morainal bank. However, it is also one of most challenging environments imaginable for marine survey work.

The sea is constantly choked with ice and there is always the possibility that chunks of the glacier will fall into the ocean, making the area unsafe for boats.

"Our project clearly proved the viability of AUV operations in this harsh environment," Goff said.

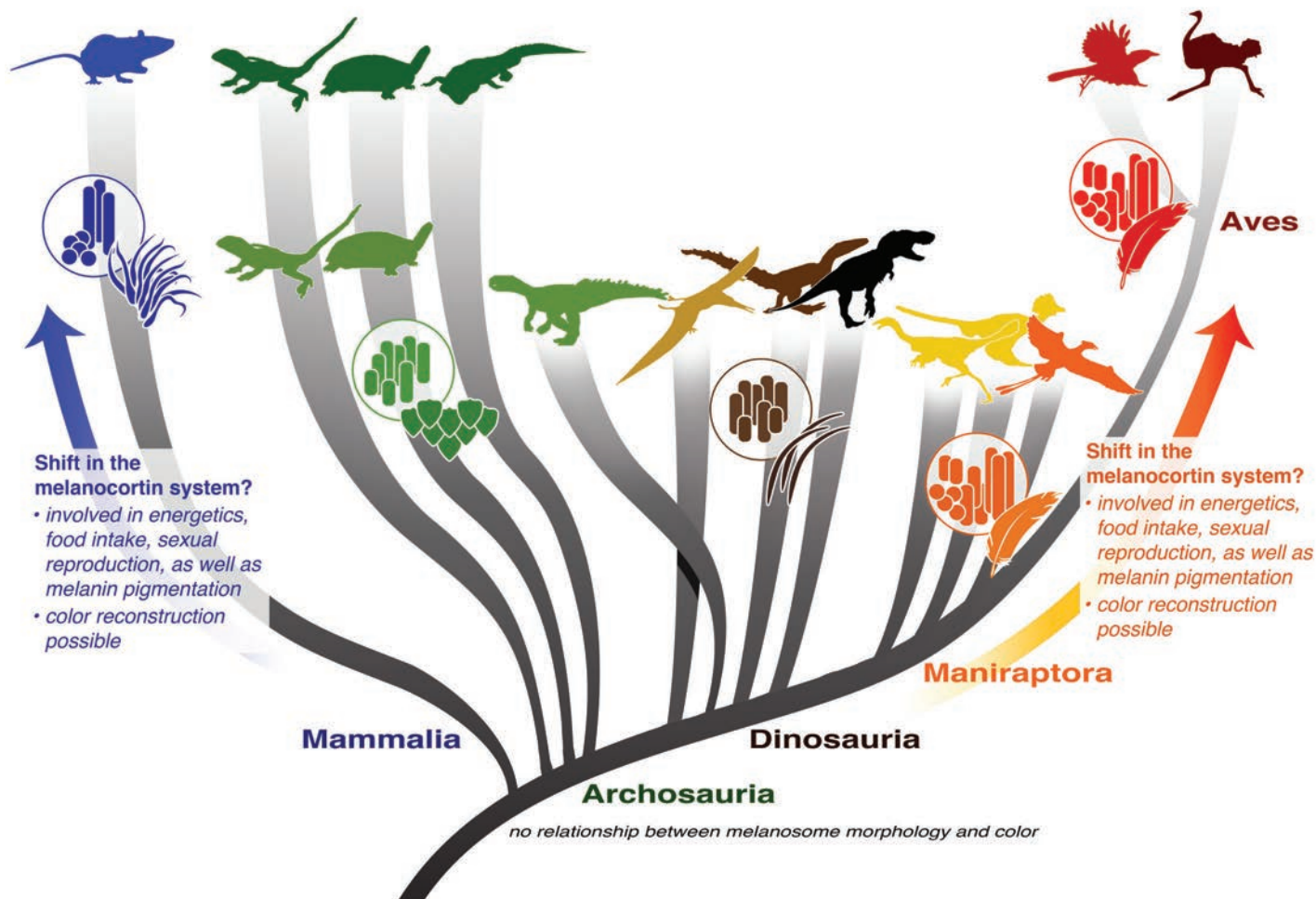
In addition to Goff, UTIG's Sean Gulick and Dan Lawson from the Cold Regions Research and Engineering Laboratory collaborated on the project. Funding was provided by the Jackson School of Geosciences seed grant initiative and by Bluefin Robotics.

Surveying the Gulf

In October 2013, the Bureau of Economic Geology's Tip Meckel led a 10-day cruise to collect 3D seismic data off the Texas coast in the Gulf of Mexico. This cruise was part of a

UTIG scientist Sean Gulick (left) and Bluefin Robotics technician Will O'Halloran deploy the Bluefin 9M AUV in front of Hubbard Glacier. Photo by John Goff





An explosion in the distribution of the shapes of melanin-containing organelles preserved in living taxa and the fossil record may point to a key physiological shift within feathered dinosaurs. Credit: Quanguo Li, et al.

multi-year effort to identify potential carbon dioxide (CO₂) storage sites beneath the Gulf floor within 10 miles of Texas.

The seismic data were collected using the new Geometrics-manufactured P-Cable system, which is designed to reveal geologic layers and structures below the seafloor at shallower depths than those typically surveyed by the oil and gas industry. The Bureau of Economic Geology (BEG), a research unit in the Jackson School of Geosciences at the University of Texas at Austin, is the only research institution in the United States (and among a handful globally) that currently operates such high-resolution 3D (HR3D) seismic acquisition technology.

Meckel and his team deployed the technology for the first time in the Gulf of Mexico in 2012. The information they are collecting is critical, they said, to ensure the CO₂ won't escape back to the seafloor.

Initial results indicate that the seismic system will be an extremely valuable tool for identifying, understanding and reducing

risks of offshore storage projects by proving up regional sealing characteristics over large continuous areas. Interest from industry has been building, and acquiring datasets such as these are an important part of developing various anticipated commercial applications of HR3D technologies.

In addition to Meckel, science staff included Nathan Bangs from UT-Austin's Institute for Geophysics and Dallas Dunlap from the BEG, as well as SMU graduate student Ben Phrampus. Logistical coordination and project management from shore was led by the BEG's Ramon Trevino.

The research is funded through the Department of Energy National Energy Technology Laboratory's carbon sequestration research program and the Texas General Land Office.

Flying Colors

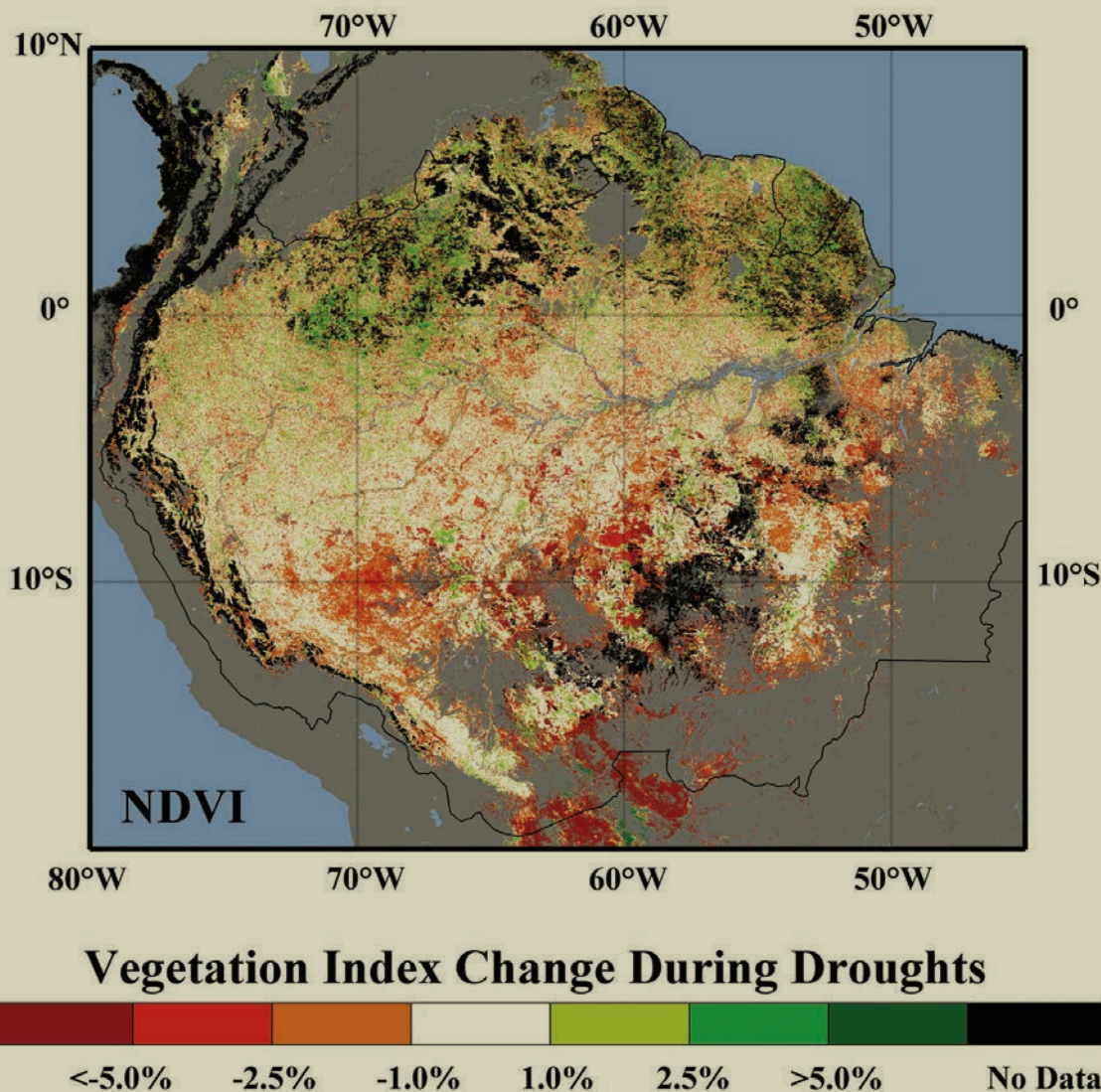
New research that revises recently established conventions allowing scientists to decipher color in dinosaurs may also provide a tool for understanding the evolutionary emergence

of flight and changes in dinosaur physiology prior to the origin of flight.

In a survey comparing the hair, skin, fuzz and feathers of living terrestrial vertebrates and fossil specimens, a research team from the University of Texas at Austin, the University of Akron, the China University of Geosciences and four other Chinese institutions found evidence for evolutionary shifts in the relationship between color and the shape of pigment-containing organelles known as melanosomes. The findings were reported in the March 20, 2014, edition of *Nature*.

At the same time, the team discovered that endothermic (commonly known as warm-blooded) birds and mammals shared a pattern of diverse melanosome shapes distinct from living ectothermic (cold-blooded) animals such as lizards, turtles and crocodiles.

Ancient maniraptoran dinosaurs and paravians also showed diverse melanosome shapes and sizes, in the pattern of living mammals and birds. (Diversity in the shape and size of melanosomes allows scientists



During the 2005 and 2010 droughts, satellites detected decreased vegetation greenness—or a lower Normalized Vegetation Index (NDVI)—over the southern Amazon rainforest (orange and red regions). NDVI is derived from MODIS instruments on NASA's Terra and Aqua satellites. Image courtesy of Ranga Myneni, Jian Bi and NASA.

DRYING OUT

A new study suggests the southern portion of the Amazon rainforest is at much higher risk of dieback due to stronger seasonal drying than projections reported by the Intergovernmental Panel on Climate Change (IPCC).

If severe enough, the loss of rainforest could cause the release of large volumes of the greenhouse gas carbon dioxide into the atmosphere. It could also disrupt plant and animal communities in one of the most biodiverse regions of the world.

Using ground-based rainfall measurements from the past three decades, a research team led by Rong Fu, professor at the University of Texas at Austin's Jackson School of Geosciences, found that since 1979, the dry season in southern Amazonia has lasted about a week longer per decade. At the same time, the annual fire season has become longer. Researchers say the most likely explanation for the lengthening dry season is global warming.

"The length of the dry season in the southern Amazon is the most important climate condition controlling the rainforest," said Fu. "If the dry season is too long, the rainforest will not survive."

The findings were reported in the Nov. 5, 2013, issue of the

journal *Proceedings of the National Academy of Sciences*.

Researchers say the most likely explanation for the lengthening dry season is human-caused greenhouse warming, which inhibits rainfall in two ways. First, it makes it harder for warm, dry air near the surface to rise and freely mix with cool, moist air above. Second, it blocks cold front incursions from outside the tropics that could trigger rainfall. The climate models used by the IPCC poorly represent these processes, possibly explaining its projection of only a slightly longer Amazonian dry season, said Fu.

The Amazon rainforest normally removes carbon dioxide from the atmosphere, but during a severe drought in 2005, it released 1 petagram of carbon (about one-tenth of annual human emissions) into the atmosphere. Fu and her colleagues estimate that if dry seasons continue to lengthen at just half the rate of recent decades, the 2005 drought could become the norm rather than the exception by the end of this century.

"Because of the potential impact on the global carbon cycle, we need to better understand the changes of the dry season over southern Amazonia," said Fu.

to decipher color.) The evolution of diverse melanosomes in these organisms raises the possibility that melanosome shape and size could yield insights into dinosaur physiology.

Co-authors include Julia Clarke from the Department of Geological Sciences at the Jackson School of Geosciences, Quanguo Li of the China University of Geosciences, Ke-Qin Gao of Peking University, Chang-Fu Zhou of Shenyang Normal University, Qingjin Meng of the Beijing Museum of Natural History, Daliang Li of the Museum of China University of Geosciences and Liliana D'Alba of the University of Akron.

Dirty Water

A new method of measuring the interaction of surface water and groundwater along the Mississippi River adds further evidence that the network's natural ability to chemically filter nitrates is being overwhelmed.

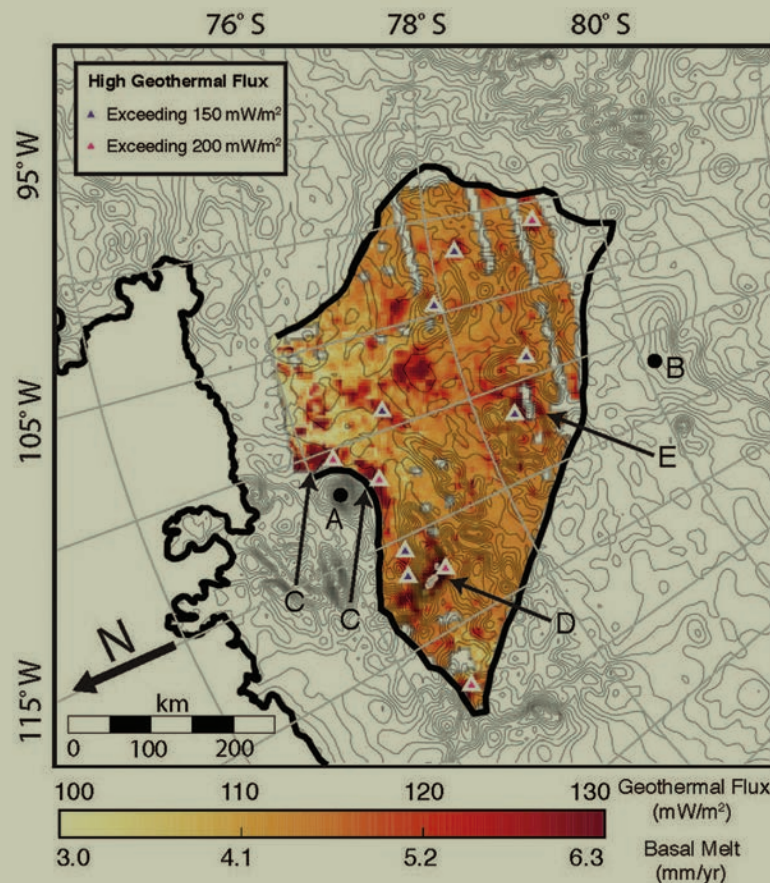
Hydrogeologists at the University of Texas at Austin showed for the first time that virtually every drop of water coursing through 311,000 miles (500,000 kilometers) of waterways in the Mississippi River network goes through a natural filtering process as it flows to the Gulf of Mexico.

The analysis, which appears in the May 11, 2014, edition of the journal *Nature Geoscience*, found that 99.6 percent of the water in the network passes through filtering sediment along the banks of creeks, streams and rivers. This finding suggests the river's natural filtration systems for nitrates—a major component of inorganic fertilizers—are operating at or very close to full capacity.

As a result, the river system operates less as a buffer and more as a conveyor belt, transporting nitrates to the Gulf of Mexico. The amount of nitrates flowing into the Gulf from the Mississippi has already created the world's second-biggest dead zone, an oxygen-depleted area where fish and other aquatic life can't survive.

The research, conducted by Bayani Cardenas, associate professor of hydrogeology, and Brian Kiel, a Ph.D. candidate in geology at the university's Jackson School of Geosciences, provides valuable information to those who manage water quality efforts in the Mississippi River network.

The new model, Cardenas said, can be a first step to enable a wider analysis of the river system.



This map shows the locations of geothermal flow underneath Thwaites Glacier in West Antarctica that were identified with airborne ice-penetrating radar. The dark magenta triangles show where geothermal flow exceeds 150 milliwatts per square meter, and the light magenta triangles show where flow exceeds 200 milliwatts per square meter. Letters C, D and E denote high melt areas.

Melting from Below

Thwaites Glacier, the large, rapidly changing outlet of the West Antarctic Ice Sheet, is not only being eroded by the ocean, but it is also being melted from below by geothermal heat, researchers at the University of Texas at Austin's Institute for Geophysics (UTIG) report in the June 24, 2014, edition of the *Proceedings of the National Academy of Sciences*.

The findings significantly change the understanding of conditions beneath the West Antarctic Ice Sheet, where accurate information has previously been unobtainable.

Using radar techniques to map how water flows under ice sheets, UTIG researchers were able to estimate ice melting rates and thus identify significant sources of geothermal heat under Thwaites Glacier. They found these sources are distributed over a wider area and are much hotter than previously assumed.

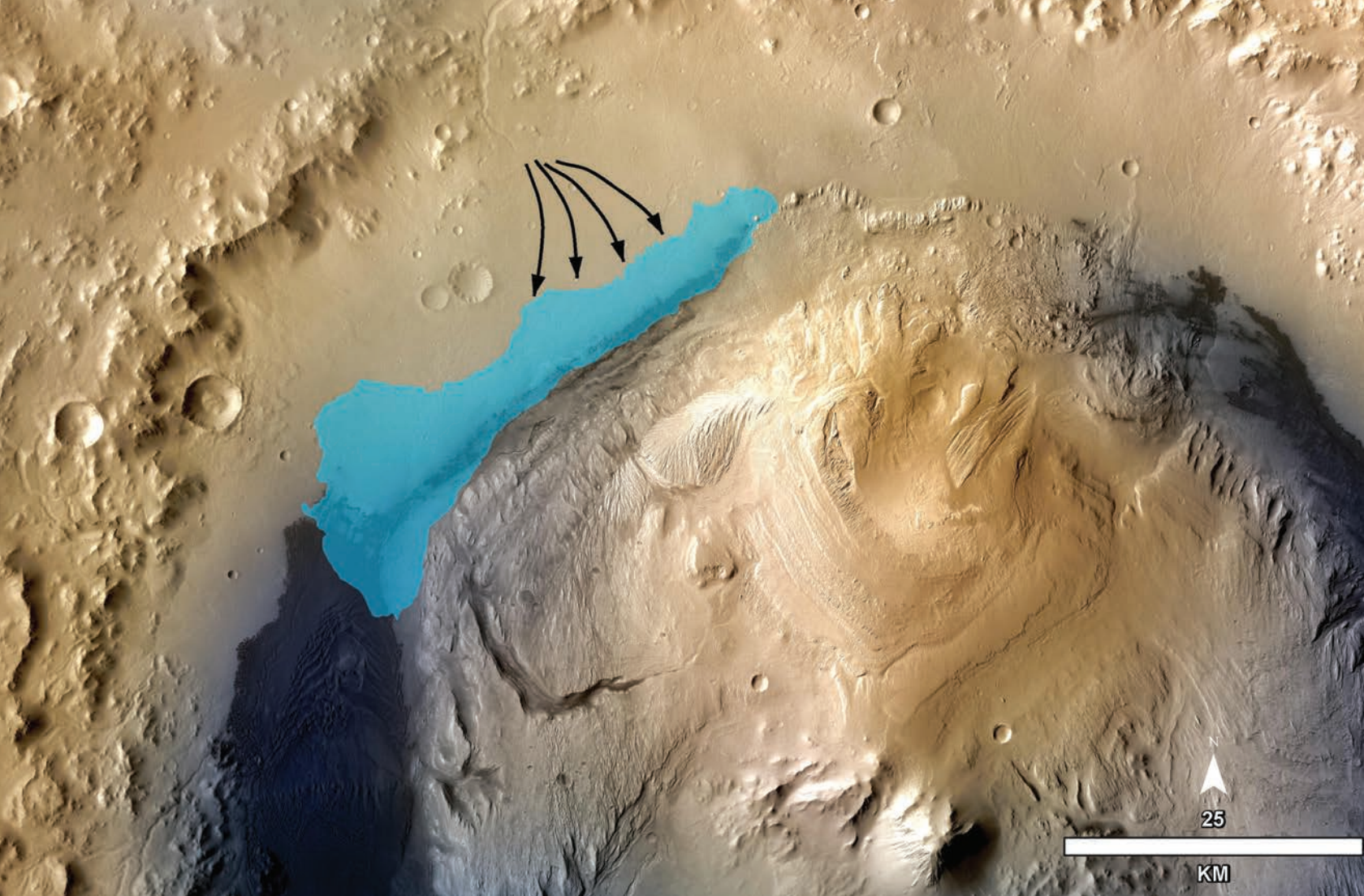
The geothermal heat contributed significantly to melting of the underside of the

glacier, possibly allowing the ice sheet to slide and affecting the ice sheet's stability and its contribution to future sea level rise. The collapse of the Thwaites Glacier would cause a global sea level increase of 1 to 2 meters.

Until now, scientists had been unable to measure the strength or location of heat flow under the glacier. Current ice sheet models have assumed heat flow under the glacier is uniform, like a pancake griddle with even heat distribution across the bottom of the ice.

The findings of lead author Dusty Schroeder and his colleagues show the glacier sits on something more like a multi-burner stovetop, with burners putting out heat at different levels at different locations.

According to Schroeder's findings, the minimum average geothermal heat flow beneath Thwaites Glacier is about 100 milliwatts per square meter (mW/m²), with hot spots over 200 mW/m². For comparison, the average heat flow of the earth's continents is less than 65 mW/m².



The presence of water and heat present researchers with significant challenges. “The combination of variable subglacial geothermal heat flow and the interacting subglacial water system could threaten the stability of Thwaites Glacier in ways that we never before imagined,” Schroeder said.

Life on Mars

Gary Kocurek, professor in the Department of Geological Sciences at the Jackson School

of Geosciences, was part of the team that reported two new findings from the Mars Curiosity rover: an ancient lake could have sustained life on the red planet and sediments at Gale Crater are similar to deposits found elsewhere on Mars.

NASA’s Curiosity rover began exploring the 96-mile-wide Gale Crater in August 2012 in hopes of discovering whether it may have once been well-suited to support microbial life. The mobile Mars Science Laboratory

carries instruments for collecting and analyzing samples drilled from rocks or scooped from soil.

Kocurek is one of about 400 scientists on the Curiosity team. He and his co-authors reported in the Jan. 24, 2014, issue of *Science* that mudstones gathered in an area of Gale Crater called Yellowknife Bay contained clay minerals indicative of a relatively freshwater lake. The samples also contained some of the key chemical ingredients for life: carbon, hydrogen, oxygen, sulfur, nitrogen and phosphorus. Such chemistry would have supported mineral-eating microbes called chemolithoautotrophs, researchers said.

Scientists estimate the ancient lake likely covered an area about 31 miles long and 3 miles wide for at least tens of thousands of years, possibly longer. The lake possibly existed until as recently as 3.7 billion years ago, researchers noted, suggesting Mars may have supported life more recently than previously thought.

Above: Illustration depicting a concept for the possible extent of an ancient lake inside Gale Crater. At left: A mosaic of images from Curiosity’s mast camera showing geological members of the Yellowknife Bay formation. Credit: NASA/JPL-Caltech/MSSS



Kocurek co-authored another *Science* paper published in the Sept. 27, 2013, edition that found a deposit of wind-blown sand and dust in Gale Crater is chemically and mineralogically similar to deposits previously analyzed by the Mars rovers Spirit and Opportunity at two other sites.

Sediments in all three locations were produced by the physical weathering of volcanic rocks called basalts.

"These results are consistent with a wealth of other evidence that the Martian crust is primarily basalt and that physical weathering is much more important than chemical weathering," said Kocurek.

Researchers offer two possible explanations for the trio of distant yet similar sediments. Strong global winds may have picked up and mixed local sediments into a globally similar mixture, or maybe the basalts that spawned the sediments are similar everywhere on the planet.

The deposit analyzed, called the Rocknest sand shadow, is an accumulation of wind-blown sediment. Soon after landing in Gale Crater, Curiosity dug up five scoops of loose material from Rocknest and analyzed it using five instruments.

"This is a big deal," said Kocurek. "We're exploring another planet with a rover that acts like a geologist and carries its own sophisticated laboratory around. We know so little about Mars that anything we find is important."

Follow the Carbon

As Alaska's permafrost melts and degrades, what happens to the massive amount of carbon stored underneath in the form of frozen organic matter? Some

of it may discharge with the melting water through underground cracks and seeps in the once-frozen landscape and end up in the Arctic Ocean.

That's the working theory of University of Texas at Austin researchers Bayani Cardenas and Philip Bennett of the Department of Geological Sciences at the Jackson School of Geosciences and associate professor Jim McClelland from the UT-Austin Department of Marine Science. The trio, funded by a seed grant from the Jackson School and supported by the U.S. Fish and Wildlife Service, conducted exploratory research on the Arctic coast near Kaktovik, Alaska, in August 2014. Greta Burkart, an aquatic ecologist with U.S. Fish and Wildlife Service, was also on the research trip.

Cardenas, Bennett and McClelland will likely return to the site in the summer of 2015 to continue the research.

Catch a Falling Sediment

Planktic foraminifer *Globigerinoides ruber* (*G. ruber*)—a single-cell organism with a hard outer shell—is perhaps one of the most widely used species for reconstructing past sea-surface conditions. Recent studies suggest two subspecies, or morphotypes, called *G. ruber sensu stricto* and *G. ruber sensu lato* live at different depths and therefore must not be mixed when reconstructing past climates.

Kaustubh Thirumalai, a Ph.D. candidate at the University of Texas at Austin's Institute for Geophysics, said such a hypothesis was worrisome because it would mean previous reconstructions that mixed the species were potentially biased.



Ph.D. candidate Kaustubh Thirumalai led sediment trap research in the Gulf of Mexico.

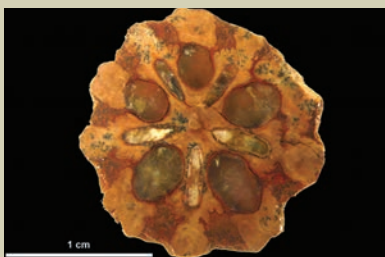
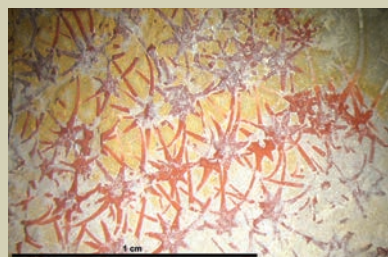
To test this thinking, Thirumalai led a study in the Gulf of Mexico, where scientists dropped a sediment trap about 1,100 meters underwater to intercept dead plankton shells before they hit the seafloor. Core-top and downcore samples were also retrieved for analysis.

"We show with the help of the sediment trap that there is little to no difference in habitat between these subspecies, thereby showing that previous reconstructions are not all wrong," Thirumalai said.

The findings were published Aug. 11, 2014, in *Nature's* open-access journal *Scientific Reports*. The study, funded in part by the Jackson School's Martin B. Lagoe Student Research Fund for Micropaleontology, was conducted in collaboration with the U.S. Geological Survey's St. Petersburg Division.

The Arctic coast near Kaktovik, Alaska, where scientists from the Department of Geological Sciences conducted exploratory research.





Going Paleo

In fall 2013, the University of Texas at Austin's world-class paleontology collections were transferred from the College of Natural Sciences to the Jackson School of Geosciences.

The collections—housed in the Vertebrate Paleontology Laboratory (VPL) and Non-Vertebrate Paleontology Laboratory (NPL)—are vital for education and research for students, faculty and research scientists.

“Both the VPL and NPL labs play a major role in public outreach, education and research,” said Sharon Mosher, Dean of the Jackson School. “Their specimens enrich the scientific community of Texas, and it is critical to ensure their continued care in the future.”

Founded in 1948, the VPL's fossil holdings rank among the seven largest in North America. Most of its specimens were collected by faculty, staff and students from UT-Austin. The holdings also include several important collections made over the last two centuries by other Texas universities and research organizations. These were transferred to VPL by legislative mandate and under agreements with those organizations to ensure the continued maintenance and accessibility of research and teaching specimens.

The NPL was created in 1999 to conserve, curate and make accessible collections from early state surveys and from research at the Bureau of Economic Geology, the Department of Geological Sciences and the Texas Memorial Museum. Other material came from orphaned collections within Texas. Additional collections have been contributed as donations. The NPL is a vast repository for more than four million specimens, the fifth largest collection of its kind in the United States.

Top left: Cretaceous dinosaur fossils from Big Bend National Park (VPL). Top right: Fossil preparator Kenneth Bader repairing a Triassic phytosaur skull (VPL). Left column, top to bottom: Gonioloboceras welleri (NPL); Archaeocidaris brownwoodensis (NPL); Archaeocidaris brownwoodensis (NPL); Chancelloria (NPL); Mammoth skull from Texas (VPL); Hand bones from a Triassic reptile being excavated in the laboratory (VPL). Right column, top to bottom: Ilymatogyra arietina (NPL); Adkinsella edwardsensis (NPL); Belosaepia ungula (NPL); Dracontomelon macdonaldii (NPL); hand of Sarahsaurus aurifontanalis (VPL); reconstructed skull of Deinonychus, a giant crocodilian from Big Bend National Park (VPL).



Student-led JSG Research Symposium

In February 2014, the Graduate Student Executive Committee and ConocoPhillips hosted the second installment of a new tradition, the annual Jackson School Research Symposium.

The goal is to stage an AGU-style poster competition with students presenting their research. Faculty and research scientists serve as judges. This year's contest was an even larger success than the first, creating a great training ground for the professional presentation of science.

Best Posters for 2014

Undergraduate: 1st Place, Audrey Eljuri, "The Efficiency of Stormwater Management Structures, Rain Gardens and Vegetated Retention Ponds in Reducing Urban Runoff and Contaminants in Downtown Austin, Texas." **2nd place, Julie Zurbuchen**, "Imaging Evidence for Hubbard Glacier Advances and Retreats since the Last Glacial Maximum in Disenchantment and Yakutat Bays, Alaska."

Early-Career Graduate: 1st Place, Joshua Davis, "A New Tectonic Model for the Breakup of India and East Antarctica." **2nd Place,**

Jacob Jordan, "Reactive melt transport in binary solid solution."

Late-Career Masters: 1st place, Felicia Kulp, "Examination of Gentoo Penguin (*Pygoscelis papua*) Feather Microstructure." **2nd place, Michael Cronin**, "Core-scale heterogeneity and dual-permeability pore structure in the Barnett Shale."

Late-Career Ph.D. Award: 1st place, Marie G. Cavitte, "Constraints on Transient Fast Flow at South Pole in the Last Glacial Cycle." **2nd place, Rattaporn Fong-Ngern**, "Peculiar deepwater slope morphology in the semi-enclosed Mio-Pliocene Dacian Basin, Romania."

Best-Represented Research Group: 1st place, Bayani Cardenas's research group. 2nd place, Daniel Stockli's research group.

The public is invited to attend the 2015 symposium on Feb. 7 in the Texas Union Ballroom at the University of Texas at Austin. Visit www.jsg.utexas.edu/research_symposium for more information.



OUTREACH

Bringing Science, Technology and Environmental Policy Together in Latin America

The 2014 IX Latin American Forum on Energy and the Environment was a unique event that brought together government and industry decision makers, scholars and scientists to foster dialogue around geosciences, technology and energy and environmental policy. The University of Texas at Austin's Jackson School of Geosciences hosted the forum on March 24 in collaboration with the Ministry of Energy and Energy Affairs of the Republic of Trinidad and Tobago.

The theme was "Natural Gas-LNG: An Atlantic Basin Perspective" and the role it plays in the Caribbean and Latin America. Additionally the role of education, sustainability and good governance were discussed within the parameters of natural gas and liquefied natural gas (LNG).

The welcome keynote was given by Cletus Springer, director of the Washington, D.C.-based Department of Sustainable Development at the Organization of American States. He discussed avenues for strengthening the network of science and policy needed to develop sustainable energy in the Caribbean.

Foster Mellen, senior strategic analyst at Ernst & Young, provided a comprehensive outlook on the global and regional stance of natural gas and LNG, and discussed Trinidad's role as a hub between Latin America and the Caribbean.

The forum's keynote luncheon was presented by Trinidad and Tobago's energy minister Kevin C. Ramnarine. Ramnarine discussed how the ministry and the local universities in Trinidad strive to advance science, technology, engineering and mathematics. He welcomed the collaboration and mutual agreements between UT-Austin, the University of the West Indies and the University of Trinidad and Tobago.

Terry Quinn, director of the Jackson School's Institute for Geophysics, introduced and presented Ramnarine with a plaque in recognition of his dedicated service to energy education and research.

The forum was well-attended by members of the oil and gas industry, government and



Speaking at the 2014 Latin American Forum, from left to right, is Juan Cruz Monticelli of the Energy and Climate Partnership of the Americas, Neal Alleyne of the University of Trinidad and Tobago, Indra Haraksingh of the University of the West Indies and Terry Quinn of UTIG. Photo by Kerwyn Chambers

academia. These included representatives from BHP Billiton, BP, Petrotrin, Repsol, Trinidad and Tobago's Ministry of Energy and Energy Affairs, The Energy Chamber of Trinidad and Tobago, Organization of American States, The National Gas Company of Trinidad and Tobago, the University of the West Indies and the University of Trinidad and Tobago.

Shaping the Future of Geoscience

As the field of geoscience changes and grows, what undergraduates need to learn and the methods of teaching must change to prepare students for the challenges ahead.

With this in mind, the Jackson School of Geosciences hosted the Summit on the Future of Undergraduate Geoscience Education in January 2014.

The three-day summit, sponsored by the National Science Foundation, brought together a broad spectrum of the national undergraduate geoscience education community. These included about 200 educators from R1 research universities with undergraduate programs, four-year private and state colleges and two-year community colleges. Representatives from industry and professional geoscience societies also attended. The summit focused on three main topics:

1. What content, competencies and skills do undergraduates need to be successful in

graduate school and the future workforce?

2. What are the best ways to teach and use technology to enhance student learning?

3. How can we broaden participation and retention of underrepresented groups and prepare K-12 science teachers to build a robust, diverse and informed future geoscience workforce?

The challenges are significant. About 143,000 geoscientists in the workforce are expected to retire by 2022 and there is predicted to be a 14 percent increase in new geoscience jobs over that same period, according to a 2014 report from the American Geosciences Institute. Yet, the report notes fewer than 30 percent of high school students take earth science in high school and only four states require the course for graduation.

And as the field expands, geoscientists need to be more well-rounded than ever.

"Geoscience research has changed, and it will continue to change and grow," said Sharon Mosher, Dean of the Jackson School. "Our research now is very interdisciplinary, multidisciplinary and transdisciplinary. This means our students need to not only have strengths in their own disciplines, they also need to be able to work across discipline boundaries and work with people who don't think like them and who don't have the same background."

The summit made major progress toward developing a collective community vision for undergraduate geoscience education. A summary report and webcast is available at

www.jsg.utexas.edu/events/future-of-geoscience-undergraduate-education.

Jackson School Big Presence at 125th Annual GSA

Scientists and students from the Jackson School of Geosciences contributed more than 70 oral presentations and 30 posters to the Geological Society of America 125th Annual Meeting, held October 2013 in Denver.

Nearly 4,800 abstracts were presented at the meeting, which attracted more than 8,000 geoscientists from business, academia and government.

Among the Jackson School presenters were Stephen Laubach, a senior research scientist at the Bureau of Economic Geology, who presented a paper titled "Fault damage zone and core fracture porosity differs in adjacent sandstones owing to inhibited quartz accumulation on feldspar and lithic grain substrates," and graduate student Jeffrey Senison who reported findings from his research titled "Geochemical indicators of municipal water influx into streamwater in the Bull Creek watershed, Austin, TX."

For a complete list of Jackson School presenters, visit www.jsg.utexas.edu/alumni/jsg-at-gsa.

Talking Water and Drought

As the 2011 Texas drought stretched into its third year, the Jackson School of Geosciences' Center for Integrated Earth System Science (CIESS) hosted its third annual Water Forum.

The forum, held Oct. 14-15, 2013, focused on the latest research on droughts and other extreme weather events and provided a setting to discuss trends, problems and future directions. Speakers and participants came from a range of academic and government

institutions, including the Texas Water Development Board (TWDB), Texas Commission on Environmental Quality, Austin Water Utility, University of Illinois Urbana-Champaign, California Institute of Technology, NASA's Jet Propulsion Laboratory, University of California at Irvine, Oklahoma Climate Survey, Texas State University, and the University of Texas at Austin.

In a lunchtime keynote, Robert Mace (Ph.D. '98), deputy executive administrator for the TWDB's Water Science and Conservation Division, focused on the opportunities that come with the drought to test new technologies and conduct research. He noted that in West Texas, where water supplies are extremely low, one community is already treating wastewater and returning it directly to the drinking water supply without passing it through an environmental buffer, a process known as direct potable reuse.

"In spring 2011, I would have told you that employing this technology in Texas was decades in the future," said Mace. "And we're starting to do it now because of the drought."

He said other technologies that need to be tested include desalination and aquifer storage and recovery, storing water underground in times of excess and extracting it during times of need. Mace also said there's a lot we don't know about how people interact with water conservation technologies at home. He and some colleagues have proposed that the state form what they've dubbed the Urban Water Efficiency Research Laboratory to study this question.

No single event summed up the current blistering Texas drought better than the 2011 Labor Day wildfires in Bastrop, which destroyed virtually all of Bastrop State Park's forest and hundreds of homes. Despite the awful destruction, Bayani Cardenas, associate professor in the Department of

Geological Sciences at the Jackson School of Geosciences, observed some positive hydrological effects and presented a talk on what he found. Compared to unburned forest, the burned areas store and transport more water (at least in the short-term), enhance groundwater recharge and have higher soil moisture, which should boost vegetation recovery, he told the crowd.

During his presentation, Jay Banner, professor in the Jackson School and director of the university's Environmental Science Institute, proposed the formation of a Texas panel on water to periodically review the state of knowledge on Texas water and project future water availability. The panel could produce assessment reports for policy makers, resource managers, businesses and citizens and help identify key areas for new research. It could also help the TWDB prioritize water infrastructure and conservation projects to be financed by the recently created State Water Implementation Fund of Texas (SWIFT), which is endowed with \$2 billion from the state's Rainy Day Fund.

The Water Forum was organized by Zong-Liang Yang, professor in the Jackson School and director of CIESS, and Jessica Smith, graduate coordinator in the Jackson School.

Presentations from past Water Forums can be found at www.jsg.utexas.edu/ciess/drought-symposium.

Olympic-style Science

The University of Texas at Austin's Institute for Geophysics (UTIG) was a silver sponsor for the 2014 Science Olympiad, an annual national competition with science-themed challenges for middle school and high school students.

The mission of Science Olympiad is "increasing student interest in science, creating a technologically literate workforce and providing recognition for outstanding achievement by both students and teachers," states the organization's national tournament brochure.

The idea for UTIG to sponsor the national tournament came from Dustin Schroeder, who earned his Ph.D. from the university in May and is now a radar geophysicist and systems engineer with NASA's Jet Propulsion Laboratory at the California Institute of Technology.

Speakers discuss drought and other extreme weather events at the 2013 Water Forum hosted by the Jackson School's Center for Integrated Earth System Science.





Professor Philip Bennett tests water supply wells in the rural village of San Antonio in Basey, Samar, two months after Typhoon Haiyan hit the Philippines in November 2013.

Schroeder has a long history with the Science Olympiad. He began competing as an eighth-grader in the astronomy event and continued for the next four years through high school, twice winning first place.

After high school, Schroeder remained involved with the competition as an event coordinator and, after relocating to Texas, as coach of a Science Olympiad high school team in the Austin area.

UTIG's involvement with the Science Olympiad reached a new level in 2014. Schroeder and UTIG director Terry Quinn helped establish UTIG as a sponsor of the competition's earth and space science events and sponsored scholarship awards.

"Terry was really involved in getting the resources to not only give the scholarships but to pay for some of the travel and development of the event," Schroeder said.

The 2014 Science Olympiad National Tournament was held in May at the University of Central Florida in Orlando.

Schroeder represented UTIG at the tournament, presenting a \$1,000 scholarship to the Division B Earth and Space Science winners, who were eighth-graders.

For Schroeder, the national tournament and his role as a sponsor representative carried a strong personal significance.

"It's interesting how I'm ending up bringing it back through this arc to space science," Schroeder said. "This same competition in astronomy was what originally got me interested in school at all and going to college at all."

"To go through this arc now and then through the sponsorship with UTIG to actually be running this competition nationally that had this impact on me, it's pretty full circle for me," he added.

For more about the Science Olympiad, visit www.soinc.org or visit the official UTIG Science Olympiad page at www.ig.utexas.edu/research/planetary/outreach.

Responding to the Devastation

Researchers from the Department of Geological Sciences at the University of Texas at Austin's Jackson School of Geosciences traveled to the Philippines in January 2014, two months after Typhoon Haiyan devastated the area. The team's mission was to study the effect the typhoon's massive storm surge had on groundwater and the water

supply in the rural village of San Antonio in Basey, Samar.

Typhoon Haiyan, known in the Philippines as Typhoon Yolanda, came ashore near Tacloban, Leyte, in November 2013, pushing a wall of water as high as 7 meters. The mammoth wave ravaged the region and inundated the community's groundwater wells with saltwater. The Jackson School research team included associate professor and William T. Stokes Centennial Teaching Fellow Bayani Cardenas and professor Philip Bennett.

The science mission was funded by the Jackson School's rapid response program. The program places geoscientists at the scenes of natural disasters and other events as quickly as possible to measure the often vanishing traces of hurricanes, earthquakes, tsunamis and other disasters.

The team returned to the Philippines in July 2014 and plans to do so again in January 2015, funded by the National Science Foundation. The results of the work will eventually be published. Ph.D. student Peter Zamora was part of January's mission. Ph.D. student Kevin Befus was part of July's mission.

Jackson School graduate students and professors walk the Andean fold-thrust belt and Patagonia foreland basin in Argentina.



South American Adventure

A field trip to Argentina in March 2014 allowed a group of 20 Jackson School of Geosciences graduate students, professors and research collaborators specializing in sedimentology, stratigraphy and basin analysis to pursue various research modules in the Andes Mountains and Patagonia foreland basin.

The active research programs of trip leaders Brian Horton, Cornel Olariu and Ron Steel provided a platform for investigating the deepwater, deltaic, and fluvial depositional processes of the prolific Neuquen basin and the stratigraphic record of Andean mountain building. Students in the course logged stratigraphic sections, measured paleocurrents, interpreted detrital geochronological data, and integrated structural and seismic data to address current issues relevant to both academic and industry communities.

The trip culminated with a traverse through the Aconcagua fold-thrust belt, following the path of Charles Darwin on his 1835 geological investigation across the Andes. Financial support for the trip was provided by the Jackson School, Marathon Oil Corporation and Pluspetrol.



Field Studies in Fennoscandia

The graduate course Regional Studies in Mineral Resources Geology offers students the opportunity to experience the fundamentals of resource exploration and production while also participating in international fieldwork. Students spent the 2014 spring semester studying the geology and resources of the Fennoscandian Shield, which includes parts of Norway, Finland and Sweden.

Rich Kyle and Brent Elliot taught the class, which culminated in a two-week trip

to Finland and Sweden for seven graduate students to study a variety of ore deposits in an Archean to Paleoproterozoic craton.

Because of the long history of tectonism in the region, many of the ore deposits have been metamorphosed and deformed, adding an extra layer of complexity to understanding their genesis. While Finland and Sweden contain only minor resources compared to other countries, they are currently exploiting a broad range of resources, including base metals, industrial

minerals and gold. This allowed students to experience a broad variety of ore types in a relatively small area.

The Geology Foundation provided scholarships to help cover airfare and lodging for students.

Above: Graduate students examine ore deposits (left) and take a tour (right) at the Pyhasalmi Mine in Oulu, Finland. Below: Meredith Bush was among the graduate students who traveled to northwestern Ireland to observe an arc-continent collision site.



Collision Course

About 470 million years ago, a volcanic arc collided with the continent Laurentia in what is today Ireland. In August 2014, more than a dozen graduate students spent eight days in northwestern Ireland observing the basins and volcanic rocks that record this ancient docking process.

Leading the field trip was famed British geologist John Dewey, who completed his Ph.D. on geological structures in western Ireland in the late 1950s.

"Dewey took the then brand-new concept

of plate tectonics out of the oceans and onto the continents in the late '60s," said Daniel Stockli, a professor and researcher in the Department of Geological Sciences at the University of Texas at Austin's Jackson School of Geosciences.

Stockli took the trip along with Mark Cloos and Whitney Behr, who jointly taught the Tectonic Problems spring graduate course. Cloos and Behr also are professors and researchers in the Department of Geological Sciences.

Ahead of the trip, Dewey came to UT-Austin in March 2014 to give guest lectures on the process of arc-continent collisions and the collision area in Ireland, a place where Stockli said certain fundamental concepts of plate tectonics were invented.

"It was a unique experience for us and the students to go somewhere with a pioneer of plate tectonics and look at an area that helped shape part of our field," said Stockli.

IN THE NEWS 2013-14

Below is selected media coverage of research and other activities at the Jackson School of Geosciences. Find more In the News items at www.jsg.utexas.edu/news/in-the-news.

Faraway Earthquake Triggered Antarctica Icequakes

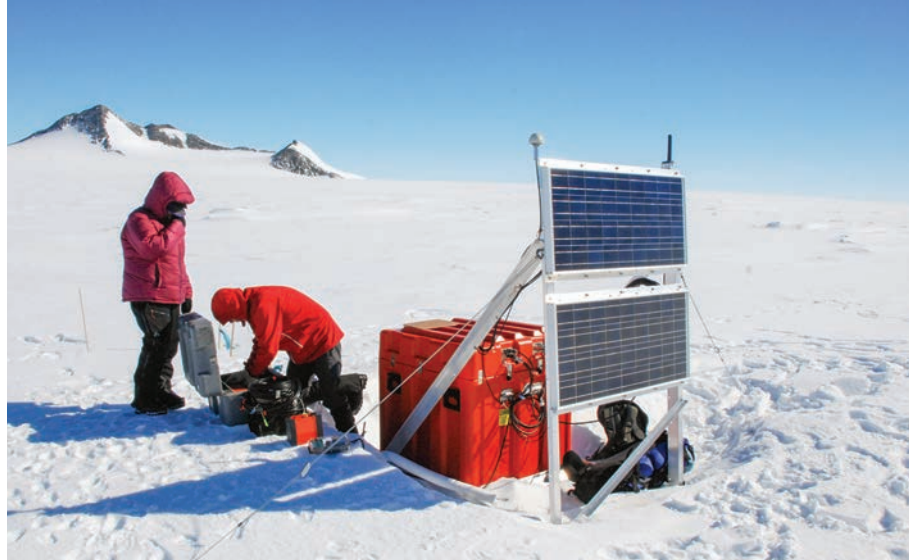
Live Science, Aug. 10, 2014

An 8.8-magnitude earthquake in Chile triggered a series of Antarctic icequakes, each lasting one to 10 seconds. The study, published in *Nature Geoscience*, was co-authored by Jake Walter, a research scientist at the Institute for Geophysics who conducted the research as a postdoctoral student at the Georgia Institute of Technology. The findings, which offer the first evidence that distant earthquakes can trigger icequakes in Antarctica, suggest that opening or closing of shallow crevasses generated the seismic tremblings. "We think the crevasses are being activated by the surface waves from this big earthquake coming through, and that's making the icequake," Walter told *Live Science*.

Mexican Congress Approves New Rules for Oil Industry

The New York Times, Aug. 5, 2014

The New York Times quoted Jorge Piñon, interim director of the Jackson School's Center for International Energy and Envi-



The seismic station located near the northwest corner of Antarctica's Ellsworth Mountains showed the clearest indication of high-frequency signals following the 2010 Chilean earthquake. Credit: Eric Kendrick/Ohio State University

ronmental Policy, in an article about Mexico's Congress approving a massive overhaul of the country's energy industry that will open it up to international oil companies and allow competition in Mexico's stagnant energy sector. The new legislation is part of President Enrique Peña Nieto's plan to improve Mexico's economy. "The political commitment from Mexico is there," Piñon told the *Times*. "The economic and business interest from international oil companies is there. On top of that, there is a need for Mexico to increase production. There is a need for Pemex to grow as a truly independent oil company. So how can it not move forward?"

If It Weren't for That Meteor, Would There Still be Dinosaurs?

Christian Science Monitor, July 29, 2014

Jackson School research professor Sean Gulick was quoted in a *Christian Science*

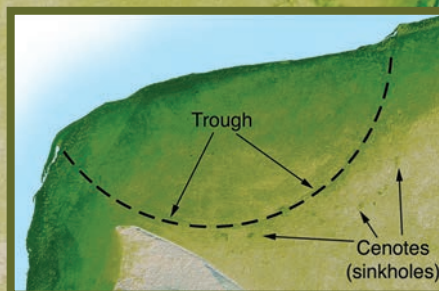
Monitor article about what drove dinosaurs to extinction. "It would be a different world" if the asteroid had never hit, said Gulick, who is studying the impact crater. "If there hadn't been this impact, [the dinosaurs] might have just kept on going," Gulick suggested, however, that the asteroid may have caused less of an extinction had it hit a different part of the planet. He said the ejecta released may have been less toxic had the asteroid landed in a less sulphur-rich location that was lower in carbon dioxide, such as the middle of the Canadian Shield.

Alejandra Martinez Selected for Education Internship at The University of Texas Institute for Geophysics

Eagle Pass Business Journal, July 16, 2014

The Institute for Geophysics welcomed three public school science teachers from minority-serving districts to take part in the DIG Texas Blueprint project. Elaine Bohls-Graham, Belinda Jacobs and Alejandra Martinez worked with scientists to develop geosciences curricula that will ultimately be shared statewide. Led by the Jackson School and the College of Geosciences at Texas A&M University, DIG Texas (short for Diversity and Innovation for Geosciences in Texas) aims to give Texas teachers the training and resources to teach geosciences and to recruit students from the increasingly diverse Texas population into college-level geosciences. *Eagle Pass Business Journal* highlighted the project and featured Martinez, a seventh-grade science teacher in Eagle Pass.

Scientists believe the Chicxulub crater, located on Mexico's Yucatan peninsula, was formed by an asteroid or comet that hit Earth more than 65 million years ago. The callout image shows the crater's trough and sinkholes. Credit: NASA/JPL





Chile energy minister Maximo Pacheco (left) and Jorge Piñon of the Jackson School.

Chile Goes Off the Beaten Path With Its Energy Pitch

Houston Chronicle, July 2, 2014

More than 140 people from the energy, environmental and renewable sectors gathered for an industry breakfast in Houston to hear Chile energy minister H.E. Maximo Pacheco Matte discuss Chile's plans to increase the nation's renewable energy production. Chile's goal is to meet 20 percent of the country's energy demand with renewable sources such as solar, wind and biomass by 2025. The *Houston Chronicle* covered the event, which was sponsored by the Latin America and Caribbean Program at the Jackson School. Jorge Piñon, the program's director, told the *Chronicle* that Chile already has an important relationship with the energy sector in Texas as one of the largest importers by volume of diesel and gasoline refined on the Gulf Coast.

Underground Volcanoes Accelerate Glacier Melting in Antarctic

UPI, June 10, 2014

Researchers at Jackson School's Institute for Geophysics (UTIG) found volcanic activity beneath the West Antarctic Ice Sheet is

significantly contributing to the melting of Thwaites Glacier, the collapse of which would cause a global sea level rise of 1 to 2 meters. UPI covered the study, published in the *Proceedings of the National Academy of Sciences*. "It's the most complex thermal environment you might imagine," said coauthor Don Blankenship, a senior research scientist at UTIG. "And then you plop the most critical dynamically unstable ice sheet on planet Earth in the middle of this thing, and then you try to model it. It's virtually impossible."

Though Texas Industrial Water Consumption Steady, Alternative Sources Needed, Panelists Say

Austin Business Journal, May 19, 2014

Jean-Philippe Nicot, a research scientist at the Bureau of Economic Geology, was quoted in an *Austin Business Journal* article about the 2014 Texas Water Summit hosted by the Academy of Medicine, Engineering and Science of Texas. Nicot, a speaker on the "Sector-Based Use and Conservation" panel, said that while some states such as Pennsylvania have high reuse capabilities, that may not be true for Texas. "We can explore alternative water resources such as brackish groundwater," Nicot said. "But we don't know the impact of this water. It is possibly more expensive to use, but we still need to think about these issues."

Using Brackish Groundwater

Houston Chronicle, May 16, 2014

In an opinion column for the *Houston Chronicle*, Jean-Philippe Nicot of the Bureau of Economic Geology talks about the use of brackish water to meet the increasing demand for water in Texas. "A well-funded statewide program is needed to assess the true potential of—and obstacles inherent

to—using brackish groundwater," he wrote.

"The early stages of an immense data collec-



Jean-Philippe Nicot, a research scientist at the Bureau of Economic Geology.

tion effort, in which hydrogeologists at the University of Texas' Bureau of Economic Geology participate, are underway to address these points. This data collection program along with additional studies will allow the state to optimize the use of

limited brackish groundwater resources and to develop a drought-resilient water strategy in Texas."

Hydrologists Find Mississippi River Network's Buffering System for Nitrates Is Overwhelmed

ScienceNewsline, May 11, 2014

Jackson School hydrogeologists found that the Mississippi River's ability to filter out nitrates is at or very close to full capacity, meaning the network's natural filtering process may be inadequate to deal with the high level of nitrates that enter the 311,000-mile-long network of waterways. The news portal *ScienceNewsline* reported the findings, which appeared in *Nature Geoscience*. "Clearly for all this nitrate to make it downstream tells us that this system is very overwhelmed," said researcher and associate professor of hydrogeology Bayani Cardenas.

Gulf's Bounty Commands Attention Amid Shale Drilling Boom

FuelFix (Houston Chronicle), May 4, 2014

FuelFix quoted John Snedden, senior research scientist at the Institute for Geophysics, in an article about the resurgence of offshore drilling in the Gulf of Mexico. The Gulf basin "keeps reinventing itself," Snedden told *FuelFix*. "We keep finding new plays. And that's why everybody (oil companies) is here." The article discusses the costs associated with pulling crude oil from the Gulf—risks many oil companies are willing to accept because of the potential for bigger yields with production that can span decades. Yet areas of the Gulf can vary

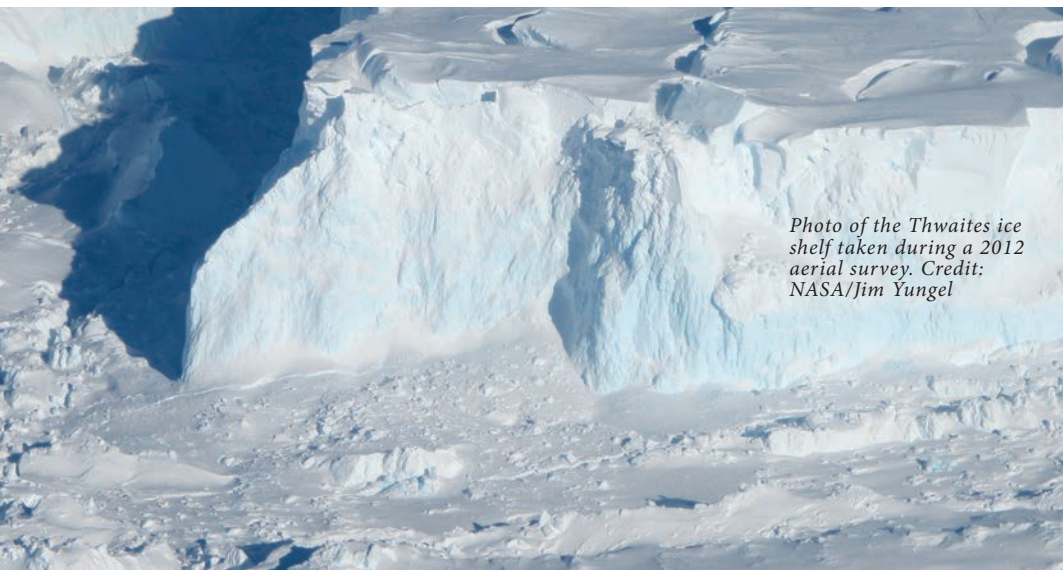


Photo of the Thwaites ice shelf taken during a 2012 aerial survey. Credit: NASA/Jim Yungel

in crude output. The article compares a relatively high success rate in an area geologists call the Outboard Lower Tertiary trend with poorer results in the Inboard Lower Tertiary and the Jurassic. “We’ve had some successes, but we’ve also had some very expensive dry holes,” Snedden commented.

Acoustic Pingers Not Just for Airplane Black Boxes

Marine Technology News, April 25, 2014

Acoustic pingers are best known for their use on airplane black boxes. But a *Marine Technology News* article highlights how scientists have long relied on pingers. The article features R. Wayne Wagner, a postdoctoral fellow at the Jackson School who is studying the effects of coastal restoration and hurricane protection projects, or “land building,” in coastal Louisiana. To measure how water moves through coastal estuaries, Wagner uses a Nortek Aquadopp current profiler (ADCP). A Fishers SFP-1 single frequency pinger is attached. “This proved invaluable in a recent survey when the retrieval line on the ADCP was cut and a diver had to be deployed with the PR-1 pinger receiver to find it,” the article said.

UC-San Diego Professor Links Global Warming Hiatus to Rainfall

The Daily Texan, April 21, 2014

University of California–San Diego climate, atmospheric science and physical oceanography professor Shang-Ping Xie gave a talk organized by Yuko Okumura, a research asso-

ciate at the Jackson School’s Institute for Geophysics, about why global average temperature has remained steady over the past 15 years.

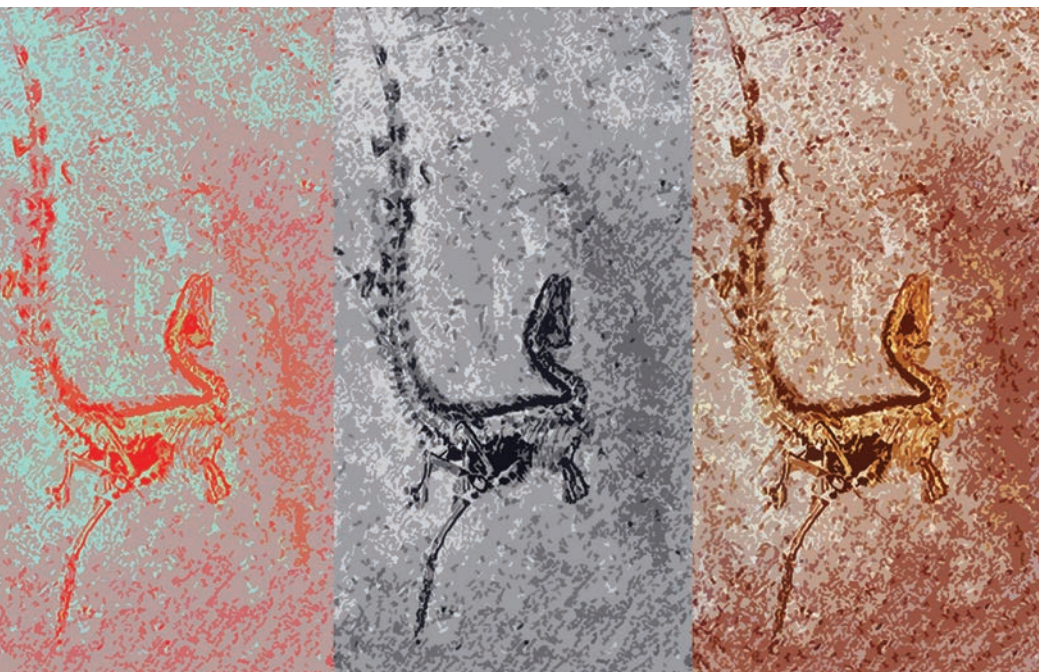
The Daily Texan covered the event, at which Xie explained that the decade-long cooling of the Pacific Ocean is likely the major cause of the current global warming hiatus. The heat waves and droughts in the southern United States seem to have resulted from the hiatus event because the precipitation and temperature patterns can be traced back to tropical Pacific cooling, Xie told the crowd. Okumura told the *Texan* that she thinks some people may still be skeptical about global warming because of the hiatus. She noted the natural variability caused by the interactions of the ocean and the atmosphere tends to overshadow the impact of human-caused climate change. “It’s really hard to communicate the impact of natural variability superimposed on global warming due to anthropogenic forcing, and it’s [a] difficult concept to understand,” Okumura told the *Texan*.

When Dinosaurs Came in Color

Time, Feb. 12, 2014

Jackson School associate professor Julia Clarke and her co-authors reported in *Nature* that in the dinosaur lineage leading to birds, the size and shape of melanin-housing melanosomes became greatly diversified, leading to an explosion of color within these groups. *Time* reported on the findings, explaining “that bright coloration may have been a side effect of a major change in dinosaur metabolism—a change that ultimately allowed one branch of the dinosaur family to escape the bounds of gravity and take to the air.”

Melanosomes in Sinosauropteryx don’t presently tell scientists whether this animal was brown, blackish or grey. However, feathered dinosaurs are similar to birds, allowing scientists to estimate their color. Credit: Quanguo Li, et al.



Fayetteville Shale Will Continue to Be Major Contributor to U.S. Gas Supplies

LNG World News, Jan. 15, 2014



A drill rig in the Fayetteville Shale gas play of Arkansas. Credit: U.S. Geological Survey/Photo by Bill Cunningham

Researchers at the Bureau of Economic Geology (BEG) forecasted that the Fayetteville Shale, one of the nation’s most productive shale basins, will continue to be a major contributor to U.S. natural gas supplies for years to come. The report was published in the *Oil & Gas Journal* and reported by *LNG World News*. “Most other assessments of shale gas reserves have taken a ‘top down’ view of production, relying on aggregate views of average production. In contrast, this study takes a ‘bottom up’ approach, starting with the production history of every well and then determining what areas remain to be drilled, says Scott Tinker, the BEG’s director and co-principal investigator. The result yields a more accurate and comprehensive view of the basin,” the article said.

To Move Energy Forward, Move to the Radical Middle

Austin American-Statesman, Jan. 6, 2014

The *Austin American-Statesman* published an opinion column from Scott Tinker, director of the Jackson School’s Bureau of Economic Geology. “The government shutdown stalled two crucial policy decisions in the United States involving the movement of energy: the Keystone pipeline and liquefied natural gas (LNG) export terminals. Even with government running again, these policies may stay mired in futile debate, much



Scott Tinker,
director of
the Bureau
of Economic
Geology. Photo
by David
Stephens

of it uninformed, some misinformed by those wishing to promote philosophical positions. Rather than allow extreme arguments to dominate, Americans should demand lawmakers move toward the radical middle on both of these vital issues,” Tinker wrote.

Is Methane Hydrate the Energy Source of the Future?

National Journal, Dec. 24, 2013

The U.S. Department of Energy plans to fund research exploring methane hydrate as a potential source of natural gas and how it could be extracted, the *National Journal* reported. According to the U.S. Geological Survey, the world’s gas hydrates may contain more organic carbon than every fossil fuel in the world combined. “A lot of geoscientists are fascinated by hydrates because of how odd it is that you can take methane gas and add water and have it result in something with such a concentrated store of energy,” Peter Flemings, Jackson School professor and research scientist, told the magazine.

Hydraulic Fracturing Reduces Threat of Texas Drought, Researchers Say

FuelFix (Houston Chronicle), Dec. 20, 2013

Water-intensive hydraulic fracturing ultimately saves water and makes Texas less vulnerable to drought, found a Bureau of Economic Geology study published in the journal *Environmental Research Letters*. “Hydraulic fracturing can use up to five million gallons of water per well, leading critics to argue that it is overdependent on scarce environmental resources. But UT researchers found that the consumption is offset by the greater water efficiency in generating power from natural gas versus coal,” *FuelFix* reported. Indeed, the study found that the water saved by shifting a power plant from coal to natural gas is 25 to 50 times greater than the amount of water required to extract the natural gas through hydraulic fracturing.

Long Island Wins Ultimate Faceoff Against Hurricane Sandy

NPR, Dec. 12, 2013

Long Island’s shore face held up well against Hurricane Sandy, scientists found. John Goff, senior research scientist at the Institute for Geophysics, was part of the rapid response team that surveyed damage to the shore after the 2012 hurricane. “We’re going to expect more storms in the future. And so understanding the impact of these storms is really important,” Goff said on NPR’s *All Things Considered*. Goff found rows of sand dunes 10 feet high that run parallel to shore for about a half mile. “I think of these ridges as kind of cushioning the blow,” Goff said. “After the hurricane, they are still there. We didn’t really see any massive destructive erosion of the shore face.”

Ocean Below Ice of Jupiter Moon May Have Heat, Energy to Sustain Life

UPI, Dec. 3, 2013

Research led by Krista Soderlund of the Institute for Geophysics found the subsurface ocean on Jupiter’s moon Europa may have deep currents and circulation patterns with heat and energy transfers capable of sustaining biological life. Scientists have long wondered whether the salty ocean hidden below Europa’s icy shell makes the moon one of the planetary bodies in the solar system most likely have conditions that could sustain life. Soder-



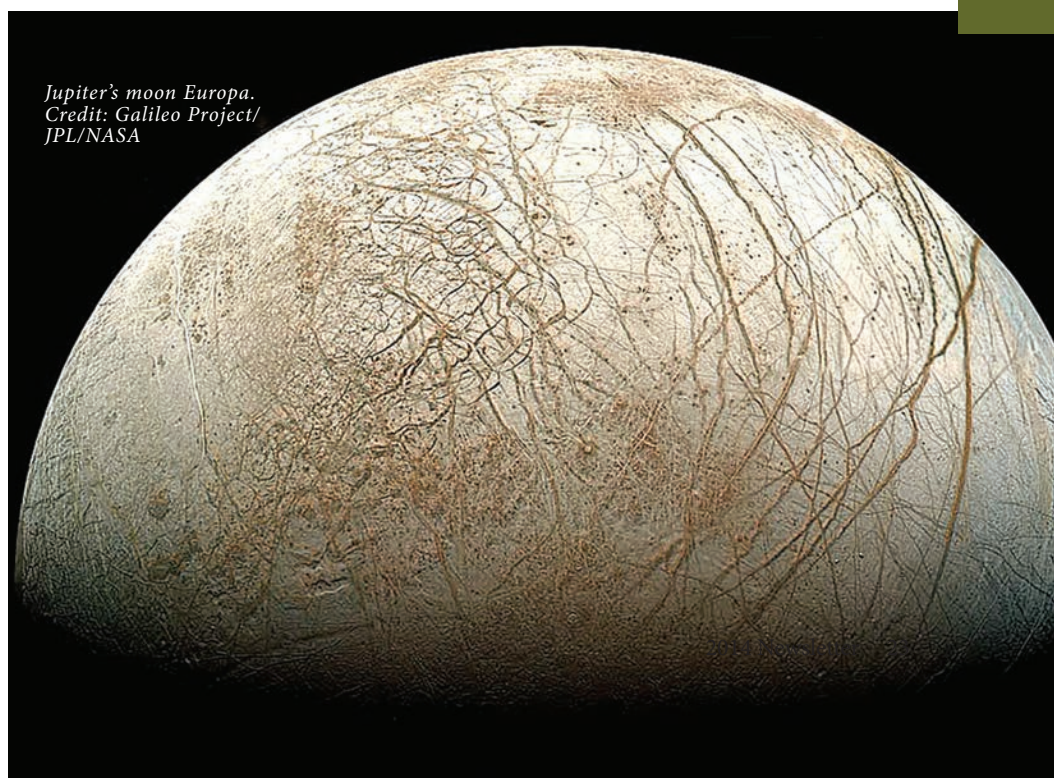
UTIG scientists used these two research vessels to study the effects of Hurricane Sandy on Long Island’s shore face.

lund and colleagues reported the findings in *Nature Geoscience*.

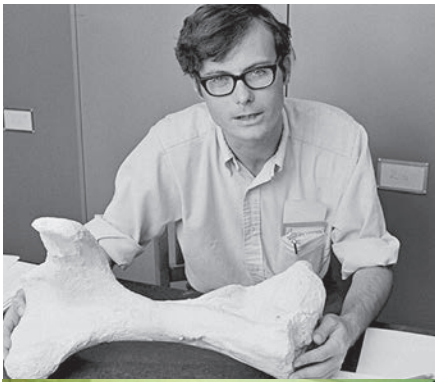
Earthquake Study Points to Possible Carbon Injection Risks

National Geographic, Nov. 4, 2013

A series of small earthquakes in western Texas was likely caused by the injection of carbon dioxide into oil wells. The study, published in the *Proceedings of the National Academy of Sciences*, is the first to link underground gas injection with earthquakes greater than magnitude 3. *National Geographic* featured the findings from Wei Gan and Cliff Frohlich of the Institute for Geophysics. “Although injecting carbon dioxide to extract oil differs from carbon sequestration, Frohlich said his study could help scientists better understand possible risks of the technology, which has shown promise for reducing carbon emissions to the atmosphere,” the article said.



Jupiter’s moon Europa.
Credit: Galileo Project/
JPL/NASA



Top: Doug Lawson with the giant pterosaur limb bone he found in Big Bend in 1971. Photo courtesy of Lawson. Bottom: The cast of a *Quetzalcoatlus* that hangs in the Great Hall of UT's Texas Memorial Museum. Courtesy of Jackson School of Geosciences.

The Miracle of Flight

The Alcide, Oct. 31, 2013

In 1971, Douglas A. Lawson, M.A. '72, made a huge discovery: fossil remains of a gigantic pterosaur. The then-22-year-old graduate

student in geology had been doing fieldwork in Big Bend National Park under the supervision of professor Wann Langston Jr. when he found the bones of what he later named *Quetzalcoatlus northropi*. *The Alcide* featured Lawson's discovery of the largest flying creature that ever lived. "*Quetzalcoatlus* has a way of testing the human imagination in general," the author wrote. "Forty-two years after Doug Lawson came across its bones in Big Bend, the creature remains a landmark scientific discovery and a crucial inspiration for young paleontologists."

Global Warming Forecast for Amazon Rain Forest: Dry and Dying

Live Science, Oct. 21, 2013

A study from researchers at the Jackson School showed the Amazon rainforest's dry season lasts three weeks longer today than it did three decades ago, most likely due to global warming. *Live Science* highlighted the findings, published in the *Proceedings of the National Academy of Sciences*. Scientists believe a longer dry season will stress trees and increase the risk of wildfires and forest dieback. "The dry season over the southern Amazon is already marginal for maintaining rainforest," says professor Rong Fu, who led the study. "At some point, if it becomes too long, the rainforest will reach a tipping point."



The megadrought in the Amazon rainforest in 2005 caused widespread damage and tree die-off, as shown here in western Amazonia. Credit: NASA/JPL-Caltech

An American Shutdown Reaches the Earth's End

The New York Times, Oct. 14, 2013

Joseph Levy, a research associate at the Institute for Geophysics, should have been heading to Antarctica in October 2013 for the Antarctic spring. Instead, he was stuck in Austin. The government shutdown had put Levy's time-sensitive scientific research on hold. Levy studies ancient buried ice that offers insights into climate change. But with Levy and other researchers told to stand down, valuable time on the ice was being lost, *The New York Times* reported. "It's like a biography of the earth with a couple of pages in the middle torn out," Levy told the *Times*. "Nature will have taken its course, and we will have not been there to see it."

Joseph Levy, a research associate at the Institute for Geophysics, is part of a research team tracking data from Garwood Valley in Antarctica. Credit: Jim O'Connor, USGS



AWARDS & HONORS 2013-2014

Common Abbreviations:

AAPG = Amer. Assoc. of Petroleum Geologists
AIPG = American Institute of Prof. Geologists
AGS = Austin Geological Society
AGU = American Geophysical Union
BEG = Bureau of Economic Geology
DGS = Department of Geological Sciences
GCAGS = Gulf Coast Assoc. Geological Societies
GSA = Geological Society of America
SEG = Society of Exploration Geophysicists
UTIG = Institute for Geophysics

Faculty & Researchers

William Ambrose

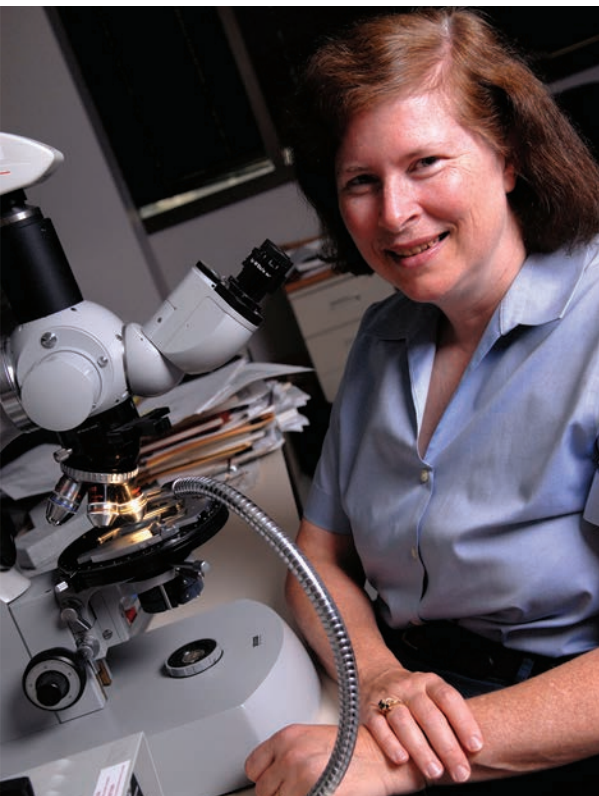
EMD (Energy Minerals Division of AAPG) Honorary Membership, presented at annual AAPG Convention; EMD (Energy Minerals Division of AAPG) President's Certificate for Excellence in Poster Presentation presented at annual AAPG Convention

James Austin

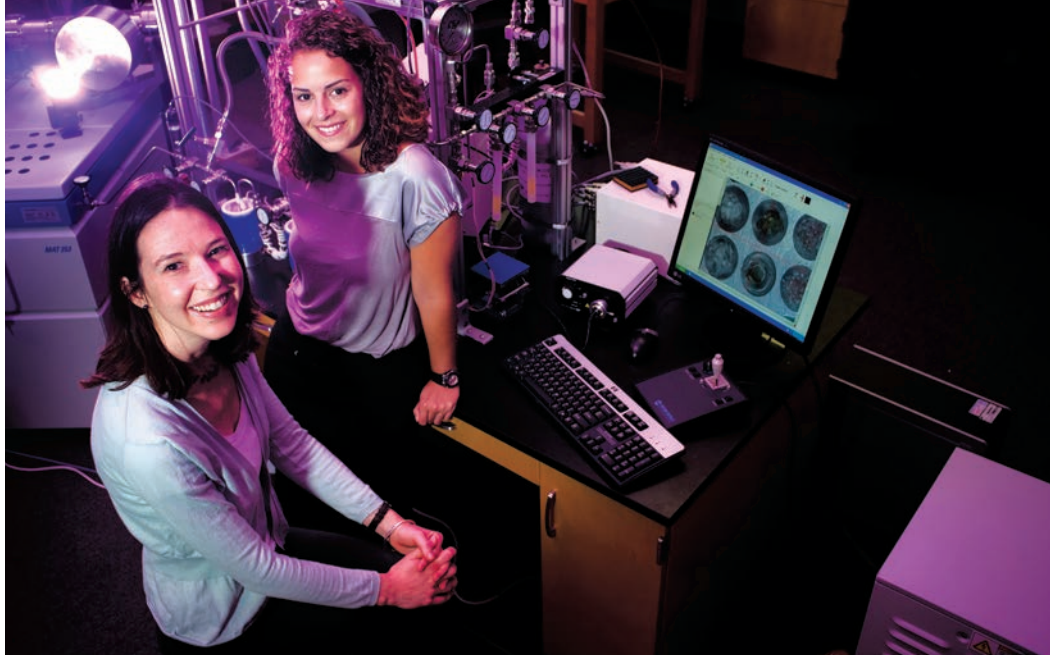
Outstanding Career Researcher Award, UTIG

Jaime Barnes

JSG Outstanding Educator Award, DGS



Shirley Dutton, senior research scientist at the Bureau of Economic Geology, was selected as a 2013-2014 Distinguished Lecturer of the American Association of Petroleum Geologists.



Rania Eldam (B.S. '13) with assistant professor Jaime Barnes (left), who was named the 2013 JSG Outstanding Educator. Photo by Sasha Haagenen

Robert Baumgardner

Charles J. Mankin Memorial Award, Association of American State Geologists

Christopher Bell

Intro Knebel Teaching Award

Bayani Cardenas

Best Represented Research Group, 1st place, Jackson School Research Symposium

William Carlson

Knebel Award for Distinguished Undergraduate Teaching

Ginny Catania

DGS Science Award

Julia Clarke

JSG Outstanding Research Award, DGS

Kerry Cook

Knebel Award for Distinguished Graduate Teaching

Michael DeAngelo

BEG Author Achievement Award

Shirley Dutton

Distinguished Lecturer, AAPG; Doris Malkin Curtis Medal, Gulf Coast Section

Sergey Fomel

Top 30 presentation at the 82nd Annual International Meeting of SEG; Tinker Family BEG Publication Award; Best Student Poster at 83rd Annual International Meeting of SEG

Julia Gale

Distinguished Lecturer, AAPG

Stephen Grand

Shell Companies Foundation Centennial Chair in Geophysics

Herbert Hamlin

Charles J. Mankin Memorial Award, Association of American State Geologists

Bob Hardage

Past President, SEG Board of Directors

Tucker Hentz

Distinguished Service Award, GCAGS; Fellow, GSA

Brian Horton

Outstanding Researcher Award, UTIG; Director's Circle of Excellence

Susan Hovorka

BEG Publication Award, Exemplary Publication of Scientific or Economic Impact for process-based approach to CO2 leakage detection by vadose zone gas monitoring at geologic CO2 storage sites

Charles Jackson

Statoil-funded Lectureship at Imperial College, 2010-2013 (£350,000)

Martin Jackson

William L. Fisher Endowed Chair in Geological Sciences, BEG

Charles Kerans

Grover P. Murray Distinguished Educator Award, AAPG; Francis J. Pettijohn Medal



Terry Quinn (left), director of the Institute for Geophysics, presented the 2013 UTIG Outstanding Researcher Award to research professor Brian Horton.

for Sedimentology, Society for Sedimentary Geology

Richard Ketcham

DGS Science Award

Joseph Levy

Outstanding Young Researcher Award, UTIG

Robert Loucks

2014 AAPG Robert R. Berg Outstanding Research Award; Karst Waters Institute 2014 KWI Karst Award; AAPG Robert R. Berg Outstanding Research Award; GCAGS Journal President's Award



The American Association of Petroleum Geologists awarded Robert Loucks, senior research scientist at the Bureau of Economic Geology, the 2014 AAPG Robert R. Berg Outstanding Research Award.

Floyd Lucia

GCAGS Journal President's Award for Best Paper

Ernest Lundelius Jr.

Distinguished Career Award, American Quaternary Association

Timothy Meckel

Bernold M. "Bruno" Hanson Division of Environmental Geosciences Excellence of Presentation Award, AAPG Annual Convention

Lorena Moscardelli

BEG-GAAC Publication Award

Jean-Philippe Nicot

Joseph C. Walter Jr. Excellence Award, BEG

Katherine Romanak

BEG Publication Award, Exemplary Publication of Scientific or Economic Impact for process-based approach to CO₂ leakage detection by vadose zone gas monitoring at geologic CO₂ storage sites; Most Ground-breaking, Innovative and Insightful Presentation at the 12th Annual Conference on Carbon Capture Utilization & Sequestration

Bridget Scanlon

Fellow, American Geophysical Union

Krista Soderlund

Outstanding Young Researcher Award, UTIG

Daniel Stockli

Best Represented Research Group, 2nd place, Jackson School Research Symposium

Scott Tinker

John T. Galey Sr. Memorial Public Service Award, AIPG; Award for Outstanding Contribution to Public Understanding of Geology, American Geosciences Institute; TIPRO "Hats Off" Award; AAPG Geosciences in the Media National Award

Brad Wolaver

BEG-GAAC Publication Award

Changbing Yang

BEG Publication Award, Exemplary Publication of Scientific or Economic Impact for process-based approach to CO₂ leakage detection by vadose zone gas monitoring at geologic CO₂ storage sites

Staff

Cathy Brown

JSG Outstanding Service Award, BEG

Kim LaValley

Best Paper Award, COMSOL Conference

Lynda Miller

JSG Staff Excellence Award, UTIG

Hejun Zhu

Excellence Prize of 2012 Chinese Government Award for Outstanding Students Abroad; Jackson School Distinguished Postdoctoral Fellowship

Promotions

Peter Eichhubl

Senior Research Scientist, BEG

Ursula Hammes

Research Scientist, BEG

Farzam Javadpour

Research Scientist, BEG

Richard Ketcham

Professor, DGS

Luc Lavier

Associate Professor, DGS

Kirk McIntosh

Senior Research Scientist, UTIG

Cornel Olariu

Research Scientist, DGS

Students

Tricia Alvarez

Student Oral Presentation Sponsored by Shell, AAPG Annual Convention and Exhibition

Veronica Anderson

Graduate Research Grant

Katelyn Atakturk

Student Service Award, Graduate Student Executive Committee



Professor William Carlson, with Wes Crawford (B.S. '04), received the Knebel Award for Distinguished Undergraduate Teaching.

Khushboo Arora

Chevron Texaco Fellowship; Muehlberger Field Scholarship

Kevin Befus

Horton Research Grant, AGU

Kenneth Befus

Technical Sessions Best Speaker Award, Ph.D., DGS

Alyse Briody

Technical Sessions Best Speaker Award, M.S., DGS

Meredith Bush

Graduate Student Research Grant, GSA; Alexander and Geraldine Wanek Memorial Grant, AAPG; Statoil Graduate Fellowship; Ogden Tweto Memorial Fund Grant, Colorado Scientific Society; Geological Societies Student Grant, Gulf Coast Association

Amanda Calle

Graduate Student Research Grant, GSA

Taylor Canada

Folk/McBride Petrography Award, DGS

Marie Cavitte

Late-Career Ph.D. Best Poster Award, 1st place, Jackson School Research Symposium

Yangkang Chen

Marathon Geophysics Fellowship, Marathon Oil Company

Michael Brett Cronin

Late-Career M.S. Best Poster Award, 2nd place, Jackson School Research Symposium

Debanjan Datta

Anadarko/SEG Scholarship

Joshua Davis

Early-Career Graduate Best Poster Award, 1st place, Jackson School Research Symposium

Luke Decker

Best Student Poster at SEG

Robert Dennen

Outstanding Teaching Assistant Award, DGS

Audrey Eljuri

Undergraduate Best Poster Award, 1st place, Jackson School Research Symposium

Rattanaorn Fong-Ngern

Late-Career Ph.D. Best Poster Award, 2nd place, Jackson School Research Symposium

Marina Fredrik

Graduate Research Grant, GSA

Stefanie Frelinger

Matthewson Scholarship Award, Association of Environmental and Engineering Geologists

Michelle Gevedon

Outstanding Teaching Assistant Award, DGS

Kealie Goodwin

Exxon Mobile Travel Grant; GSA Grant; Roscoe G. Jackson II Award for Sedimentology

Emily Hernandez Goldstein

Graduate Research Fellowship, National Science Foundation

Menal Gupta

Anadarko/SEG Scholarship; ExxonMobil Travel Grant/SEG Scholarship

Jacob Jordan

Early-Career Graduate Best Poster Award, 2nd place, Jackson School Research Symposium

Woong Mo Koo

William Dow Hamm Memorial Grand, AAPG

Renas I. Koshnaw (Mohammed)

Graduate Student Research Grant, GSA



Hall of Distinction Gets Two New Members

The Jackson School of Geosciences added two legends to its Hall of Distinction in 2014. Earle McBride, pictured above with Dean Sharon Mosher, and the late G. Moses Knebel join 32 other inductees who helped shape the Jackson School and whose contributions to the field of geosciences will influence generations of geoscientists.

McBride, a professor emeritus at the Jackson School, joined the University of Texas at Austin in 1959. He taught sedimentary geology and supervised 52 master's and 17 Ph.D. students until his retirement in 2005. He also served as chairman of the Department of Geological Sciences from 1980 to 1985.

In his 53 years as a geoscientist, McBride published more than 200 articles, abstracts, field guidebook articles and book chapters. The R.L. Folk/E.F. McBride Petrography Fund, awarded each year to a UT-Austin geology student who correctly identifies a variety of rock hand specimens and thin sections, is named in his honor.

Knebel, who received a B.A. in geology from UT-Austin in 1922, devoted much of his life to petroleum geology. He spent his career at Standard Oil Company of New Jersey (now part of ExxonMobil Corporation), where he became a leader in exploration for oil and gas.

He explored salt domes and oil and gas reserves in East Texas and discovered some of the most prolific oil fields in Venezuela. As manager of the company's worldwide exploration division, Knebel directed the acreage acquisition and exploration programs in North Africa and the Middle East and pioneered the discovery of oil fields in Canada, France and Libya. He retired from Standard Oil in 1959.

In 1956, UT-Austin established the Carolyn G. and G. Moses Knebel Teaching Fund for what is now the Jackson School. Knebel died in 1974.

Felicia Kulp

Late-Career M.S. Best Poster Award, 1st place, Jackson School Research Symposium

Ashley Latimer

Technical Sessions Best Speaker Award, M.S., DGS

Matthew Ledvina

Society of Economic Geologists Student Research McKinstry Grant

Sasha Montelli

Fulbright Scholarship

Kimberly Myers

Outstanding Teaching Assistant Award, DGS

Johnathon Osmond

East Texas Geological Society Scholarship; GSA Structural Geology & Tectonics Division Field Trip Grant

Allison Pace

GK-12 Fellowship, Environmental Science Institute

Yang Peng

CSC Scholarship, Golden Bay Scholarship

Nicholas Perez

Research Grant, AAPG

Timothy Shin (M.S. '14), with professor Liz Catlos, received the Technical Sessions Best Speaker Award, M.S., from the DGS.

**Natalie Raia**

Folk/McBride Petrography Award, DGS

Sebastian Ramirez

Post-Expedition Award, International Ocean Discovery Program; AGU Travel Grant; Graduate Student Research Grant, GSA

Reed Roush

A.L. Cox Best Poster Award, AAPG Southwest Section Annual Conference

Dustin Schroeder

Best Graduate Paper Award, JSG

Jeffrey Senison

Outstanding Teaching Assistant Award, DGS

Nikki Seymour

Folk/McBride Petrography Award, DGS

Timothy Shin

Technical Sessions Best Speaker Award, M.S., DGS

Kaustubh Thirumalai

Shipboard Scientist Candidate for Joides Resolution

Kelsi Ustipak

Kuhn Intellectual Entrepreneurship Award, IE Program College of Communications; Best Graduate Student Cover Letter; GSA Research Grant Award; GSA Sedimentary Geology Division Student Research Award

Maureen LeVoor Walton

Outstanding Student Paper Award, AGU 2013 Fall Meeting; Student Presentation Award, Seismological Society of America 2014 Annual Meeting, GK-12 Fellowship, Environmental Science Institute; Ewing/Worzel Fellowship, UTIG

Logan West

GK-12 Fellowship, Environmental Science Institute

Jie Xu

Ewing/Worzel Fellowship, UTIG; Ronald K. DeFord Field Scholarship Fund, Jackson School of Geosciences

Julie Zurbuchen

Undergraduate Best Poster Award, 2nd place, Jackson School Research Symposium



Whitney Behr Named Outstanding Woman in Science

Whitney Behr, an assistant professor in the Department of Geological Sciences at the Jackson School of Geosciences, received the 2013 Subaru Outstanding Woman in Science Award. In partnership with Subaru, the Geological Society of America (GSA) confers the annual award to a woman who has made a significant impact on the geosciences with her Ph.D. research.

Behr's research focused on the measurement of flow stress in ductilely deformed rocks from various depths in the crust in southeastern California and southern Spain.

"Her primary contribution was verifying the strength of the crust with depth," said Dean Sharon Mosher. "But she also investigated the apparent discrepancies between geologic and geodetic slip rates on faults and the mechanical properties of intracontinental subduction zones."

Mosher served as GSA's president when the award was established in 2001 in memory of Doris M. Curtis, GSA's first female president.

"I came up with the idea of awarding it specifically to women three years out from their Ph.D. to encourage young women to stay in the field," Mosher said.

Behr completed her Ph.D. at the University of Southern California in 2011 and joined the Jackson School in 2012. She is the second Jackson School faculty member to receive the award. Assistant professor Jaime Barnes was honored in 2009.

What's New at the Walter Geology Library

At the Walter Geology Library we've spent the past year putting some of our reserves to work to enhance services.

We were able to reach a deal with the European Association of Geoscientists and Engineers, signing a five-year license for their Earth-Doc database, giving University of Texas users online access to a large store of full-text materials from Europe dealing with energy, geophysics, petroleum geology and related environmental topics. The database is not widely available in the United States and is a great complement to the American Association of Petroleum Geologists (AAPG), One-Petro and GeoScienceWorld (GSW) holdings we already offer. In the first four months we had almost 1,400 downloads.

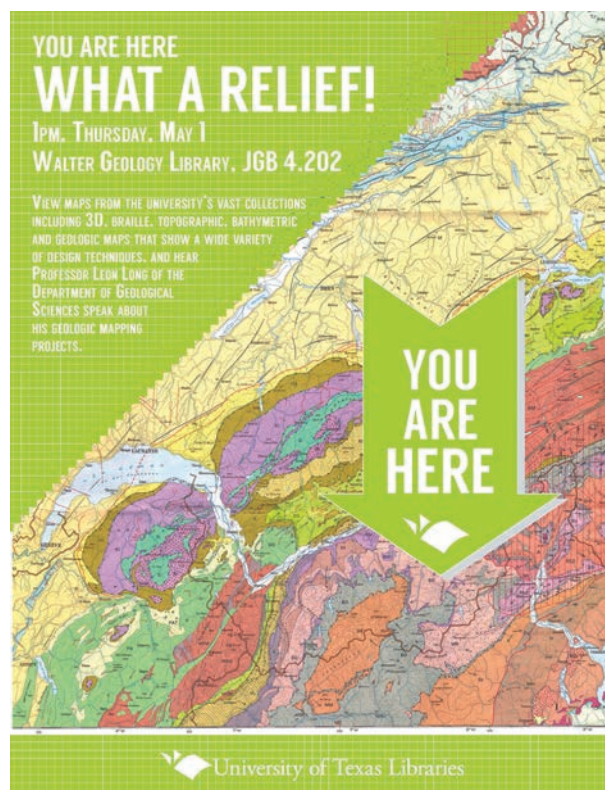
We also signed a five-year deal with GSW to be an early participant in its new e-books platform released in July 2014. Since we already hold some of the e-titles through our licenses, we focused on the roughly 700 titles in the package that we did not have already. Clearly the transition from print to electronic delivery is well under way.

The Texas topographic map collection has been consolidated into the Perry-Castaneda Library (PCL) Map Collection. This turned out to be a big task, but it has freed up 40 drawers. We are now processing 20 cartons of UNOCAL maps and preparing to shift the entire map collection. This year, with the assistance of associate professor Elizabeth Catlos and her students, we also acquired more than 60 pounds of Turkish geologic maps, vastly enlarging our coverage of that geologically important region.

In other map news, Calla Smith-Dowling and Katherine Strickland from the PCL Map Collection have initiated a quarterly event called "You Are Here" to highlight the role of cartographic information in the various libraries on campus. This year they featured the Benson Latin American Collection, the Fine

Arts Library, the PCL Map Collection and the Walter Geology Library. Find out more at www.lib.utexas.edu/geo/youarehere.html.

In the area of notable gifts, in addition to about 50 cartons of materials from the Bureau of Economic Geology and Institute for Geophysics' collections, this year we processed almost 75 cartons donated by the Edwards Aquifer Authority in San Antonio, of which we will retain about 20 percent.



The Walter Geology Library was featured at a "You Are Here" event in May 2014.

We also this summer received 16 large cartons from the American Geosciences Institute containing materials from Australia and other overseas locations that we do not already own. AGI wanted these materials, which were processed for its GeoRef database, to be placed in an academic library where they would be available to users.

This is an outgrowth of our cooperative arrangement, having indexers from GeoRef onsite, which has been a great benefit for both us and AGI over the years.

Space, both onsite and for library storage, is becoming a crisis. Our new storage facility is now full due to making user space in the PCL, and we may lose an existing storage and processing building in a few years to make way for the Dell Medical School on Red River.

This year's digitization news is again focused on theses and dissertations. We ask alumni to grant permission to digitize their master's and doctoral theses for our UT Digital Repository, home of the official copies of new graduate theses available at repositories.lib.utexas.edu. To date, there are 430 geology theses in the repository, of which about 200 pre-date the repository. This process is especially important for geology titles, which often include loose maps and glued-in photographs that are difficult to preserve. Since the copyright of a thesis belongs to the author, we need individual permission to post the files. If you would like to be included, please contact us at georequests@lib.utexas.edu.

Our new School of Information graduate research assistant Laura Mattys has done a great deal of work helping to catalog backlogged gifts.

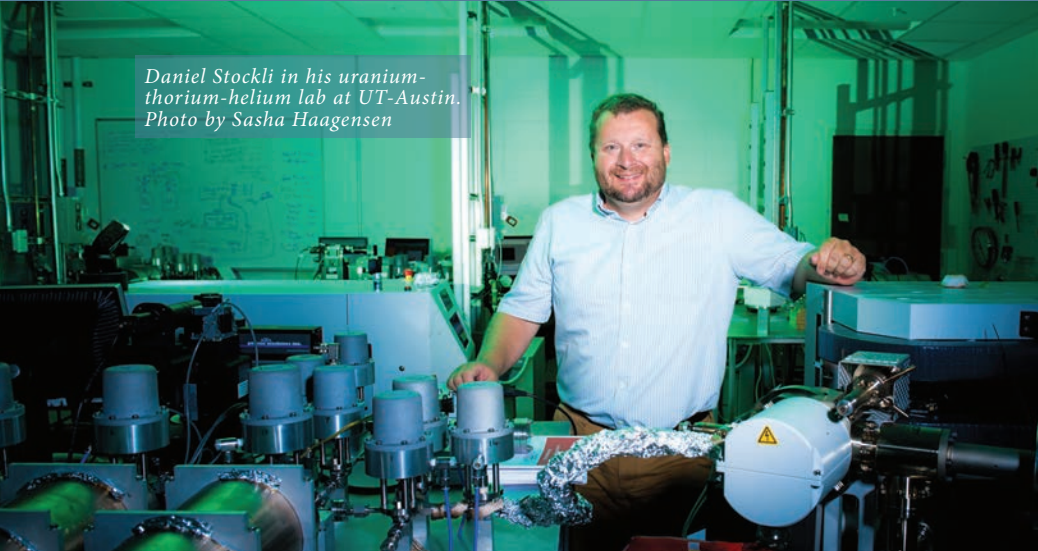
In staff news, this year's Guion Award winners are Ron Podgorsek, for his work on the Texas topo transfer project, and Strickland, for her teamwork in organizing the "You Are Here" presentations.

Smith-Dowling, unit manager and webmaster, attended the Western Association of Map Librarians (WAML) meeting last fall and is taking over map cataloging in addition to her other varied duties.

Finally, congratulations to our student workers who have completed their degrees: Regi Floresca, Amanda Gatti, Zarina Moreno, Armando Pecina, Camille Senellart de Vriere and Samantha Vo. Thanks for your efforts over the years and best wishes to you all in your chosen careers!

—Dennis Trombatore, Librarian

*Daniel Stockli in his uranium-thorium-helium lab at UT-Austin.
Photo by Sasha Haagenzen*



The World in a Grain of Sand

Daniel Stockli is using zircons to reconstruct past worlds

By Melissa Weber

Over the quiet thrum of mass spectrometers and various lasers in a lab at the University of Texas at Austin, professor Daniel Stockli carefully aims a laser at a zircon no thicker than a human hair. The tiny mineral is one of 120,000 that he and his research team have dated in the past year. Sixty seconds later, the age of this ancient bit of Earth is revealed: 750 million years old.

But that's just the first step in revealing this little zircon's storied life.

"A fair number of people do uranium-lead dating on zircon, so the question we had to ask was, 'Can we do more? How much history can we tease out of a grain of sand?'" said Stockli, a professor and researcher in the Department of Geological Sciences at the Jackson School of Geosciences.

Using a unique combination of methods on a single zircon, Stockli's lab is piecing together a more complete look into the past than simply assigning the crystal an age. Such insights can help scientists reconstruct what the mountain belts and ancient river systems once looked like and how they interacted, how many years mountains existed before being washed to sea, and how each zircon likely reached its current resting spot.

Knowing the genealogy of a zircon grain could be helpful to oil companies that want

to know the size and quality of sand bodies. Pinpointing what controls an area's thermal maturation is also valuable in energy exploration, because organic matter must heat to the right temperature to produce oil and gas.

Zircons are the earth's biographers. These nearly indestructible crystals contain a record of how tectonics, climate, river drainage systems, basins and coastal processes have worked together over eons across the globe. Stockli's collection of zircons comes from places like Greece, the Swiss Alps and Iraqi Kurdistan.

But zircons are also tightlipped—so to figure out how long ago a zircon cooled and where it came from, Stockli has to tap into the zircon's helium supply.

He uses the uranium-thorium-helium method to determine the mineral's cooling age. As a zircon-containing rock makes its way up through the earth's crust, the temperature drops. For a zircon, the crystal structure closes at a depth of around 6 kilometers when the rock hits about 180 degrees Celsius. That's when helium—a byproduct of the radioactive decay of uranium and thorium—starts to accumulate inside the zircon.

"The interesting thing is that with thermal chronology you're learning something about the tectonic or erosional activity in the

hinterland," Stockli said. "You learn, did this zircon cool and come up quickly? Or did it sit around and do nothing for a long time?"

At the Llano Uplift—the geologic dome in Central Texas where that 750-million-year-old zircon was found—Stockli said rocks have been bobbing up and down near the surface for millions of years.

"That's a long time to be basically in the upper crust without eroding, without being deeply reburied," he said. "It's a place that for some reason has been very stable."

A zircon carries somewhat of a geochemical signature from its origins. That is what allows scientists to trace grains found in the Gulf of Mexico back to the rocks in Montana from which they eroded. For Stockli, drilling into a zircon and pulling out its trace elements reveals more about the environment in which the crystal formed. In the past year, his lab has analyzed the cooling history and geochemistry of about 7,000 zircons.

"The geochemistry tells us about its family history—what kind of rock it crystallized in—whereas the cooling temperature tells us more about its life history, and the crystallization age tells us about its absolute age," said Stockli, whose lab is one of few in the world looking at all three pieces of data in a single zircon.

To hear Stockli tell it, dating a billion-year-old zircon is actually pretty simple. So he developed a technique with a colleague from the University of California—Los Angeles that involves combined uranium-thorium using an ion microprobe and his uranium-thorium-helium method to date zircons as young as 2,000 years old, a method with applications in archeology and volcanic hazards. For very young minerals—between 1,000 and 100,000 years old—dating becomes analytically difficult.

Yet with this new technique, his lab is now dating zircons found in ashes interlayered with archaeological deposits found in the Mediterranean and in Mesoamerica, once home to the Mayans and Aztecs.

They're also analyzing zircons found among anthropological remains in Europe, where a series of volcanic eruptions about 40,000 years ago appear to mark the end of the Neanderthals.

"Zircons can tell you much more than just their age," said Stockli. "It's amazing how much information they retain. They're like ancient time capsules."

Setting Limits on the Unknown

New Jackson School researcher
Patrick Heimbach works to reduce the
uncertainties of climate simulations

By Tim Green



Patrick Heimbach

Scientists who develop computer models that simulate climate wrestle with uncertainty. It's a fact of the profession.

There are so many complex variables that go into a simulation that at times modelers have to rely on the best estimated data or just put "x" in places where no data are available.

Patrick Heimbach, a climate modeler who will join the University of Texas at Austin in January 2015, is working to get a better handle on these unknowns. His goal is to increase the accuracy of the models simulating future conditions to help scientists better understand how climate change might happen and the impact it could have around the world.

Heimbach, who comes to Austin after 15 years at MIT, specializes in research aimed at understanding the global circulation of the ocean and its role in the global climate system and in the dynamics of Arctic sea ice and polar ice sheets.

He joins researchers working on that problem at the Jackson School of Geosciences and its Institute for Geophysics (UTIG) and at the Institute for Computational Engineering and Sciences (ICES). Heimbach will add to an already strong cadre of climate researchers at the university, said Omar Ghattas, a researcher also affiliated with the Jackson School and ICES.

"Patrick Heimbach is one of the world's leading authorities on data assimilation in ocean models," Ghattas said. "His research addresses the question of how we can best extract knowledge about ocean systems from ever-expanding data volumes and make ocean models more predictive."

Heimbach is joining the university as a W. A. "Tex" Moncrief, Jr. Simulation-Based Engineering Science Professor. The position was created to bring advances in computer modeling and simulation to bear on the scientific and engineering challenges that affect our nation's well-being and competitiveness.

In an interview in August, Heimbach said he was looking forward to working with

researchers doing innovative work in the area of uncertainty quantification, which he calls one of the open frontiers in climate modeling research and the effort to create better models.

"Colleagues at UT-Austin's Institute for Computational Engineering and Science are at the cutting edge worldwide to try to develop methodologies on how you can rigorously tackle this problem," he said.

It's a challenge that demands a lot of computing power. Heimbach is ready to get his hands on the university's high performance systems such as those at the Texas Advanced Computing Center (TACC).

"Computing resources are absolutely critical because these models are getting very sophisticated, very complex," Heimbach said. "Without them, there's very little you can do at the end of the day."

He hopes to use some of his start-up funding for his laboratory to contribute to TACC's resources. Heimbach also looks forward to collaborating with UTIG scientists conducting groundbreaking airborne surveys to collect data around Antarctica's and Greenland's marine margins.

"I'm very keen on working with them and advancing ideas in ocean, ice and climate research," he said.

Heimbach's computational approaches are generally based on inverse modeling. He tries to learn from building computer models that accurately reflect events that have already occurred. He compared the method to the high school mathematics exercise in which a student tries to plot the best fit of a line through a scattering of data points.

"That fit is your optimal model representation of the data," he said of the line. "Here what we do is similar, but with much more complex models, models that run on supercomputers and many more data sets."

An example is a model of the Labrador Sea, just southwest of Greenland, that Heimbach and MIT colleagues developed.

The simulation was based on a method

that Heimbach developed with one of his graduate students. The method combined models and observations to accurately simulate the seasonal extent of Arctic sea ice and the ocean circulation beneath, according to an MIT report on the research.

"We're slowly trying to improve detailed understanding of the underlying processes through model simulations that are confirmed by observations," he said.

Heimbach said the method could be applied to the Arctic Ocean as a whole, which could be useful for companies trying to navigate the ocean. That's because, while there has been a trend toward less ice in the Arctic Ocean during the summers, there is still no guarantee it will be completely navigable.

Heimbach pointed to September 2012 when sea ice reached a historic minimum. Nevertheless, several oil companies had to cut short exploratory drilling projects when confronted with unexpected ice.

"Naively you wouldn't expect that because you are in an all-time minimum," Heimbach said. "But one has to be really careful to understand regional changes that would look different in different years and different regions."

In addition to cultivating better climate models, Heimbach also works to cultivate a new generation of climate scientists. Together with colleagues in Norway, he is a cofounder, organizer and teacher in an annual series of climate dynamics courses for advanced graduate students and post-docs.

Held in 2014 in August on Disko Island off the west coast of Greenland, the topic was the dynamics of the Greenland Ice Sheet. The classes afford Heimbach, who does most of his research at a computer, the opportunity to get closer to the environments he studies.

"Sometimes it's very healthy for a modeler to actually get out and see the system you're trying to simulate and get a bit humbled by the complexity," he said.

Of that, he's certain.

SUMMER FIELD CAMPS



Scenes From the Field

Fieldwork is an integral part of the Jackson School of Geosciences undergraduate experience, from Introduction to Geology to our cornerstone summer field courses. While other earth science programs have scaled back field offerings, we've ramped up ours, expanding courses in hydrogeology and marine geosciences. Jackson School alumni and friends also highly value fieldwork: their financial support underwrites smaller trips and offsets the expense of longer summer field courses for hundreds of students. These pictures are from the 2014 GEO 660, Hydrogeology, and Marine Geosciences & Geophysics (MG&G) field courses.

This page: At top, undergraduate geophysics major Keith Young logs navigation information (MG&G); Ph.D. candidate and teaching assistant Allan Jones with a snake at the Valles Caldera National Preserve in northern New Mexico (Hydrogeology).

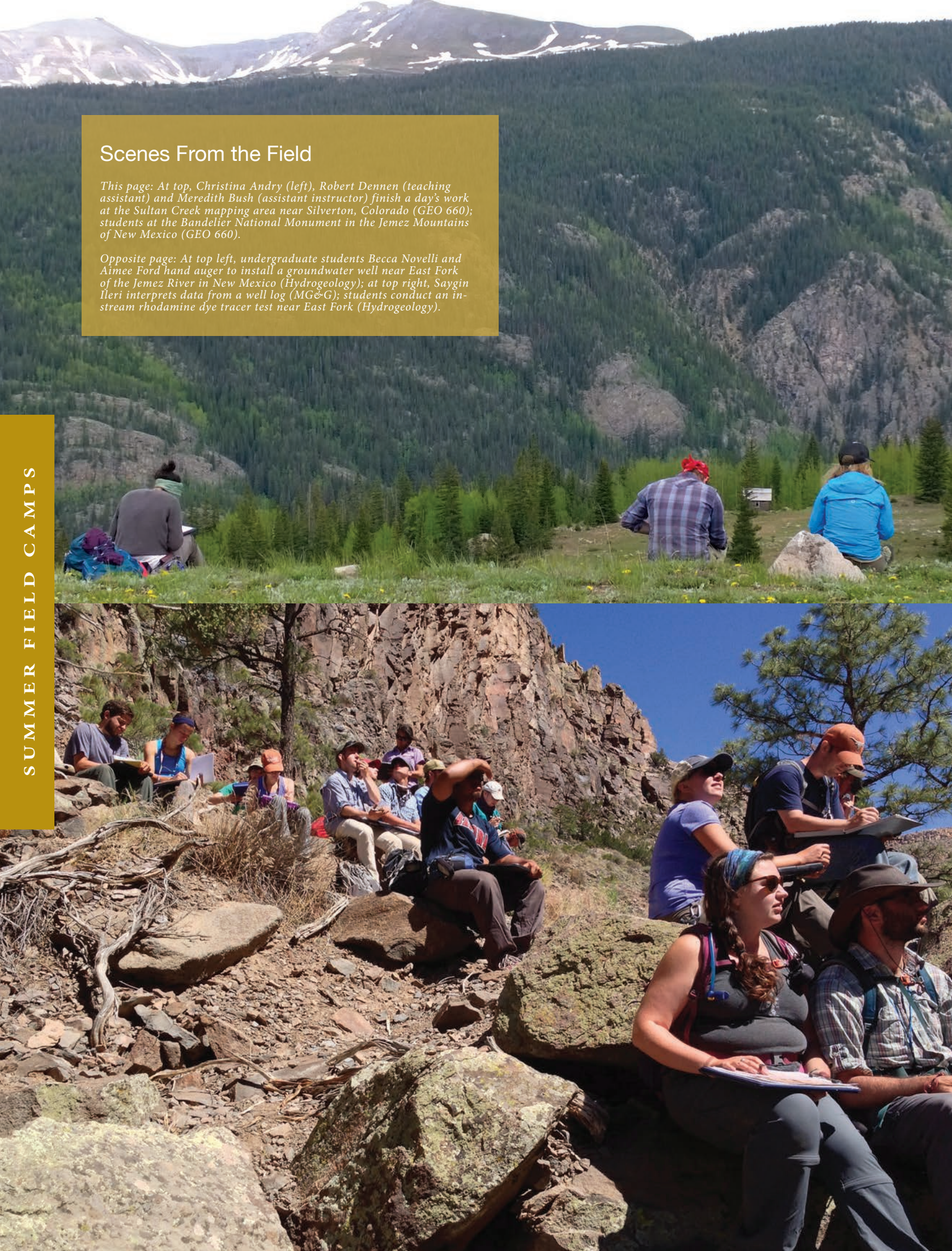
Opposite page: Students start on a one-day project mapping volcanic rocks in Frijoles Canyon at Bandelier National Monument in the Jemez Mountains of New Mexico (GEO 660); UTIG marine technicians Steffen Saustrop and Dan Duncan work with undergraduate and graduate students to recover a vibracorer on the stern of the R/V Manta (MG&G).



Scenes From the Field

This page: At top, Christina Andry (left), Robert Dennen (teaching assistant) and Meredith Bush (assistant instructor) finish a day's work at the Sultan Creek mapping area near Silverton, Colorado (GEO 660); students at the Bandelier National Monument in the Jemez Mountains of New Mexico (GEO 660).

Opposite page: At top left, undergraduate students Becca Novelli and Aimee Ford hand auger to install a groundwater well near East Fork of the Jemez River in New Mexico (Hydrogeology); at top right, Saygin Ileri interprets data from a well log (MG&G); students conduct an in-stream rhodamine dye tracer test near East Fork (Hydrogeology).







OPENING UP

As Mexico deregulates its state-run oil industry, UT-Austin expertise could play a significant role

By Tracy Idell Hamilton

The Congreso Mexicano del Petróleo, or Mexican Petroleum Congress, bills itself as the most important forum for scientific exchange for oil and gas exploration and production in Mexico.

For years it has gathered engineers and executives to share their views on the future of Mexico's petroleum industry.

This year, however, the crowd was much more diverse.

"It used to be mostly folks from Pemex and those working as service providers in Mexico," said Scott Tinker, director of the Bureau of Economic Geology (BEG) at the University of Texas at Austin and the luncheon keynote speaker at the Congreso this June. "This year, it was everyone interested in Mexico."

The increased interest stems from the Mexican government's December 2013 decision, under the leadership of President Enrique

Peña Nieto, to end Pemex's 75-year monopoly over that nation's oil and gas industry.

Allowing foreign companies and investment in its energy sector is uncharted territory for Mexico. The country nationalized Pemex in 1938 under President Lázaro Cárdenas with a revolutionary, nationalistic rhetoric that equated state-owned energy resources with sovereignty and national pride.

Oil revenues became a cornerstone of the Mexican economy, with Pemex taxed so heavily it funded as much as 40 percent of the national budget.

For decades, the company did well, buoyed by the country's rich reserves, rising production and high oil prices. But a lack of investment finally caught up with the company. In 2013, Mexico produced

2.5 million barrels per day of crude oil, down from its peak in 2004 of about 3.4 million barrels per day—roughly a 26 percent decline. And a lack of refinery capacity has meant increased transportation fuel imports from the United States.

Now, Mexican officials preparing to open the country to competition must craft an entirely new regulatory and legal framework to guide the outside exploration and exploitation of its untapped oil fields, shale formations and deep water.

The challenges are tremendous, but so are the opportunities, most obviously for deep-pocketed international oil companies, which have been pushing Mexico to open for years.

But opportunities also abound for Texas companies—mid-sized and small oil and gas independents, equipment and service companies, and consultants who specialize in engineering and construction, environmental issues and financial and legal work.

Overall direct and indirect investment could be \$1 trillion from the deregulation of the Mexican oil and gas industry, according to a recent economic impact study from Morgan Stanley.

Longhorn Connection

As the transition occurs, opportunities for the university also abound.

“We have been working on a Mexico strategy,” said Jorge Piñon, who leads the Jackson School of Geosciences’ Latin America and Caribbean Energy Program and is currently serving as interim director of the Center for International Energy and Environmental Policy (CIEEP).

Created in 2005, the CIEEP brought together the Jackson School (which itself was established as a college that year), the College of Engineering and the LBJ School of Public Affairs with the goal of infusing policy-making with scientific and engineering expertise.

As with other countries in Latin America, Piñon said, the challenge for Mexico is not its resource base—it has high potential for shale gas reserves—but in creating the right economic and regulatory model to develop it.

While the Jackson School—particularly the BEG—has enjoyed research and academic relationships with Mexico and Pemex for decades, the liberalization of Mexico’s energy industry offers an unprecedented opportunity for the university to deepen those ties and offer expertise and guidance across disciplines.

“Energy, environment, economics, education,” Tinker rattled off. “We’re pretty passionate that these four E’s need to work hand in hand” to help solve the kinds of challenges facing Mexico as it moves forward.

The BEG can help with the technical side of the equation, he said, by working with Pemex and other companies to understand the

opportunities in the country’s shale basins and deepwater formations. The BEG can also help with “above ground” issues such as water, land use and the environment as infrastructure is developed.

“Parallel to that, however, must be the creation of a strong regulatory framework that offers transparency and certainty,” said Tinker.

International oil companies will bring capital and expertise and help spread the risk and costs of exploration, but in exchange they expect a stable, long-term operating environment guided by accountability and the rule of law, he continued.

That’s where the expertise of the university’s business, law and public policy schools could come into play.

John C. Butler is an associate professor with the McCombs School of Business and the academic director of its Energy Management and Innovation Center. He’s been working with Piñon, Melinda Taylor from the Law School and Eugene Gholz of the LBJ School of Public Policy on a Mexico strategy.

Having the university’s various schools collaborate “really encourages open dialogue

“WE [AT UT-AUSTIN] HAVE BEEN WORKING ON A MEXICO STRATEGY.”

JORGE PIÑON



The Bureau of Economic Geology has done considerable integrated basin analyses for Pemex, including a study of the Laguna Madre-Tuxpan area (red) and the Veracruz and Macuspana basins (green).



The Mexican Congress (above left) passed legislation in December 2013 to open up the country's state-run oil industry. Maria de Lourdes Melgar Palacios (above right), an undersecretary in the Mexican Ministry of Energy, speaks at a seminar in Houston hosted by the University of Texas at Austin and the Atlantic Council.

and opens doors to different ways to attack these kinds of problems,” Butler said. “And as part of that effort, we’ve targeted Jorge as a natural as we look to do more with Latin America.”

Challenges Ahead

Piñon, hired three years ago by the Jackson School after a career in the private energy sector, said his is “an enabler role” to bring together expertise from the various schools to connect and offer guidance, not just to Mexico, but to other Latin American countries as they work through similar transitions.

He, Butler and Tinker pointed to work they’ve done with Brazil and its oil company, Petrobras, and the valuable “lessons learned” that Tinker shared with the Congreso audience of 1,200 in June.

“External investment was necessary to share costs and open up the country,” Tinker said.

New players energized the industry. But Petrobras, which remains largely under national control, has struggled to increase oil production while management has been ensnared in political scandals.

Pemex faces similar challenges as it ramps up to compete for the first time in 75 years. The company has not kept pace with exploration or extraction technologies, and many of its engineers are retirement age. Others are sure to be poached by companies entering Mexico, eager to gain local knowledge. The university can help Pemex, and the country, with academic training and research as it develops the next generation of oil industry engineers and executives.

While the main focus of deregulation has been on the oil and gas industry, Mexico has also set targets for a greater reliance on renewables and a reduction in greenhouse gas emissions.

Mexico has “incredible potential in wind, geothermal and solar, as well as small hydro-electric power plants,” said Maria de Lourdes Melgar Palacios, undersecretary of hydrocarbons in the Mexican Ministry of Energy. She spoke

at a recent seminar in Houston hosted by the university and the Atlantic Council.

A visiting fellow at CIEEP in 2008 and 2009, Melgar said foreign companies have begun submitting proposals to move into Mexico, but she doesn’t expect the first contracts to be awarded before 2015.

Piñon, who notes that it takes three to five years to bring a deepwater well online, envisions a thriving, highly productive industry in the next 10 to 25 years. He sees the industry bringing in as-yet unrealized revenue streams from taxes and royalties, and creating jobs at every level in the economy.

If successful, the changes have the potential to snowball into far-reaching economic reform in Mexico, Piñon said, through what Tinker calls “social investment” in education, entrepreneurship, infrastructure, health and agriculture.

A successful energy industry in Mexico with good jobs and infrastructure spending would even reduce illegal immigration into the United States, Piñon said.

“This could be huge for U.S.-Mexico relations,” he added. “We all have a role to play to help Mexico achieve its goals.”



From left, Victor Glover, Anne McClain, Nicole Aunapu Mann and Nick Hague, with Mark Helper, get maps oriented at the La Junta overlook, where the Rio Grande joins the Red River. Credit: NASA/JSC



Prepping for Space

Jackson School geologist trains astronauts for a trip to the International Space Station and maybe, someday, beyond

By John Williams

In a training room this June at the National Aeronautics and Space Administration's Johnson Space Center near Houston, members of the new astronaut class huddled around images of the Rio Grande Rift in New Mexico shot from the International Space Station more than 200 miles above Earth. Other black-and-white images, known as hillshaded digital elevation models, have reduced the terrain to resemble little more than a lunar landscape, with spiderweb-like veins denoting the Rio

Grande and wriggles and shading indicating mountains and outcroppings.

Instructor Mark Helper of the University of Texas at Austin's Jackson School of Geosciences directed the students—officially known as astronaut candidates—to develop a map that details their understanding of the terrain's geologic features. The astronaut candidates developed maps not by touching the screens of tablets or laptops loaded with mapping software, but by drawing with colored pencils on plastic overlays atop the

photos, each color denoting a specific landscape or rock feature. The following month they journeyed to the New Mexico site north of Taos to see whether their interpretations were correct.

In most cases, they were.

“By and large, the training worked extremely well,” said Helper. “I was impressed by how they were able to pick up so much so quickly.”

Mapmaking with colored pencils? Investigating desert regions on Earth? Is this really part of 21st-century space training?



It is—and it is what NASA has determined will help astronauts understand what they’re looking at when they are in the space station’s 400-kilometer perch above Earth, or perhaps one day if we return to the moon—or set foot on Mars.

NASA has trained astronauts in geology since the final Apollo missions of the early 1970s, and Jackson School faculty members have played a leading role in that training. That relationship began with the late Bill Muehlberger, who served as principal investigator for the last two Apollo missions, 16 and 17, in which astronauts carried out significant geological research.

Muehlberger, who trained the astronauts for those Apollo missions, went on to train astronauts for the Skylab and shuttle crews. In 2005 he and Patricia Wood Dickerson, a university Ph.D. who collaborated with Muehlberger in post-Apollo NASA training, invited Helper, who has taught at the Jackson School since 1985, to become involved. Today Helper, a distinguished senior lecturer at the Jackson School, is the lead geology instructor in NASA’s Astronaut Candidate Program.

Understanding What They See

Helper works with Dean Eppler, a NASA senior scientist and geologist by training, to

help train future astronauts who one day may be working on the space station. While the astronauts will have opportunities for what Eppler calls “phenomenal observations” of Earth’s features, those observations will have limited value if the astronauts don’t understand what they are seeing.

That is why field geology is part of the training the candidates receive on a variety of subjects, including the space station’s mechanics and life support systems, as well as related courses in space physiology, medicine and Russian (a practical consideration given the close coordination between the American and Russian space agencies for traveling to and



Victor Glover, Barbara Tewksbury from Hamilton College, Anne McClain, Nick Hague and Nicole Aunapu Mann look at the geology across the Red River Gorge.
Credit: NASA/JSC



from the space station). With candidates having to absorb a massive amount of knowledge and skills within a couple of years, Helper likens the process to “drinking from a fire hose.”

For this summer’s class, Helper and his training team selected a site in the Taos Plateau Volcanic Field of the Rio Grande Rift near the confluence of the Rio Grande and Red River. The area is part of one of Earth’s major rift zones, regions that exhibit the results of shifting tectonic plates that formed present-day continents, oceans, mountain ranges and volcanoes, as well as other outcroppings and features that reveal much about the earth’s geologic history.

NASA’s use of the Rio Grande Rift dates back to the days of Apollo training. The region is a favorite for geologic training because the geology and landscapes are in some ways analogous to the moon. The features are relatively young (mostly less than 10 million years), so they are less affected by the vagaries of erosion, and deep gorges and canyons provide a view of what is below the surface.

Helper designed his instruction to allow his students to get the most out of their brief time with him. During classroom instruction, the astronaut candidates reviewed and discussed geologic features, then paired off with instructors over satellite and space-station imagery of a 10-by-14-kilometer (6.2-by-8.7-mile) section of the field site. Using colored pencils on plastic overlays atop their 11-by-9-inch photos, the candidates defined and labeled the site’s topographic and geological features, outlining what they perceived to be the site’s various rocks and sediments.

By tracing, shading and labeling the site’s features, the candidates learned how to establish the history of a field site, Helper explained. The variety and layers of rock and sediment can tell much about the order of events that led to the geology we see today. Gravel layers and some basalt flows near the bottom of the canyons date from earlier times, while talus and “modern” sediment that overlie them are more recent.

The challenge for the candidates was to unravel the sequence and timing of rock layer formation—the “geologic layer cake,” as Eppler puts it—and of land form development to produce testable hypotheses about the site’s evolution. This summer, the candidates traveled to New Mexico to compare their maps and ideas with the actual site.

Simple Is Better

The hand-drawn maps reflect Helper’s hands-on, learning-by-doing teaching style that he believes provides much more productive learning opportunities.

“It’s a much simpler way to work,” he said.

If color pencils on a plastic overlay seems low-tech compared to laptops and tablets, Helper said there is a plus side: “You don’t have to worry about batteries losing power or wasting limited, precious field time on hardware and software issues.”

This was Helper’s second class. Graduates of his class in 2010 are currently serving

aboard the space station, and others are scheduled to serve. The classes are small—14 candidates (including two each from the Canadian and Japanese space agencies) in the 2010 class and eight this summer.

Culled from a pool of thousands of applicants, the candidates—mainly engineers, scientists and aviators—are selected on the basis of the skill sets NASA believes it will need for its next mission. The current candidates are scheduled to complete their training in July 2015.

Training in geology will take on increased importance if NASA is able to return to the moon, which has not hosted human visitors since Apollo 17 lifted off from the lunar surface in December 1972. That return depends on the agency’s ability to muster political support and funding to build the kind of spaceship that can carry astronauts to an asteroid or back to the moon—and allow them to stay there longer for more extensive research. If that phase is successful, future goals will likely include the landing of an exploration team on Mars—a long-standing dream of scientists to go beyond the limited capabilities of the two robotic rovers, Spirit and Opportunity, currently on the planet.

Field experiences like the astronauts’ exploration of the Rio Grande Rift will be especially valuable in such endeavors. The rift’s rocks and record of volcanic activity, Helper explained, “are analogous to what we expected to see on the moon,” and its sediment fill “is similar to what we expect to see on Mars or other planetary surfaces.”

Whichever planet they visit, astronauts “will not have an infinite amount of time to explore or unlimited storage to bring back all the rocks they find,” Eppler explained. “So they will need to prioritize”—specifically, identifying those features on the planets’ surface such as the ridges, canyons, volcanic cones and rock outcroppings that, like the features in the Rio Grande Rift, offer the greatest potential for revealing how the planet formed.

The astronauts being trained by Helper and his associates “may not be going to the moon or Mars, but they’re gonna be in charge when we do,” Eppler predicted. That means the earth-based, pencil-on-plastic training being conducted by Helper will be influencing current and future space explorers for generations to come.



DISSECTING A GLACIER

A decade of research on Thwaites Glacier has greatly advanced knowledge of the West Antarctic Ice Sheet's potential contribution to sea level rise

By Tim Green



About a decade ago, a de Havilland Twin Otter aircraft flew back and forth over an area the size of New Mexico in the West Antarctic Ice Sheet, sending radar signals deep into Thwaites Glacier.

The plane made three trips a day, six days a week, flying about 600 meters above the stark, white surface—except where a volcano poked out of the ice here and there.

On board, researchers from the University of Texas at Austin's Institute for Geophysics (UTIG) operated the radar and instruments that measured gravity and magnetism.

In all, they collected about a terabyte of data in the survey of Thwaites.

Then they deployed UTIG's characteristic combination of developing innovative radar technology and geophysical expertise to mine the data for crucial information about Thwaites.

Over the decade since the survey, UTIG geophysicists have revealed the glacier's size, shape and how precariously it is situated on the West Antarctic Ice Sheet, as well as the complex water and geothermal systems under the glacier.

"These are big problems that take time," said Don Blankenship, a senior UTIG researcher and a leader of the project. "That's what we tackle here at Texas."

More than 70 research papers and other scientific presentations have come out of the expedition, known as the Airborne Geophysical Survey of the Amundsen Sea Embayment, Antarctica (AGASEA).

The detailed physical characteristics of the glacier that UTIG research has produced have helped sharpen computer models of climate change and sea level rise.

The project was just one of UTIG's numerous investigations that have extended across the Antarctic continent.

The AGASEA expedition was one of the largest field projects in Antarctic exploration when conducted in the 2004-2005 austral summer. UTIG researchers Jack Holt, David Morse and Blankenship led the project, which the National Science Foundation funded with \$1.6 million.

Work on the expedition began even earlier. UTIG researchers started to build support for it in 1997. For the next seven years, the UTIG team found funding and scientific partners and improved the radar technology.

Mammoth Task

The area to be surveyed was big, even for a research group from Texas. To cover the survey area, UTIG teamed up with the British Antarctic Survey (BAS). UTIG flew radar runs over Thwaites and the British surveyed the neighboring Pine Island Glacier.

In making their case for the survey, UTIG researchers pointed out that scientists realized the West Antarctic Ice Sheet was the potential source of up to 5 meters of sea level rise because of climate change. Yet, UTIG researchers noted, its isolation—more than 2,000 kilometers from McMurdo Station, the main U.S. base on Antarctica—made it logistically difficult to study.

In practice, the research was difficult to stage, but doable. For example, two refueling stops had to be set up for the C-130 aircraft that supplied the Twin Otter with fuel.

Overall, the UTIG and BAS teams made 107 flights and flew 60,000 kilometers to collect data.

Between flights, researchers checked the collected data to make sure the instruments were operating correctly.

“There was a lot of work in getting the data quickly processed,” said Duncan Young, now a UTIG research associate whose first expedition was AGASEA. “Are we seeing what we’re supposed to be seeing? Are we flying where we’re supposed to be flying?”



Left: C-FSJB survey aircraft over Thwaites camp in West Antarctica. Credit: U.S. Antarctic Program. Above: Jackson School researchers and U.S. Antarctic Program members dine in camp. Photo by Theresa Damiani

When the team returned to Austin, they set to work processing and analyzing the data. The first task was to determine the glacier’s core shape, Young said.

Undergraduates helped with some of the less technical tasks while the researchers fine-tuned the processing methods for understanding the radar data. The computational work was done on a high-performance system at the university’s Texas Advanced Computing Center.

The first result was a 2006 paper that comprehensively showed that Thwaites Glacier was more likely than the Pine Island Glacier to contribute to a massive release of ice from the West Antarctic Ice Sheet because it is more directly connected to the rest of the ice sheet.

They found that Thwaites’s interior lies more than 2 kilometers below sea level while, at the coast, the bottom of the glacier is shallow.

Because its interior connects to the vast portion of the West Antarctic Ice Sheet that lies deeply below sea level, the glacier is considered a gateway to the majority of West Antarctica’s potential sea level contribution.

The collapse of Thwaites Glacier would cause an increase of global sea level of between 1 and 2 meters, with the potential for more than twice that from the entire West Antarctic Ice Sheet.

Since then, UTIG researchers have worked with the data to extract more information about Thwaites. The most recent papers from the AGASEA expeditions were published in 2013 and 2014.

Clearing the Noise

Dustin Schroeder arrived at the university in 2007 with undergraduate degrees in electrical engineering and physics from Bucknell University. He applied both degrees in working with the Thwaites Glacier radar data.

Radar data of Antarctica has been collected from the air since the 1970s, Blankenship said. But technologically, it was the equivalent of radio where you just hear noise, not words.

In 2000, UTIG researchers started to work on understanding the phase of the signal coming back.

“These are called phase coherent radars,” Blankenship said. “That’s like the difference between AM and FM radio. We’re using the phase to make the signal clearer and understand more about it.”

Schroeder’s original work was to process the radar return so that you could tell when the signals were in phase and when they weren’t.

In a 2013 paper, Schroeder showed that Thwaites’ subglacial water system consists of a swamp-like canal system several times as large as Florida’s Everglades lying under the deep interior of the ice sheet, shifting to a series of mainly stream-like channels downstream as the glacier approaches the ocean.

The findings suggested that the dynamics of the subglacial water system may be as important as well-recognized ocean influences in predicting the fate of Thwaites Glacier.

Schroeder’s work was instrumental in drawing the information from the radar data.

Previously, scientists had attempted to use ice-penetrating radar to characterize subglacial water, but the effects of ice temperature on radar made it difficult to confirm the spread of water systems and how they were organized.

Schroeder’s technique looked at the geometry of reflections and solved the problem, because the temperature of the ice does not affect the angular distribution of radar energy.

With that water information in hand, Schroeder and the UTIG team published another paper that showed how they were able to estimate ice melting rates and thus identify significant sources of geothermal heat under Thwaites Glacier. They found these sources are distributed over a wider area and are much hotter than previously assumed.

The geothermal heat contributed significantly to melting of the underside of the glacier, and it might be a key factor in allowing the ice sheet to slide, affecting the ice sheet’s stability and its contribution to future sea level rise.

Unique Combination

Schroeder said UTIG is one of the few places where researchers are as interested in developing and applying radar technology as they are in the geophysics of research.

“UTIG takes a radar scientific approach to data and a geophysical approach to ice,” he said. “And we put those together to answer the important problems. There are just a few environments that encourage this in those two ways and very few groups who enjoy both.”

Schroeder, who received a Ph.D. in geophysics in May 2014, said the UTIG approach encourages hard thinking on both fronts that can result in novel research.

“That’s what Texas is good at,” Blankenship said. “That’s what the Institute for Geophysics is here for. We’re here to understand the techniques from the perspective of what they tell us about Earth problems.”

It comes down to the appropriate instrument.

“Here radar is the right tool and we understand the whole signal and we build our own instruments for this stuff,” he said. “We understand how to tune the instrument to solve the problem.”



STRIKING IT BIG WITH NANOTECH

JACKSON SCHOOL RESEARCHERS ARE UNLOCKING THE MIGHTY IMPACTS OF TINY TECHNOLOGY FOR ENERGY DEVELOPMENT AND RECOVERY

By Joshua Zaffos

The difference between boom and bust in the field of energy development is often a matter of inches and guesswork: An abundant reserve can be tapped—or overlooked—depending on the location of a well and properties of a reservoir.

While advances in drilling and mapping in the 21st century have eliminated much of the old-school wildcatters' speculation, researchers and engineers are still constantly working to improve practices and recovery rates of oil and gas drilling, including hydraulic fracturing. At the Bureau of Economic Geology (BEG) within the Jackson School of Geosciences, scientists are taking a page from medical science trailblazers by using nanotechnology—molecular-scale engineering—to make huge gains with tiny tools.

"Nanotechnology within geology and the oil and gas industry hasn't really been mainstream," said Scott Tinker, director of the BEG and the Advanced Energy Consortium (AEC). "This is cutting-edge research going on at the Jackson School. It's new thinking."

"We saw that, within the medical industry, they were coming up with these

nanoparticles that you could put in a human body to actually search out cancer cells, and then do some things with those particles to eradicate the tumors," Tinker continued. "We were so fascinated and we said, 'Why can't we do something similar with the earth's body?'"

Specifically, Jay Kipper, associate director at the BEG and AEC, and others are testing how industry can deploy millions of particles of "smart dust" sensors and micro-scale tools down into wells in order to gain a better picture of underground formations and their characteristics.

Nanoparticles are so small that roughly 800 to 8,000 of them would fit across the diameter of a human hair. The miniscule size and relatively large surface-area-to-volume ratio means the particles follow quantum mechanics rather than the standard rules of physics, so they may have enhanced reactivity and mobility traits, for instance. That means scientists can potentially send nano- and micro-scale sensors into wellbores and inter-well space to collect data for a number of parameters, such as temperature, pressure and other chemical and physical properties.

The clearer picture underground can guide improved oil and gas recovery and minimize environmental impacts.

"It's so difficult for a geologist to know what's really going on in a reservoir," Kipper said. "There's a lot of interpretation, but with more data we will be able to make smarter and more accurate predictions."

TEAM EFFORT

Bureau researchers embarked on their big plans with nanotech in 2008, launching the AEC. Tinker and Kipper reached out to scientists from academic institutions around the world and leaders in the energy industry. The consortium has funded researchers from the Jackson School, Harvard, Caltech and 30 other universities from around the world and has been supported by Shell, BP, Schlumberger and many other major energy corporations—"the best and the brightest" among geosciences and nanotechnology, Kipper said.

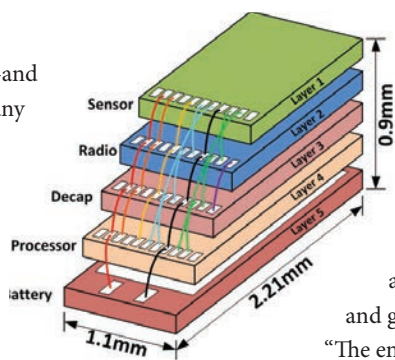
By bringing together academics and industry, the consortium is facilitating cooperative research in nanotechnology and leveraging

the partners' expertise—and investments—ahead of any market competition.

"By design, this is run very different than a typical university research program," Kipper said, noting that the group meets every two months. "We're not doing just the same old traditional research. We're introducing innovation to the field."

That innovation has focused on a few key initiatives and research areas. Researchers are developing sensors that range in size from nanometers (1 nanometer equals a billionth of a meter) to a millimeter cubed. These devices can be sent underground and withstand the conditions to transmit data that helps characterize a reservoir's geological, chemical and physical details. Consortium partners and project managers are also studying how they can use nanotechnology as high-powered contrast agents to boost visibility underground and improve existing drilling tools and techniques.

Mohsen Ahmadian, an AEC researcher and project manager who previously worked in the semiconductor and biotechnology industries, said millions of electromagnetic nanoparticles can be co-injected into wells during typical water-flooding processes and



serve as "in situ tracers" to help "illuminate" subsurface reservoir fluid paths that geologists might otherwise never find. He compares the approach to a "large-scale MRI" for oil and gas reserves.

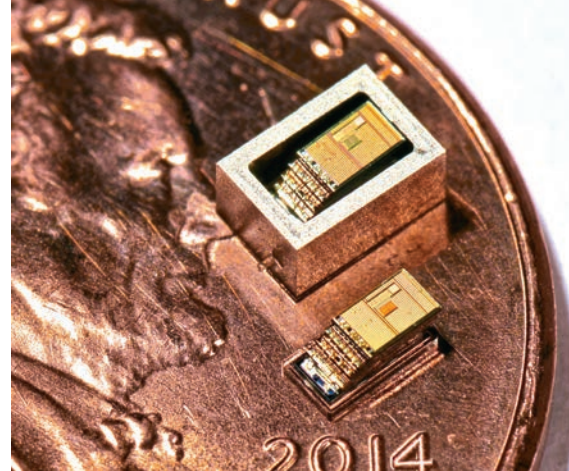
"The enhanced recovery of oil is very similar to targeting a specific disease in human beings," Ahmadian said. Every reservoir has specific characteristics, he added, and "fingerprinting" a reservoir, as with a disease, would enable targeted treatment.

Just as the medical industry has collaborated with other scientific disciplines to solve "big" problems, the energy sector will benefit from the advancements made in other fields through the consortium.

"I strongly believe the marriage of different industries and scientific disciplines can lead to much better ways of addressing some of the critical questions we have in the energy sector," Ahmadian said. "This vision is being put into practice at the AEC."

NANOTECH'S EXPANDING ROLE

The geophysical applications and opportunities of nanotechnology have only grown with the recent seismic shift across the



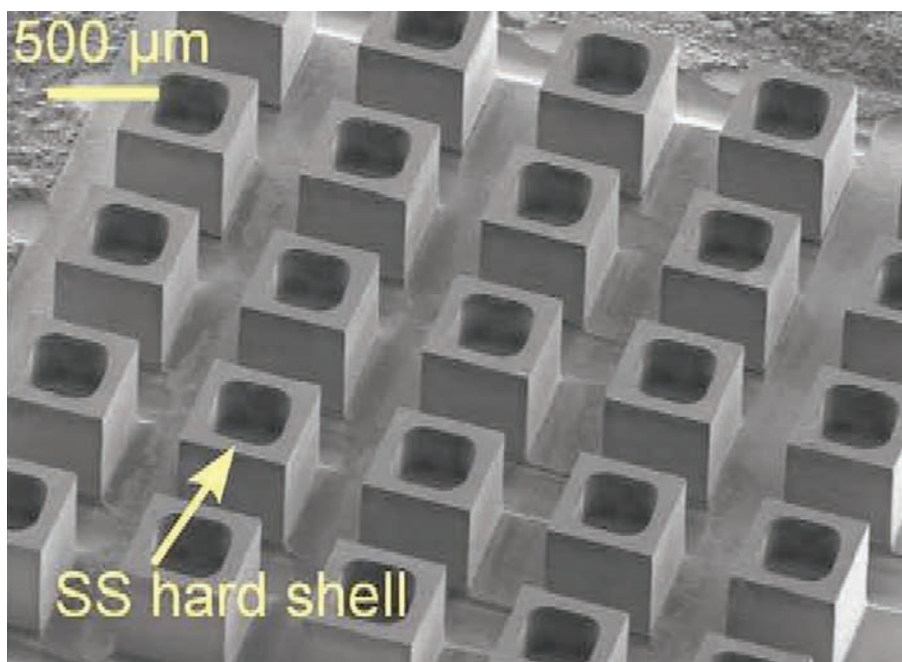
energy industry. When the AEC began, petroleum geologists were just beginning to pay attention to shale gas reservoirs. The rise of hydraulic fracturing and horizontal and diagonal drilling has opened these plays to increased exploration and development. Scientists are still learning about how these formations hold resources, move fluids and generally behave compared with larger-pore sand and carbonate reservoirs that have more traditionally been drilled.

As a result, companies using hydraulic fracturing typically only recover a small percentage of resources from the better parts of the shale gas reservoirs, meaning they leave a major share—and billions of dollars' worth—of gas or oil underground due to economic and technological constraints and gaps in data. Studies with nanoparticles hold vast potential to fill in the blanks, where even a modest increase in recovery would have major impacts.

"If we can get a better set of data and more information to make interpretations, it's going to translate into higher recovery," Kipper said. "If it is 1 percent [increased recovery], it will translate into billions of dollars for the industry."

For now, the work of the consortium and its members is progressing mostly in labs and through initial field tests. Kipper said commercial production of nanoparticles and sensors for the energy industry is a few years away, but researchers have been encouraged by results and haven't run into any major roadblocks in their studies.

"We didn't know much about subsurface nanosensing [when we started], but that's where some of the best ideas come from, when you get a bunch of smart people together and challenge and fund them," Tinker said. "We're giving birth to a whole new scientific space and opening a new area for application of nanotechnology."



Opposite: Bureau of Economic Geology research scientist and project manager Mohsen Ahmadian (center) works with geology students Krystal Heibel and William Lu at the Advanced Energy Consortium nanotechnology lab. This page: At top left, diagram of AEC smart sand nanotechnology. At top right, smart sand on a penny. Above, smart sand in protective hard shell.



LIFELESS WATERS

Analysis reveals how limited natural buffering of Mississippi River pollution is likely contributing to Gulf of Mexico “dead zone”

By John Williams

"FOR WHATEVER WE LOSE..., IT'S ALWAYS OUR SELF WE FIND IN THE SEA,"

the poet E.E. Cummings once wrote. Cummings was no water-quality expert, but his line unintentionally touches upon a major environmental problem: Pollution, generated by humans on land, is washed into seas and oceans, resulting in the creation of hypoxic areas—or "dead zones"—in coastal waters around the world.

Dead zones are regions unable to sustain fish or other aquatic life. One of the largest, and most persistent, lies in the Gulf of Mexico off the Texas and Louisiana coasts, the result of pollution washed into the Gulf from the Mississippi River, which drains roughly 40 percent of the continental United States. The problem has existed for decades, despite virtually every drop of water in the gigantic Mississippi River system undergoing a natural process to filter out pollution.

Now, research published by two hydrologists from the Jackson School of Geosciences helps explain why that filtering system is not as effective as it could be. That could provide the first step in helping water-quality scientists better understand how to deal with the Gulf's dead zone.

The research was conducted by Bayani Cardenas, associate professor of hydrogeology, and Brian Kiel, who is scheduled to complete his work for a Ph.D. in geological sciences this December. It was published in the June 2014 issue of the journal *Nature Geoscience*. Cardenas and Kiel studied the Mississippi River system's effectiveness in dealing with a particular pollutant—nitrate—and its link to the Gulf's dead zone.

Water scientists have long known the effects of nitrates on water quality. An overabundance of nitrates can supercharge the growth of algae and other aquatic plants that consume the dissolved oxygen in the water. In rivers, nitrate pollution can result in unsightly "algal blooms" on the water's surface and, in some extreme situations, kill off fish and other aquatic life that are unable to escape to more oxygen-rich water.

Nitrates have much the same effect in Gulf coastal waters, triggering the rapid growth of free-floating algae and other single-cell organisms. As they die off, they drop to the bottom of the water, displacing live organisms that help produce dissolved oxygen. The lower oxygen levels in the water can impair the ability of some fish to reproduce. Eventually, the fish and other aquatic species swim away to more oxygen-rich zones; slower-moving species, such as clams, oysters and lobsters, begin to die off. The phenomenon is especially worrisome to commercial fisheries that work the Gulf's coastal waters, as well as those who fish for recreation in the Gulf.

GLOBAL TREND

The phenomenon is not unique to the Gulf of Mexico. According to one estimate, more than 400 hypoxic regions have been documented in coastal waters worldwide. But the Gulf of Mexico's dead zone is worrisome because of its size. By some accounts, it is the largest in the United States and second largest in the world. In summer 2013, it covered at least 5,800 square miles of sea floor—an area roughly the size of Connecticut—according to the National Center for Coastal Oceans Science, an arm of the federal National Oceanic and Atmospheric Administration.



The Mississippi River's natural ability to filter out pollutants has become overwhelmed.

The zone has varied in size, from 15 square miles in 1998 to 8,400 square miles in 2002. Whatever its size, it has existed for decades—shrimp trawlers reported its existence as early as 1950.

Scientists have long tied the Gulf's dead zone to the nutrient-rich waters discharged by the Mississippi River. One factor is the sheer size of the Mississippi's basin: Encompassing more than 1.2 million square miles, the basin includes the Ohio River and Missouri River watersheds and covers all or parts of 32 states and two Canadian provinces.

The basin also cuts across the farm belt that produces much of the nation's agricultural produce. Farmers feed their crops with nitrate-rich fertilizers, and the cattle, hogs and other livestock excrete nitrate-rich manure. Heavy rains wash the fertilizers and manure off the land and into nearby creeks and rivers that eventually flow into the Mississippi and the Gulf of Mexico.

Like any other basin, the Mississippi has a natural buffering system that deals with water pollution. The system consists of hyporheic zones along streambeds, where groundwater and surface water mix. As the water percolates through the soil, the sediment acts as a filter to remove pollutants or initiate chemical changes that render them harmless.

The most effective hyporheic zones appear to be located in places where streams curve and bend (a quality known as sinuosity). At these locations the water spends more time percolating through the sediment, allowing more time for pollutants to be removed or neutralized. Soil composition of the sediment is also a factor: Sediments with larger or rockier grain size are more effective in filtering out pollution than sediments with finer-grained soils. However, if the sediment is too permeable, water flows through too quickly, which doesn't allow sufficient time for the chemical reactions that reduce pollutants.

A basin the size of the Mississippi has numerous hyporheic zones to deal with pollution. Yet the persistent presence of the Gulf of Mexico's dead zone indicates there is a problem.

The topic was a natural for Cardenas, a hydrogeologist who joined the Jackson School in 2006 and heads a research group that studies the flow and transport dynamics of natural hydrologic systems.

"I am particularly motivated by problems that cross disciplinary boundaries which require drawing ideas and approaches from different fields," he wrote on the group's webpage. He has authored or co-authored more than 80 papers on a variety of issues in this field.

In 2009 he published two papers on the relationship between a stream's sinuosity and its hyporheic flow and exchange. The papers discussed a theoretical model that could be developed, but

Cardenas' model lacked input from actual conditions that could determine its effectiveness.

Enter Kiel, who as part of his graduate degree research had begun collecting data on the Mississippi basin and the ability of river systems to deal with pollution. The data from Kiel's studies were "what my model needed," Cardenas said.

POOR FILTERS

Joining forces in 2013, the two spent more than a year analyzing data from millions of points throughout the Mississippi basin that Kiel had obtained from the U.S. Geological Survey and the Environmental Protection Agency.

The resulting computer model painted a detailed picture of how the Mississippi's buffering system is dealing with pollution. While nearly every drop of water—99.6 percent—passes through one or more of the Mississippi's hyporheic zones, the model found a wide variation in the time spent in the zones, from less than an hour in headwaters to more than a month in larger channels. (According to an earlier study, water must spend at least seven hours in hyporheic zones in order for the sediment to deal effectively with pollutants.)

Locating the zones on a map of the Mississippi basin, Cardenas and Kiel were able to illustrate the areas where water spent more time. These are the areas or zones more likely to filter out nitrates. Zones with longer residence times were shaded in dark blue, while zones exhibiting shorter residence times were shaded in lighter colors.

Cardenas and Kiel determined that only about one-fourth of the zones were effective in removing or neutralizing nitrates. In the other zones, the water was not spending sufficient time for the chemical changes to take place that would remove or neutralize the nitrates. Leaving these zones, the nitrate-loaded waters continued their flow into the Mississippi River—in effect turning the river into a "conveyor

belt," as Cardenas put it, for dumping nitrates into Gulf waters.

The findings, Cardenas said, were a "disappointment" in that they illustrated the Mississippi River system's limited ability to control the nitrates contributing to the Gulf's dead zone.

"It will require an engineering solution, because the natural system is apparently not capable of dealing with it," Cardenas said.

Kiel agreed.

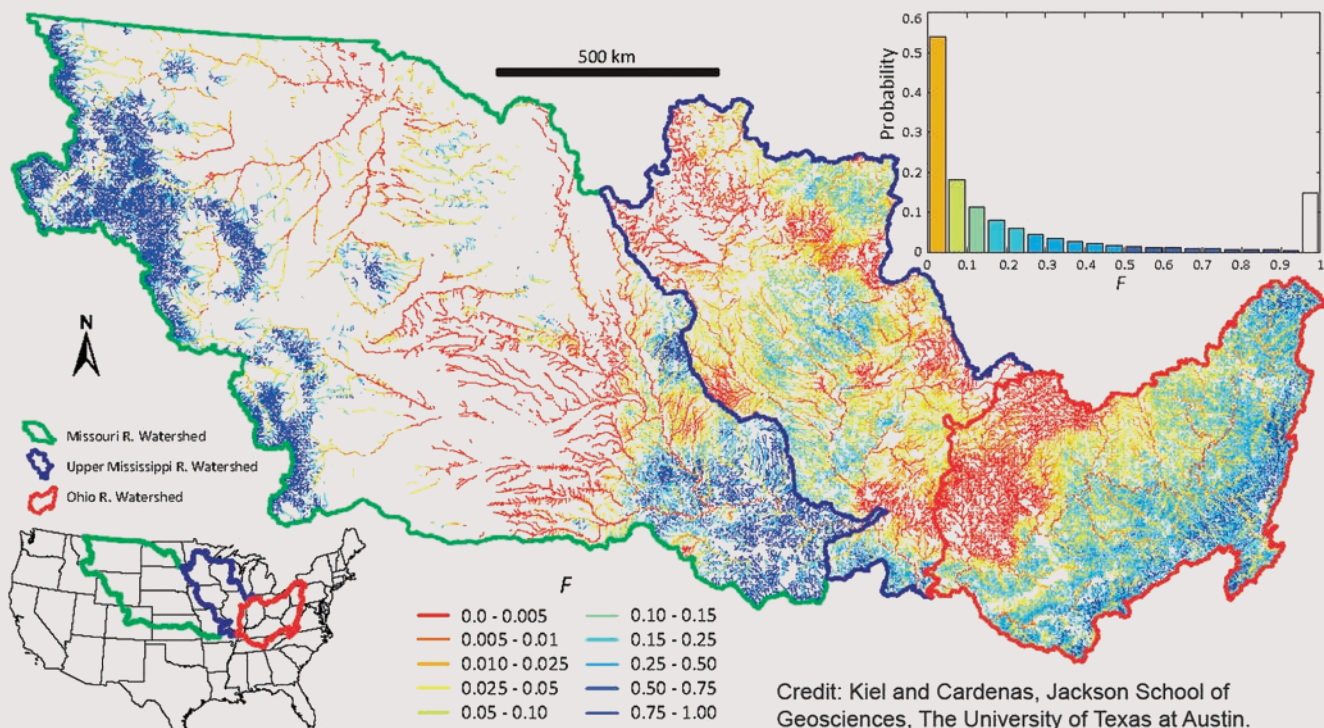
"Right now, the Mississippi River system isn't cutting it," he said.

While the model is not designed to measure the amount of pollution or propose solutions, it can be a useful tool in studying water-quality issues. Cardenas said the model can be adapted to study problems with phosphorus (another nutrient that, like nitrates, can accelerate unwanted algal growth), as well as dissolved organic carbons and other pollutants.

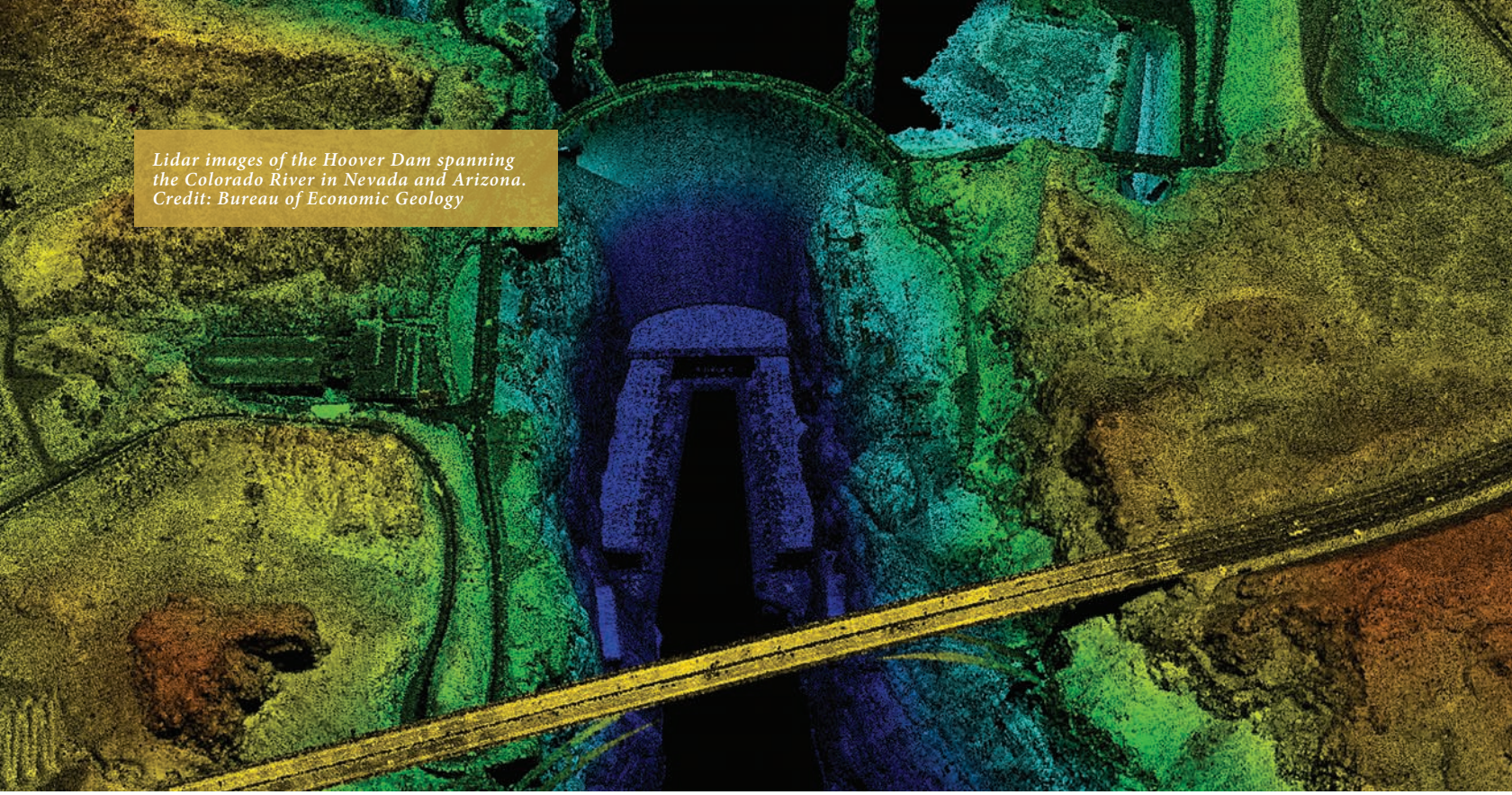
The model can also be used to analyze other river systems. Cardenas is planning such a study on the Colorado River between Austin and Bastrop. That segment of the river experienced major pollution problems in the 1980s. Cardenas' study will help determine how water quality has fared since the river segment was cleaned up in the early 1990s.

As the model is adapted to study the pollution problems of the Mississippi and other river basins, the results of those studies could enable water-quality experts to develop more effective solutions that prevent or control pollution. That could one day help reverse the dead zone that has plagued the Gulf of Mexico and other regions, and remove the noxious pollution—that part of "our self," as E.E. Cummings put it—that we don't want to find in the sea.

Map and probability distribution of the fraction of laterally exchanged water (F) for the Mississippi River network. Map shows the fractional amount of surface water that is likely to enter the hyporheic zone, where it can undergo filtration. Orange and red represent areas experiencing a lower fraction of water entering the hyporheic zone. Dark blue areas approach 100 percent likelihood water will enter the zone.



Credit: Kiel and Cardenas, Jackson School of Geosciences, The University of Texas at Austin.



Lidar images of the Hoover Dam spanning the Colorado River in Nevada and Arizona. Credit: Bureau of Economic Geology

Ride High and Seek

Texas researchers have gained an eagle-eyed view of the world thanks to a premier digital mapping tool

By Joshua Zaffos

Halloween was particularly scary in the Texas capital in 2013. An intense storm over south Austin caused Onion Creek to top its banks and flood hundreds of homes. In just 15 minutes, the creek rose 11 feet and sent walls of water and debris through nearby neighborhoods, killing five people.

In the aftermath of the flash flood, researchers at the Bureau of Economic Geology (BEG), part of the Jackson School of Geosciences, took to the sky on a “first response” effort with one of the world’s most advanced digital mapping tools. Using the Bureau’s airborne laser-based instrument system—known as lidar—scientists were able to quickly scan the disaster zone by plane to collect detailed measurements of flood erosion and debris movement, and then create high-resolution digital elevation maps.

The reconnaissance was a major assist for Lindsay Olinde, a Jackson School student pursuing her doctorate, who is comparing pre- and post-flood images of Onion Creek to recognize how different sections of the creek responded to the flash flood.

“Integrating these results with flow modeling will improve our understanding of how streams respond to flash flood conditions,” Olinde said. “The extensive resources required to collect lidar datasets are truly rare. Without the support from the BEG, especially the expertise of Kutalmis Saylam (Bureau scientist associate who oversees the lidar program), this unique record would have been unrecorded.”

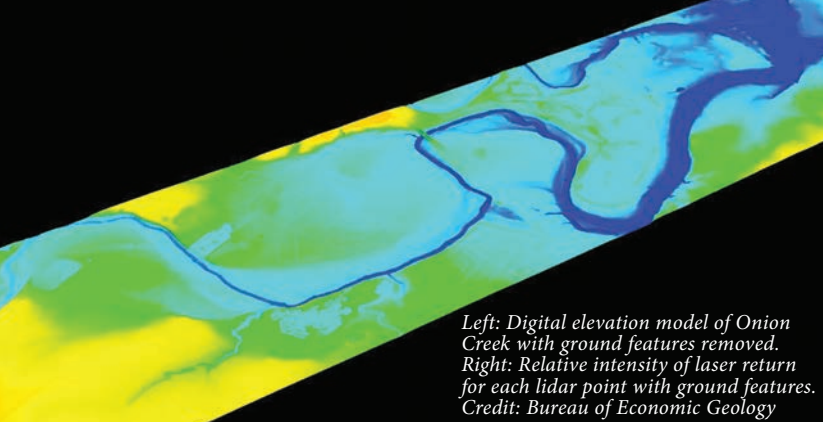
The Onion Creek survey was a collaborative—and swift—success within the Jackson School. The Bureau’s state-of-the-art lidar unit is capable of very in-depth and long-term analyses and has been used on projects from the Gulf Coast to Alaska’s North Slope.

Named Chiroptera, the Latin name for bats, the Bureau’s new lidar unit can detect landforms and details on the ground and also identify underwater, or bathymetric, features, piecing together data with precision and detail that was unimaginable just a few years ago. The technology enables scientists to detect ancient archaeological sites hidden beneath tree canopies and vegetation, measure the length of coastlines and depth of lakes, and monitor and prepare for environmental changes and disasters, including flooding, land subsidence and the formation of sinkholes.

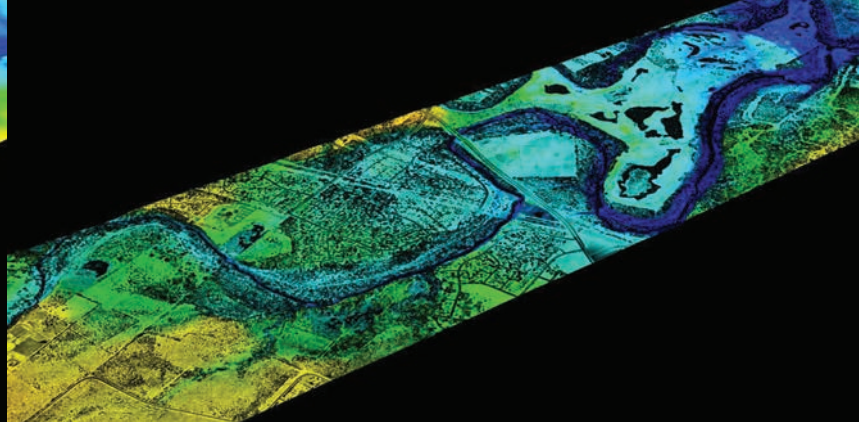
“Laser mapping provides an amazing level of detail that helps us build flow models much more accurately than was done in the past,” said Michael Young, associate director of the Bureau.

Better Than the Naked Eye

Lidar relies on laser technology, in which the instrument emits laser pulses toward ground surfaces, receives the reflected signal and stores the data. The system is mounted in an airplane, or sometimes a helicopter, and then flown at relatively low elevations, around 1,200 feet above the ground.



Left: Digital elevation model of Onion Creek with ground features removed. Right: Relative intensity of laser return for each lidar point with ground features. Credit: Bureau of Economic Geology



Near-infrared wavelengths detect topography, but the most sophisticated and newest lidar units, such as Chiroptera, also emit light in green wavelengths to measure bathymetry. The resulting digital maps and data weave together above-ground and underwater landforms and features down to an inch-by-inch resolution, and allow researchers to understand natural processes and changes at an otherwise unattainable scale.

“Lidar will show you things your eye cannot distinguish,” said Saylam.

Jackson School researchers bought the program’s first airborne lidar unit and began using the technology in 2000. The state General Land Office contracted with the Bureau to monitor the Texas Gulf Coast and measure beach erosion and recovery following hurricanes and major storms. Whereas on-the-ground surveys can take weeks, airborne lidar can gather spot-on data in just hours.

Young said the digital maps improved the pace and progress of coastal reconstruction by giving managers a relatively quick and very precise picture of geographic changes—on land, that is. The data stopped at the waterline since the original system wasn’t capable of providing bathymetric measurements, a major advance in recent years.

The school procured its new, state-of-the-art unit in 2011-2012 thanks to a grant from the General Land Office. Young and others customized the system specs to fit the Bureau’s needs, while also taking advantage of technical improvements that allow for quicker data collection and storage and greater resolution. Manufactured in Sweden by Airborne Hydrography AB, Chiroptera and its lasers and sensors fit in a square box about 2.5 feet long on each side. The unit weighs about 200 pounds, making it mobile and light enough to be used in many types of aircraft.

“We had an opportunity to push the scientific envelope, so to speak,” said Young, explaining that the new lidar system shoots up to 400,000 laser pulses per second, 20 times faster than the previous unit. “We can fly over, see right where the water line begins at the shoreline, and then measure below the water surface and stitch everything together in one image. It really changes what we can do.”

At the same time, the Bureau purchased a hyperspectral imaging system, a unit that also fits on an aircraft platform and complements the lidar in terms of data collection. Hyperspectral imaging uses reflected light at different wavelengths and intensities to collect a wide range of information, including vegetation and soil cover types, ground temperatures and mineral compositions.

Exclusively at the JSG

Saylam, a lidar remote-sensing expert who joined the Bureau to oversee lidar and surface mapping projects, said no other academic institution in the United States has a similar hyperspectral imaging unit. With the unrivaled airborne laboratory setup, Bureau and Jackson School researchers have already collaborated with federal and state government agencies, industry and other scientists eager to tap

into the Jackson School’s resources—and play with its high-tech toys.

Working with industry partners in 2012, a group led by Jeffrey Paine, manager of the Bureau’s Near Surface Observatory, flew over and surveyed 490 square kilometers along Alaska’s North Slope.

A remote and ecologically sensitive area covered by permafrost, the North Slope is receiving attention for potential new energy production. The lidar and bathymetric surveys mapped and measured wetlands and kettle lakes. The rapid survey and unprecedented surface details will help managers better understand the overlap of energy and environmental resources and inform decisions on which areas to avoid or protect and which are better suited for exploration. During a previous field survey, researchers used rowboats and poles to manually collect data on 20 lakes during an entire season; the airborne lidar surveyed more than 200 lakes in six days, representing a huge advance in data collection. Another survey on the North Slope was completed this summer.

Saylam said the lidar system has since been used on nearly 20 different surveys in less than two years. In Nevada, scientists employed the system to map potential desert tortoise habitat around Las Vegas, identifying individual rock ledges and shrubs that are essential for young tortoises. Dave Mohrig, a professor at the Jackson School, teamed with the lidar group to measure the topography and bathymetry between islands within Louisiana’s Wax Lake Delta, which has been used as a case study in delta regrowth and recovery along the Gulf Coast.

In 2015, with funding from the National Science Foundation, Joseph Levy, a research associate at the Jackson School’s Institute for Geophysics, hopes to use lidar and hyperspectral imaging in Antarctica’s dry valleys to produce unprecedented, highly detailed maps that should vastly improve what scientists know about the hydrology of the freezing deserts of wind and ice.

In addition to the 2013 post-flood reconnaissance in Austin, the school’s lidar system has been used to map the growth of sinkholes in West Texas. The infamous Wink Sink 1 formed in 1980 and spans roughly 110 meters across and 34 meters deep, while Wink Sink 2 opened in 2002 and has grown to 137 meters wide and as deep as 250 meters.

Bureau researchers led an airborne lidar survey of the sinkholes and surrounding area in November 2013 and will use the data to create maps and estimate land subsidence rates around the geological hazards. The project, led by Paine, may even help scientists determine the causes behind the sinkholes and future risks.

“You can let your imagination run wild in terms of the types of questions that [lidar] can be used for, from assessing risk upfront to calculating damages after an event,” Young said. “Laser mapping as well as the imaging really increase the capacity of the school for doing research and answering science questions.”

BACK FROM TOTTEN

Unbreakable ice alters research plans for UTIG researchers

By Terry Britt

Even when uncontrollable circumstances keep an expedition from reaching its intended landmark, it does not mean the participants come away empty-handed.

Such was the case for those involved in the Totten Expedition, a collaborative scientific research voyage into East Antarctica for about six weeks in February and March 2014. Sean Gulick, an associate research professor at the University of Texas at Austin's Institute for Geophysics (UTIG) explained that the icebreaker vessel on which they were sailing was unable to get through ice that blocked the way to the Totten Glacier.

"Icebreakers, despite their name, can't break all kinds of ice," Gulick explained. The researchers' ship, the R/V Nathaniel B. Palmer, tried three times to get to the Totten Glacier. On one attempt, it took almost three hours for the ship to turn back once it became obvious that passage could not be gained.

Interestingly, though, as the research team explored the systems en route to Totten, they realized it's all one big system.

"We didn't get to the main trunk, which was where Totten comes out of, but we saw a lot of the feeders and saw a part that was probably the second most important, if you will, pathway," Gulick said.

Fellow UTIG researcher Steffen Sastrup noted the area the expedition was able to reach yielded very valuable data itself.

"Gradually that secondary area became more and more interesting to us and actually became of real value. It was almost an accidental data set. The regrettable thing is the time lost attempting to get to Totten. The value of an hour's worth of data is great," Sastrup said.

Gulick said there were actually three areas of discovery in a part of the Antarctic that "effectively had never been explored by ship."

"Fundamentally, we were able to map the seafloor, and in a place where we didn't even know how deep the water was, and observe some sort of dynamic processes of glaciers that occurred

during the last great retreat of the Antarctic ice sheet," Gulick said.

What the researchers found is that the ice sheets and glaciers in East Antarctica are thinning more rapidly than previously thought.

"A lot of people were aware the glaciers and ice sheets are retreating back because you can see that with satellite imagery," Sastrup said. "What I didn't know coming into this is they are thinning even faster than they are retreating back in places so the total volume loss of ice is greater than I realized, because I'm not a glaciologist."

"The question now becomes why they are thinning as well as retreating, and thinning faster than predicted by models just based on air temperature, sunlight and things like that," Sastrup said.

UTIG researcher Rodrigo Fernandez-Vasquez added about the significance of the expedition's findings, "Now we know there are several glaciers below sea level and this (Totten) is one of those. That was the main hook for this research. This is one of the places in East Antarctica that ... is more unstable than we think."

David Gwyther, a University of Tasmania Ph.D. student currently completing a Fulbright scholarship at the university, elaborated on the changes taking place.

"This is the region in East Antarctica that is showing the greatest change. It's the glaciers that have very deep grounding lines so that the glacier starts to float. If we look at areas of thinning, they are also the areas that have these deep grounding lines and there is probably warm water coming in. The theory is the ocean is changing and driving this increased thinning," Gwyther said.

He said the research on the expedition provided a nice confirmation of three years of modeling work about the area.

"The head oceanographer wanted to do a map of temperature and salinity. We did that and put some of the measurements taken at the same depth, and the model predictions were spot on with what we were measuring," Gwyther said.



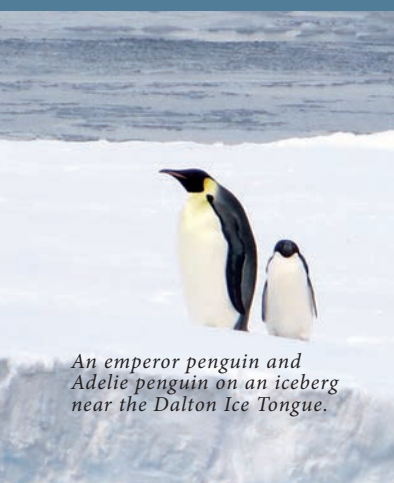
Icebergs broken off of East Antarctica ice shelves.



Looking at sediment collected in a jumbo gravity core on the R/V Nathaniel B. Palmer.



A cruise-ship-sized iceberg.



An emperor penguin and Adelie penguin on an iceberg near the Dalton Ice Tongue.



Collecting high-resolution seismic data.



Recovering a multicore used to collect samples of the seafloor and shallow sediments.

GeoFORCE alum Jeff Sitgreaves is now a Ph.D. student at the Jackson School.



GEOFORCE TURNS 10

Building a diverse workforce and changing young lives

By Angela Curtis

At first glance, the two problems may seem unrelated: The geosciences are facing a growing labor shortage, and many talented high school students in underprivileged areas of Texas aren't realizing their full potential.

The Jackson School of Geosciences is addressing both issues with a single program—GeoFORCE. The program takes high school students from two disadvantaged areas of the state—inner-city Houston and rural Southwest Texas—on field trips for four summers, visiting geologically significant sites around the country. As a result, potential geologists are introduced to the profession, and students from disadvantaged areas find a path to college and rewarding careers.

The program also addresses an industry dilemma. A 2014 report from the American Geosciences Institute predicts nearly half of geoscientists will retire by 2022. Combine that with a booming industry and a lack of geoscience students—especially those from diverse

racial backgrounds—and you have a profession at a crossroads.

“If we are going to meet the challenge of meeting the growing labor shortage of geoscientists, then we have to be inclusive in providing opportunities such as GeoFORCE that provide students the experience and information needed to make informed choices about careers in the geosciences,” said Samuel Moore, director of outreach and diversity at the Jackson School.

Eighty percent of GeoFORCE participants are members of minority groups. Since its inception, GeoFORCE has been a robust success, delivering:

- 100 percent high school graduation;
- 96 percent college matriculation;
- 94 percent sophomore persistence;
- 64 percent college STEM (science, technology, engineering, math) majors—more than double the national average; and

- 16 percent college geoscience majors—more than 50 times the national average.

GeoFORCE is more than an introduction to the geosciences. The program offers high school students advice on applying for college and help preparing for the SAT and ACT. After high school, GeoFORCE helps students transition to college and the workforce.

What's Geology?

"Before GeoFORCE, I didn't know what geology was," said Victoria Fortiz, a GeoFORCE alum and current Jackson School senior.

That's part of the problem, said Eleanor Snow, associate director of outreach and diversity at the Jackson School.

"Students are not hearing about geosciences when they're in high school," she said. "The really smart kids who are very good at sciences don't know this is another option for them because what they see is AP biology, AP physics, AP chemistry, and they think that's it."

Now Fortiz, a first-generation college student from Eagle Pass, is on the verge of graduating, with plans to go to graduate school to study geological oceanography.

"GeoFORCE gave me my career path," she said.

GeoFORCE alum Marissa Vara, who grew up in Uvalde, graduated from the Jackson School in May 2014 with a degree in geological science. She interned with the Texas Commission on Environmental Quality this summer and plans to sail on an Antarctic research expedition in October. Afterward she plans to attend graduate school and become a marine geologist.

When Vara first learned about GeoFORCE, her father was reluctant to allow his youngest child to travel far from home, but her mother encouraged her to take advantage of the opportunity.

"Truthfully, I was not particularly excited about spending a week looking at rocks, so I viewed the first two years of GeoFORCE as an opportunity to obtain new life experiences, like taking my first plane ride," Vara recalled. "It was during my junior-year trip to Oregon, however, that I became hooked on geology."

That's a common trajectory, said program assistant Ann Merriman.

"It's amazing to see the change in what they're learning and taking out of the experience," Merriman said.

At the end of every year, students write essays about their experiences. During their first couple of years, students tend to focus on the life skills they developed during the trips—remembering to bring their cellphone chargers, packing their bags and setting their alarms. That focus shifts during their final years in the program.

"By the time they're older, they're talking more about being confident in their science knowledge and academic skills," Snow said.

Jeff Sitgreaves of Bracketville was the program's first geology graduate. Sitgreaves earned his undergraduate degree in 2013 from the Jackson School, where he is now attending graduate school. He interned this summer at ExxonMobil and plans to pursue a career in the energy industry.

"I wouldn't be in the geosciences if it weren't for GeoFORCE," Sitgreaves said. "My first year, I thought, 'This is kind of interesting.' The second year, 'This is cool.' Then by the third year, 'Yes, this is what I want to do.'"

More information about GeoFORCE is available at www.jsg.utexas.edu/geoforce.



GeoFORCE alumni Isaac Jimenez and Marissa Vara at the Jackson School spring 2014 graduation ceremony.

Keeping GeoFORCE Going

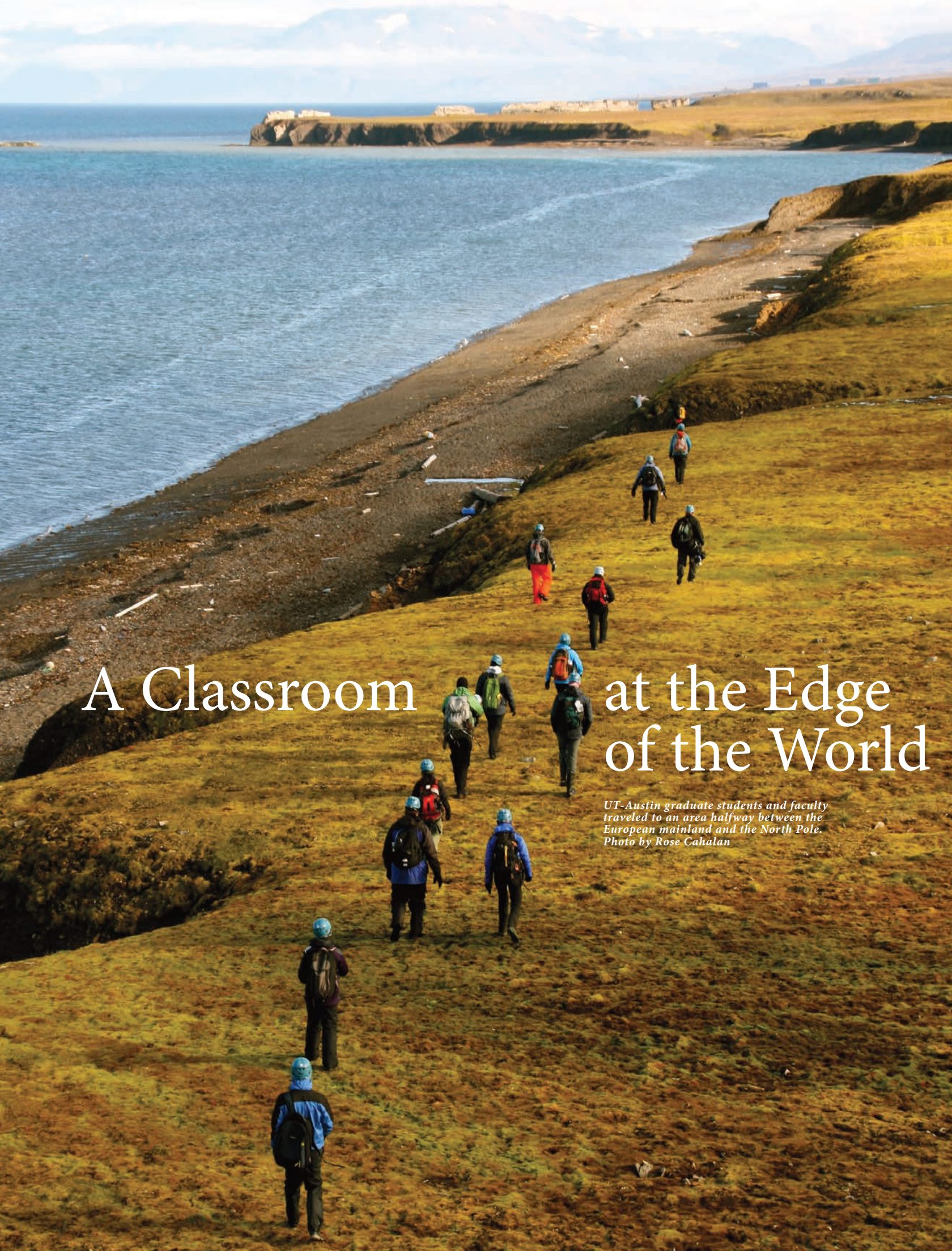
Now entering its 10th year, GeoFORCE aims to raise money for an endowment to help it continue in perpetuity. The endowment was kick-started by a \$500,000 matching grant from an anonymous donor, and ConocoPhillips has pledged a \$50,000 matching grant. The Jackson School of Geosciences must raise dollar-for-dollar matching funds by Aug. 31, 2015.

"Thanks to annual gifts from companies, foundations and individuals, we have been able to provide this opportunity every year for the past decade. If we want to ensure that GeoFORCE is sustained in future decades, building an endowment is essential," said Samuel Moore, director of outreach and diversity at the Jackson School.

GeoFORCE needs stable, recurring revenue to supplement support from companies, foundations and individuals, which can fluctuate from year to year.

"The endowment will make sure the program is there even if times get rough and annual contributions slow down," said Eleanor Snow, associate director of outreach and diversity.

Contribute to GeoFORCE by clicking "Make a Gift" at www.jsg.utexas.edu, or contact Karen Cochran at kcochran@jsg.utexas.edu or 512-471-6010.

A group of approximately 15 hikers, seen from behind, are walking along a wide, grassy path that slopes down towards a body of water. The hikers are wearing various outdoor gear, including backpacks and hats. The water is a deep blue, and the distant shoreline features a prominent, flat-topped island or headland. The sky is overcast with soft, grey clouds. The overall scene conveys a sense of adventure and exploration in a remote, natural setting.

A Classroom at the Edge of the World

*UT-Austin graduate students and faculty traveled to an area halfway between the European mainland and the North Pole.
Photo by Rose Cahalan*

A journey to the Arctic, where polar bears outnumber people, the sun never sets, and the frozen tundra is a geologist's paradise.

By Rose Cahalan

There's a pair of binoculars in my backpack, but I don't need them. The slick head of a ringed seal breaks the water just a stone's throw from the Zodiac boat. Our driver kills the motor so as not to disturb the animal, who watches us through impassive black eyes and a thick plume of whiskers.

He regards us coolly for a moment, blinks, and then sinks back into the gray waters of the Barents Sea. The Zodiac's motor sputters to life again, and freezing raindrops fleck our coats and hats as we push on toward the rocky shore.

It's just another day in Svalbard, the remote Arctic island chain where a group of UT graduate students and professors spent a week in August 2013. The trip's aim was to teach geology and petroleum engineering skills in one of the world's most rare and compelling research sites. But by the week's end—after countless hikes and lectures and wildlife encounters and frost-nipped fingers—it would become about much more than that. It would be the adventure of a lifetime.

Due North

In 1908, when the explorer Frederick Cook claimed to reach the North Pole—historians are still arguing over whether he really made it—he wrote in his journal, “We were the only pulsating creatures in a dead world of ice.”

Cook missed Svalbard by a few hundred miles, but the sentiment still rings true. Step off the plane in Longyearbyen, the world's northernmost town and the jumping-off point for Svalbard expeditions, and you're initially struck by two things: the cold and the quiet. In summer, temperatures rarely rise above 40 degrees Fahrenheit, and in winter they tend to stay below zero. From April to August, the sun doesn't set, while from October to February, the land is enveloped in total darkness. In the center of Longyearbyen, where there are shops and bars and restaurants, there's an almost eerie stillness in the chilly air. People walk briskly with gloved hands buried deep in their pockets, and everyone carries a gun.

Carrying a firearm is required by law in Svalbard, because the archipelago's 3,000 polar bears outnumber its 2,000 human residents—and the bears are the masters of the land. “We have a saying here,” a scientist at UNIS, the small university outpost in Svalbard, told our group. “If you don't know what you're doing in Svalbard, Svalbard will kill you.”

She wasn't joking. In what is surely among the world's most unusual college orientation programs, new students at UNIS spend their first day learning to handle a rifle at a shooting range. Step two is an intensive safety course covering all the technical gear and know-how needed to survive in a harsh environment—like how to avoid a fatal fall into a crevasse when hiking on a glacier. (Answer: use safety ropes, and be extremely careful.)

Luckily, our group wouldn't face such dangers alone. We would be traveling in comfort aboard the M.S. Expedition, a cruise liner chartered by the Norwegian oil company Statoil. For the past 13 years, Statoil has hosted a field class called Svalex (for “Svalbard expedition”) aboard the Expedition. Every summer, the course brings Norwegian graduate students to Svalbard—a territory of Norway, located about halfway between the European mainland and the North Pole—to study the area's unique geology up close.

In 2011, when UT inked a \$5-million research partnership with Statoil, the university and the company were looking to strengthen

The Pyramiden settlement in Svalbard was built by Soviet colonists in the 1940s and stands virtually untouched today. Photo by Kyle Yuhao Sun





Sayantan Bhowmik was among 58 graduate students who traveled to Svalbard, Norway, on a seven-day field course in 2013. Photo by Rose Cahalan

their longtime ties. Scott Tinker, who directs UT's Bureau of Economic Geology and serves as acting associate dean of the Jackson School of Geosciences, remembers the day it all began. As an afterthought at the end of a meeting, Statoil manager Brit Ragnhildstveit told Tinker about Svalex. Would Tinker be interested in talking about a UT version of the expedition? "I almost jumped over the table," Tinker says. "Would we be interested? Of course we were interested!"

Two years and dozens of planning meetings later, our group of 76—including 58 UT grad students in geology or petroleum engineering, 17 faculty members, and one wide-eyed *Alcalde* reporter—boarded the first of three flights in a long journey from Austin to Svalbard. The big, boisterous, burnt-orange-wearing, hiking-boot-clad group attracted more than a few stares in the airport. As the plane backed away from the gate in Austin, the PA system crackled to life and the pilot said cheerfully, "Good luck to all you UT Longhorns!"

We would need it. After 30 hours in transit and a short first night's sleep aboard the Expedition, we woke early for the first of many landings. The ship's crew had already been up for hours, scouting the land where we would hike to make sure it was clear of polar bears. Armed guards would flank us during every hike, although needing to shoot a bear is a rare and tragic last resort. "There's more paperwork in Svalbard if you kill a bear than

Found only in Svalbard, the Svalbard reindeer evolved to be smaller and hardier than other species so it can survive in the harsh tundra environment. Photo by Kyle Yuhao Sun

if you kill a person," crew member Kerstin Langenberger says, scanning the horizon through binoculars. "They are such incredible animals, and they are fiercely protected here."

Seeing a bear in the summer is rare, since they head north in pursuit of polar ice, but summer encounters are also especially dangerous, since the bears are hungrier: less ice means bears have a harder time hunting seals. "I'm extra careful when we're on the beach," Langenberger says, "because unlike on land where you see them coming, they can pop up out of the water with no warning, and then we're in trouble."

But we weren't there to see bears. We were there for the rocks.

Geologic Time Travel

"We just walked across 240 million years of history," Ron Steel says. "I don't think there's anywhere else in the world where you can do that."

A compact man with a Scottish brogue, silver hair, and twinkling eyes, Steel chairs UT's Department of Geological Sciences. He has made 33 research trips to Svalbard over three decades. Although the Svalex class was officially (and expertly) led by a team of five Norwegian professors, with the UT faculty watching and contributing informally, Steel spoke with singular authority.

To call Steel unflappable would be an understatement. In 1980, he slipped and broke his knee while doing fieldwork late into the sunny polar night on a Svalbard slope. His graduate students had to carry him down the mountain to spend two excruciating days in a hut awaiting a helicopter rescue from their remote research site. Ask Steel what that was like, and he shrugs it off: "Oh, it wasn't pleasant," he deadpans.

Bounding across a moss-carpeted valley in the Festningen site of Svalbard, Steel looks far younger than his 68 years. He has a bounce in his step, and it's not just the springy permafrost underfoot, which feels a bit like walking on a very large mattress. As students walk up to the outcrops and sketch geologic formations in yellow field notebooks, Steel hovers, always with a question or a few words of encouragement, pushing the students to get even closer to their subject.



“Beyond looking at the rocks,” he says, “you should feel them in your hands, hold them, even smell them.”

Svalbard is a mecca for geologists because it offers unparalleled access to the earth’s history. A full 30 percent of Svalbard is exposed rock, while 60 percent is glaciers, and only 10 percent has vegetation. Since there are few plants on the Arctic tundra, the rocks are there for the taking—a researcher can simply walk right up and see millions of years worth of strata. Fossilized leaves and ferns from the warm Carboniferous period, roughly 350 million years ago, trace Svalbard’s continental drift north from the Equator. Touching a leaf fossil in a land that has been treeless for eons somehow makes the mind-bending concept of geologic time easier to grasp.

And while photos and diagrams can depict geologic formations in great detail, nothing beats the muscle memory that comes from the real thing. “Photos help, but you never really understand until you touch the rocks,” says Isaac Smith, a doctoral student in geology. “And once you do, it sticks with you for a long time.”

In addition to hands-on experience, the trip also aimed to bridge the gap between geologists and petroleum engineers. Although the two work closely in the oil industry—where most of these students will end up—they use different jargon and often struggle to relate. So the class paired geologists and engineers together in small groups and gave them interdisciplinary tasks. What are the features of a particular outcrop, and what would be the safest, most efficient way to drill for oil there? It takes both a geologist and an engineer to answer those questions, and they did, in presentations delivered at the end of long days—as late as 10 p.m.—over tea and cookies in the Expedition’s cozy meeting room.

But the diversity on the ship went far beyond geologists and engineers. It was, as Tinker says, “like a U.N. meeting.” Reflecting the composition of UT’s graduate school, the students hailed from at least 13 countries, from Taiwan to Argentina to Indonesia to Italy. And the list of professors along for the ride reads like a Who’s Who of the energy world. A twenty-something student might find herself chatting about biofuels over dinner with an engineering and policy expert (Tad Patzek), looking at a glacier with a

climate scientist (Rong Fu) or hiking up a mountain with the state geologist of Texas (Tinker). With no phones, no Internet and no distractions, there were only the students, their teachers and the landscape. And we haven’t even arrived at the Soviet ghost town.

Hello, Lenin

Guy Esparon hoists his rifle over his shoulder, tugs his red knit cap down over his ears and cups his hands around his mouth. “Listen up,” he shouts. “I need everyone to stay together. No wandering off. Even though we’re in the middle of town, there could be a bear waiting around the next corner.”

Esparon—a nature guide working on the Expedition—hails from the tropical Seychelles Islands, and he has an accent that evokes coconuts and sunshine. I feel warmer just standing near him. Back on the ship, he’s a jokester, passing around his recipe for the perfect pineapple cocktail, but now he’s all business.

We are in Pyramiden, a former Soviet coal-mining town that was abandoned in 1998. From a junkyard heaped with rusted scrap metal, much of it still covered with Cyrillic writing, we follow a creaking boardwalk past faded 1940s-era apartment buildings and an elementary school with its once-cheery mural of a farmer in traditional Russian dress strolling through a verdant forest. The swings on a half-collapsed jungle gym are still swaying. Beyond the crunch of boots on the ground, the only sound is the cawing of hundreds of seagulls as they coast on the wind above our heads.

Pyramiden once had more than 1,000 residents: men who worked (and died, if they were unlucky) in rickety mineshafts, and women and children who tried to eke out as normal an existence as possible in a lonely settlement at the world’s end. The cavernous cultural center at the top of the town square still holds a grand piano and an empty swimming pool. A towering statue of Vladimir Lenin, with his characteristic scowl, passes silent judgment on us all.

It is with this backdrop that our group does what we came to do: learn geology. Our blackboard is a rusted shipping container, onto which a professor tacks up a diagram of a rock formation, and our classroom is the mountains, the sea and the glaciers that surround us. Everyone starts shivering if we stand still too long, but I’ve never seen a more riveted audience during each half-hour lecture.

The Arctic light—as warm and radiant as the air is cold—casts a luminous, pastel glow over everything. In his book *Arctic Dreams*, nature writer Barry Lopez calls it “a healing light.” I had rolled my eyes at that phrase, thinking it hyperbolic, but as I stand in Pyramiden, feeling a deep calm in this strangest of places, I finally understand what Lopez meant. I will never forget that light as long as I live.

Two days later, we wake to sunlight at 2 a.m. to begin our long journey home. On a bus to the airport, even while we are half-asleep and exhausted, Jackson School of Geosciences professor Daniel Stockli points out a rock formation: “Look at that beautiful Carboniferous outcrop!” Someone teases him—“Aren’t we done?” Stockli shakes his head. “We’re geologists. We’re never done.”

—This article first appeared in *Alcalde*.

At top, a colorful row of houses in Longyearbyen stands in contrast to the bleak landscape. Photo by Rose Cahalan. At bottom, lecture at 199-million-year-old black shale. Photo by Kyle Yuhao Sun



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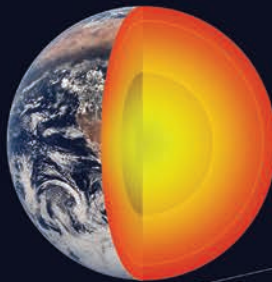
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The Texas Leadership Society is composed of a distinguished group of friends and alumni who have included the University of Texas at Austin in their estate plans. Estate gifts support faculty and research, provide scholarships and graduate fellowships, and keep libraries, laboratories and facilities up-to-date. We would like to recognize those members who have designated the Jackson School of Geosciences as their beneficiary.

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The L.T. Barrow Founders Circle recognizes friends and alumni who have given cumulative gifts of \$100,000 or more since the Jackson School of Geosciences was established in 2005. Named after Leonidas T. and Laura T. Barrow, creators of the first Geology Foundation endowment in 1953, Barrow Founders Circle members honor the legacy of these two guiding spirits of geoscience education at the University of Texas at Austin.

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The Hill Society honors friends and alumni who have given \$10,000 or more over their lifetime in support of the Jackson School of Geosciences. This society is named after Robert T. Hill, the first professor and chair of the Department of Geology and a founding member of the UT Mineral Survey, which would later become the Bureau of Economic Geology.

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Clockwise from top left: TK



Caption Area if needed

ALUMNI NOTES

Jackson School alumni, staff and friends traveled with the Texas Exes to Scotland in summer 2014. The 12-day trip included a stop in Glencoe in the Scottish Highlands. Find more pictures on pages 83-84.



1950s

Jim W. Adams (B.S. '51) writes, "Good to hear all the news from Geology at UT. I am 86 and holding. Enjoying retirement during industry's greatest boom. I have taught the Boy Scout merit badge in geology in Midland at our excellent summer camp in the Davis Mountains of West Texas and at National Jamborees. Would like to hear from friends at 505 Lajitas Dr., Midland, Texas, 79707, or by email at slatsjacobs@suddenlink.net. God bless you all."

Gene Ames, Jr. (B.S. '55) resides in San Antonio, Texas, and can be reached at gamesjr33@gmail.com.

Walter V. Boyle (B.S. '54, M.A. '55) writes, "Vada and I continued our travels with a Crystal Cruise in February this year to Tahiti, Bora Bora and the Society Islands in the South Pacific, and, in late summer, we plan to take a land tour to Eastern Europe. Walt stays busy attending his investment club meetings, men's book club and working in the yard and the garden. Vada continues her volunteer duties with the Houston Symphony League. In June, Vada was elected president of the North Harris County AAUW. We continue to enjoy attending the Jackson School of Geosciences functions, meetings and dinners and seeing and visiting with old classmates and friends."

Philip Braithwaite (M.A. '58) writes, "Barbara and I are still enjoying retirement in Dallas, Texas. We have cut back on traveling the last few years. I spend my time working in the garden and house projects with a little part-time consulting. Barbara keeps up with

Stay in Touch!

Complete and mail the form on page 99 or visit www.jsg.utexas.edu/alumni to let us know what you've been up to recently and to update your contact information.



all the bestsellers in her reading. We have been married for 56 years and hope to enjoy each other for many more years to come!”

Robert F. Brandt (B.S. ’57) is a retired geology professor from Houston Community College. Robert writes, “Still enjoying life in Houston despite the aches and pains to be expected at age 80.”

Jack C. Cartwright (B.S. ’51, M.A. ’55) writes, “Barbara and I are still enjoying our home in the Manor Park facility in Midland after 59 years of marriage. Our relationship began 60 years ago when I returned to UT

for graduate school and she was working in the geology library. We both face some health issues, but we love being with family and friends here in our home during our retirement years. During the past nine years while we lived in this community there were four 1951-52 UT geologists—Pat Bolden, Laddie Long, Jim Adams and myself. Presently, Jim and I are the survivors. Though our ranks are growing smaller each year it is good to have notes from my classmates from the early 1950s. Best wishes to all UT grads!”

James M. Caruthers (B.S. ’56) writes, “Since my retirement from the USGS in 1986, I’ve had adventures ranging from Himalayas climbs to treks in Iceland, Greenland and most recently Patagonia. Also, hikes in the Navajo SS Rainbow Bridge, The Wave and Zebra Canyon Slot.”

Robert E. Doyle (B.S. ’55, M.S. ’57) writes, “I am now marketing a system I invented that will stop and contain the spread of major oil spills. This system was approved by the USPTO in a record seven and a half months. A description may be found in the August 2014 issue of the *Journal of Petroleum Technology* published by the Society of Petroleum Engineers. It was also presented in the May 2014 issue of *Maritime Executive*. I am also in the process of patenting several other inventions dealing with power generation and protection from wildfires. Drop in for a visit should you be in Houston or give me a call at 713-334-4464.”

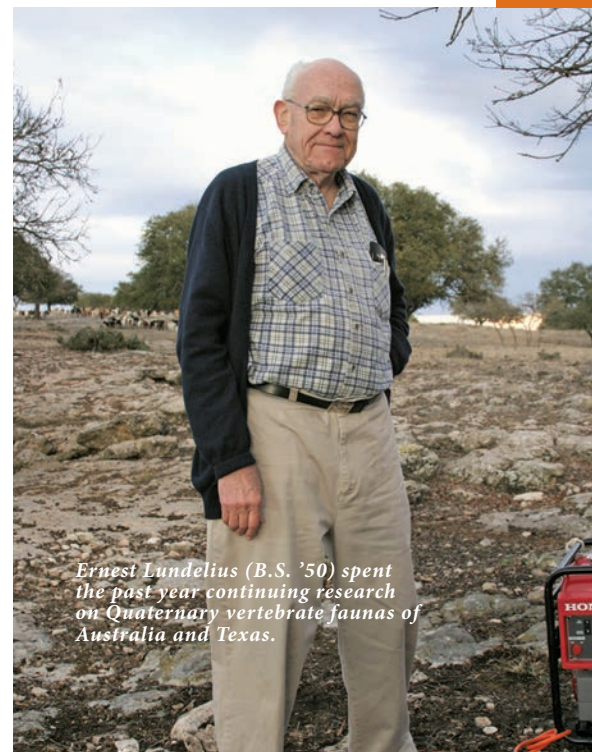
Willard “Will” R. Green (M.A. ’55) writes, “Greetings from Midland, Texas—Boom Town, USA, thanks to horizontal drilling and fracturing technology. I continue as an independent geologist and oil producer trying to generate prospects in parts of the Permian Basin where thick ‘shale’ sequences are absent. Have been a member of the advisory council of the Geology Foundation for five years and it has been a learning experience to see the many things happening at the Jackson School. Congrats to Dean Sharon Mosher and the entire staff.”

George Mathis Harwell, Jr. (B.S. ’58, M.A. ’59) writes, “Linette and I moved to Round Rock in 2011. Being closer to UT, we have enjoyed participating in occasional activities at JSG. I continue to be grateful for the

education and support I received from faculty and staff of the geology department in the late 1950s—Professor Deford and Drs. Folk, Young, Muelberger, Claibough, Wilson and Lundelius, to name a few. Each of these men taught me the science of geology and reinforced life skills which prepared me for a career in the oil and gas business. While serving on the Geology Foundation Advisory Council I witnessed the unique and extraordinary leadership of Sam Ellison, Morgan Davis, Peter Flawn and Bill Fisher along with the dedication and service of council members. I applaud the contributions being made today by Dean Mosher, the faculty and staff, and the advisory council. My hope is that all involved have a deep understanding of the tremendous influence they have on the future of each student and that each student has a deep appreciation for what is being made available at JSG. Thanks to all! I can be reached at gharwell@flash.net.”

Jack M. Howard (B.S. ’51) writes, “After 52 years on Enfield Road, we now reside in Westminster Retirement Community in West Austin, across Mopac from Camp Mabry. On July 23, 2014, Shirley and I quietly celebrated our 65th anniversary with friends and family.”

Ernest Lundelius, Jr. (B.S. ’50) writes, “I spent the last year continuing research on Quaternary vertebrate faunas of Australia and Texas. Hall’s Cave in Kerr County continues to provide new information on the fauna, climate and soil erosion rates over the past 18,000 years. Chris Bell and I are investigating Pleistocene deposits in a newly



Ernest Lundelius (B.S. ’50) spent the past year continuing research on Quaternary vertebrate faunas of Australia and Texas.



Undergraduate Research Fund Honors Retiring Professor Bill Carlson

After serving as an icon on the Forty Acres for more than 30 years, Jackson School of Geosciences professor William Carlson retired in August 2014.

Carlson, a petrologist and geochemist who held the Peter T. Flawn Centennial Chair in Geology, joined the faculty of UT-Austin's Department of Geological Sciences in 1980 after earning a bachelor's degree from Stanford and a doctorate from the University of California–Los Angeles.

With professors Tim Rowe and John Kappelman, Carlson established the High-Resolution X-ray Computed Tomography Facility (UTCT), the nation's first X-ray CT facility dedicated to and optimized for scanning geological specimens. UTCT has grown into a national resource shared by a variety of institutions around the globe. It has been supported by the National Science Foundation since 1999. For these efforts and for other achievements in mineralogical research, Carlson was awarded the Mineralogical Society of America Dana Medal in 2005.

He served as chair of the Department of Geological Sciences and associate dean for academic affairs in the College of Natural Sciences before leading the team that created the organizational charter estab-

lishing the Jackson School of Geosciences as an autonomous college-level component of UT-Austin.

Carlson's dedication to teaching undergraduate and graduate students produced numerous departmental teaching awards, induction into the university's Academy of Distinguished Teachers and selection for the Board of Regents' Outstanding Teaching Award from the University of Texas System.

Despite his transition to emeritus status, Carlson's legacy will live on through a new endowment that supports undergraduate geoscience research. Carlotta Chernoff (B.S. '92, M.A. '95) has made a leading gift to establish the William D. Carlson Undergraduate Research Program Fund. This endowment will ensure that undergraduate students at the Jackson School can continue to take part in research experiences that enrich their academic studies and career trajectories.

One area directly impacted by this endowment is the department's Undergraduate Honors Research Program. This unique program trains undergrads to conduct their own independent research in collaboration with the JSG's outstanding faculty and research scientists. Carlson was the

founder of the program and codirector until his retirement. It remains one of his great passions.

"I am thrilled to be able to establish this endowment in honor of Dr. Carlson," Chernoff said. "I cannot think of a more appropriate way to acknowledge his legacy than by continuing to provide undergraduate students with access to rewarding research opportunities. I know first-hand that these kinds of research experiences can have a lasting impact on a student's personal and professional development."

To make a contribution to the William D. Carlson Undergraduate Research Program Fund, please contact Belle German at 512-471-1993 or bgerman@jsg.utexas.edu, or Karen Cochran at 512-471-6010 or kcochran@jsg.utexas.edu. You also may visit www.jsg.utexas.edu/alumni/support to make a gift online. Please indicate that the gift is for the Carlson endowment.

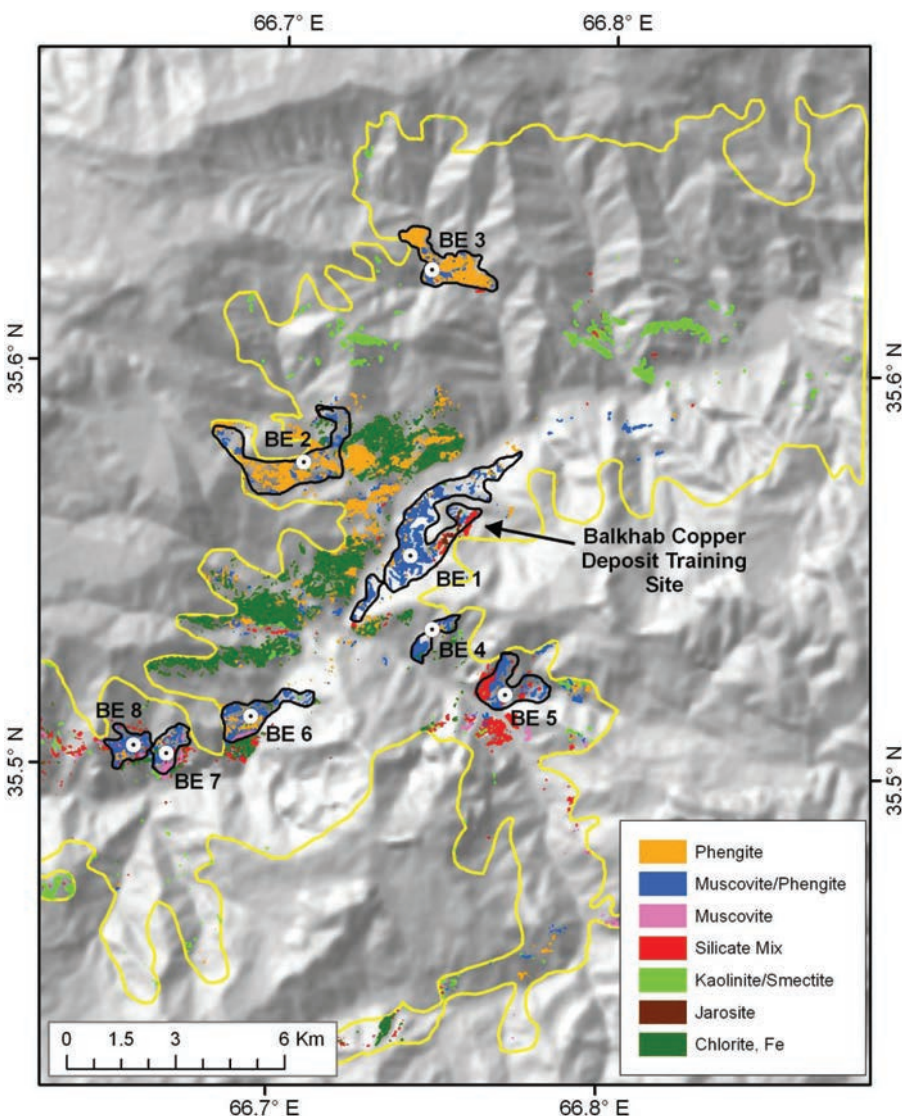
Clockwise: William Carlson with students Elizabeth Hatley and Eric Kelly in the Austrian Alps in 2008; Carlson with student Charna Meth in Switzerland in 2001; and Carlson with the undergraduate Honors Research Program graduates at commencement in 2014 (left to right: Julie Zurbuchen, Wesley Neely, Tiffany Kocis, Carlson, Nicole Kurka, Aaron Salin, Audrey Eljuri and Daniel Le).

discovered cave in Crocket County. Another fairly new locality north of Houston has produced the first record of a toxodont for the United States. This is another addition to the list of animals of South American origin that entered North America with the establishment of the Panamanian Isthmus about four million years ago. I attended the annual meetings of the Society of Vertebrate Paleontology and the American Quaternary Association to keep abreast of developments in those areas.”

Wayne D. Miller (M.A. '57) writes, “Still consulting full-time but planning on slowing down some in 2014. Hope to continue work, as I still enjoy the oil business. Sorry to see that Sam Sims has passed away. Look forward to the next *Newsletter*.”

George Pichel (B.S. '51) writes, “After 36 years as a geologist all over the world and crossing the Pacific in a 36-foot sailboat, now 88 and existing.”

Floyd F. Sabins (B.S. '52) writes, “After leaving UT I earned my Ph.D. at Yale and spent 37 years at Chevron’s geologic research facility where I introduced remote sensing and digital image processing for oil and mineral exploration. Upon retirement I continued remote sensing research and exploration with my company, Remote Sensing Enterprises, Inc. (RSE). In 2010 the U.S. Department of Defense tasked RSE to identify mineral exploration targets in Afghanistan. We digitally processed and visually interpreted images acquired by an array of satellite and airborne systems. The systems and digital processing methods are described in the third edition of my book *Remote Sensing – Principles and Interpretation*. Our 18 DoD reports cover 21 sites and define several hundred exploration targets for gold, copper, chromite, lithium and coal. The above image is a sample interpretation/target map derived from HyMap hyperspectral images of the Balkhab copper prospect and surrounding terrain in north-central Afghanistan. The deposit is hosted in volcanogenic massive sulfide rocks exposed in the gorge of the northeast-flowing Balkhab River. The digital data for 124 spectral bands were acquired by a NASA aircraft and provided courtesy of the USGS spectroscopy laboratory. The plan is for the USGS to include the 18 RSE reports in a data package



Floyd Sabins (B.S. '52) recently conducted research in Afghanistan commissioned by the U.S. Department of Defense. The above shows an airborne HyMap hyperspectral image of the Balkhab copper deposit training site and vicinity. The yellow outline is the top of volcanogenic massive sulfide unit that hosts the Balkhab copper deposit and targets. Image courtesy of Sabins

for the Afghan Geological Survey, which will make the data available to the exploration community. The objective is to provide an inventory of exploration targets for follow-on evaluation. Because of uncertain conditions in Afghanistan we do not know when the data package will be available.” Floyd can be reached at ffsabins@roadrunner.com.

Eugene Patrick Scott (B.S. '57) is a petroleum geologist consultant in Corpus Christi, Texas.

Holmes A. Semken (B.A. '58, M.A. '60) writes, “I retired six months early in 1999 to order to expand a conference in South Africa into a tour with family and students of game parks and Zulu/Boer War battlefields and came home to continue work in ice-age vertebrates without the pain of commit-

tee and faculty meetings. I also continue working with archaeological teams on the examination of mammal bones, large and small, from archaeological sites on the High Plains. Almost all involve students so I am into the world of social media—to a point anyway. There are a lot of quick people out there and it is a pleasure to be associated with a younger group. Elaine and I traveled frequently worldwide primarily using public transportation. We had a goal of riding every kind and class of train, ferry and bus. However, it is hard to know when you are done. Life has not been dull even though our age is showing. We chose to stay in Iowa because we like having four distinct seasons and have come to better withstand cold Iowa winters than the long hot summers of the South. Also the association with the University of Iowa, especially its Museum of Natural His-

tory, has produced some great moments. We still have a soft spot for UT-Austin and enjoy return visits. We have recovered parts of three Jefferson's giant sloths at one locality, a few remains of a short-faced bear at another and are now working on a site with three woolly mammoths present."

Marriott Wieckhoff Smart (B.S. '57) writes, "John and I continue to live in Centennial, Colorado. We revisited New Orleans so that we could visit the World War II Museum. That trip began our study of the D-Day invasion because in June we toured Normandy with the Flying Longhorns. Nice to be around Texans again. When one is fortunate enough to live in Colorado, one tends not to leave in the summer. So we stayed home and went to mountains when we could. Wildflowers were especially beautiful this July. Best wishes to all from Colorado."

Theodore E. Stanzel (B.S. '56) writes, "There is no significant change in my life over the past 12 months. Enjoying life and planning new travel excursions. Wanda and I really enjoyed the Oceania cruise in the Mediterranean in April. It was a pleasant journey thanks to University of Texas Exes that traveled with us."

Bernie Ward (B.A. '55) writes, "I still maintain an office although I'm semi-retired. I visited my grandson at UT last semester. He graduated with a B.S. in biology and is now enrolled as a student at Texas Tech Medical School. Walked the campus to the geology building. On the south wall was a quotation, 'Oh earth, what changes hast thou seen.' Dr. Bullard would give five points if you recited it on his pop quiz!"

Billy D. Watson (B.S. '58) writes, "Enjoying my 29th year of retirement playing as much golf as I can. My wife, Jean, and I are also enjoying our 13 grandchildren and looking forward to our third great-grandchild in November. Life is full of music. I still play my trumpet at church and with three other organizations. Staying active and looking forward to football season! I can be reached at bdjewatson1930@gmail.com. Hook 'em!"

Leslie P. White (B.S. '56) writes, "Dianne and I continue on enjoying life as grandparents. At this age no news is good news."

1960s

Donald H. Campbell (M.A. '62) writes, "Retired now after 35 years in cement and concrete industries, plus oil/gas and teaching ... an enjoyable career. Now studying climate change and advocating various means of mitigating its damaging effects. Major tectonic events combined with catastrophic climate change—what a scenario!"

Chuck Caughey (B.S. '69, M.A. '73) writes, "Passed three years with Noble Energy and recently started enjoying a reduced work schedule of three days per week."

Gerald Keith Ebanks (M.A. '66) writes, "After 36 years in Carrollton, Texas, we moved to College Station almost two years ago to be close to our daughter and her family. I've gotten over the skin itch that I had contracted from being so deep here in Aggie country. I'm about 95 percent retired now, but I'm still doing a little bit of consulting work when it wanders in the door or off the phone or email. It's been a great life. You can contact me at jerrygeo40@gmail.com."

William H. Harris (M.A. '61) writes, "Beginning my 16th year of retirement in wonderful south Florida. Hope to celebrate my 80th birthday this December, first with family and friends in the U.S. and then with family and friends in Israel."

J. Phil Jones (B.S. '64) writes, "Greetings from Edmond, Oklahoma. Marilyn and I have made numerous trips to upstate New York over the past several years visiting kids and grandkids in Richfield Springs, near Cooperstown. We have observed the political issues surrounding horizontal drilling and the impact on the local economy. I much appreciate the work of the Bureau of Economic Geology in their efforts to inform the public of the scientific facts surrounding energy exploration and development, and safe handling of the resulting products that grandly reward the economy of Texas and the University of Texas. Please continue the excellent work. You can contact me at philj1@cox.net."

Don Kirksey (B.S. '60) writes, "In 1960, the University of Texas at Austin's geology department gave me my ticket to a lifetime filled with all that I wanted in my career."

What I hoped to do came true. I worked for Sinclair and Tenneco, two majors that were active, using all types of exploration for oil and gas. These included subsurface, photogeology, field geology, geochemical and even submarine geologic exploration. It was exciting to work and live in so many places: Alaska, Europe, the Gulf of Mexico and the mid-continent. Today, I am enjoying retirement with my wife, BJ, in Oklahoma City. The only geology I do now is studying outcrops as we travel in our RV (dangerous if I'm driving). I thank my Lord Jesus and the University of Texas for my wonderful career."

Jereld E. McQueen (B.S. '61, M.A. '63) writes, "Still with Medallion Oil Company searching for hydrocarbons. Proud of the student center and how JSG is educating and training young people with field geosciences—as one of the best in the world."

Tom S. Patty (M.A. '68) writes, "After setting up the research geology and petrographic lab for the Materials and Tests Division of the Texas Department of Transportation (TxDOT) in 1968, I spent 13 years sampling and examining portland cement concrete pavements and bridge decks throughout the state to determine the cause of distress, examining asphaltic pavements for composition and skid resistance characteristics, as well as studying the engineering properties of all commercial aggregate sources in Texas and nearby states. I retired from TxDOT in 1981. I opened a consulting office for Wiss Janney Elstner Associates, Inc., a forensic engineering firm doing concrete petrography and aggregate evaluations. I worked as a geologist, petrographer and construction materials consultant in the Austin office as associate principal until retirement in 2011 after 30 years with WJE. I now work part-time as an affiliated consultant and tend to our retirement home in Pflugerville. I enjoy being with the families of our three children, eight grandchildren who have grown up in and live around the Austin area. I provide for my wife JoAnn's needs, especially going antiquing. I now have 62 volumes of the UT-Austin yearbook *The Cactus* that date from 1920 as well as copies of the Jackson School *Newsletter* that date back to the early 1960s. I can be reached at tspgeorock@gmail.com."

Robert Samson Singer (B.S. '61) writes, "Retired now. Too much to do at the house. It is six Saturdays and a Sunday."

Herbert "Sam" Travis (B.S. '60) writes, "Currently I'm retired from work in the geologic field. However, I am still working on my real estate projects down on East Cedar Creek Lake, Mabank and Gun Barrel City, Texas. The surrounding geology of the area is mostly Queen City Sand Formation. For those who might want to communicate, I can be reached at herbert_travis@msn.com."

Richard B. Waitt (B.S. '66, M.A. '70) writes, "Wife Cynthia and I still live in Vancouver, Washington, where I'm still a research geologist with USGS Cascades Volcano Observatory. My long-in-the-making popular book on Mount St. Helens' 1980 eruption, *In the Path of Destruction: Eyewitness Chronicles of Mount St. Helens*, is scheduled for publication in early November by Washington State University Press. Recent or continuing field-work and writing includes: a gigantic 1980 landslide, monstrous surge and giant wave on Spirit Lake at Mount St. Helens; Pleistocene tephra in central Oregon; gigantic Pleistocene debris flows in southeast Utah; and colossal Pleistocene Missoula floods in central Washington. Our daughter Kristin lives in Seattle and we have three grandkids."

William Feathergail Wilson (B.S. '60, M.A. '62) writes, "Working on deep desalination test well near Kyle, Texas. Working on South and East Texas deep injection brine wells. Finished an exploration job in Paraguay. Presented a paper to the Texas Archeological Society on Texas Hill Country on the ages of

pedalfer and chernozem soils as they relate to Native American settlements. Found a rock shelter with 1577 carved at the entrance along with a Spanish silver adit near Tarpley, Texas. Working on a few other interesting pieces of geology at age 79."

William C. Young (B.A. '61) writes, "Still enjoying traveling and grandkids."

1970s

Donna Balin (B.S. '78) is a geologist with Altuda Energy Corporation in San Antonio.

Michael "Snap" Conger (B.A. '72) writes, "As the Antares Orb-2 mission NASA/GSFC/WFF Range Services Manager (RSM), I and the NASA/Orbital team successfully sent another cargo flight to the International Space Station (ISS) on July 13, 2014. Three days later, the standard Cygnus cargo module docked successfully to the ISS docking port. Next launch for the Orb-3 mission is mid-October 2014. I'll be there to enjoy the ride. I was just informed my two new world records in the Legend's Division were validated from my performance at the World Flying Disc Federation (recognized by the International Olympic Committee) in Norrköping, Sweden, in July of 2013."

Frank Cornish (M.A. '75) writes, "I continue to enjoy supporting the Jackson School as Corpus Christi's FAN rep. With a house in Austin, we've been making numerous trips up there. I've been busy looking at all the Wilcox core I can at the BEG core facility. It's been a slow drilling year, but it's picking up, with one well completing now and another shallow one to drill. I'm still working with SV



Antares rocket launching from NASA's Wallops Flight Facility in Virginia on July 13, 2014, carrying the Orb-2 Cygnus cargo payload to the International Space Station.

Energy in Corpus Christi and we are looking forward to drilling for gas again in the near future. In Corpus, we've downsized to a small condo and are cramped for space. I've picked up speed in the photograph area, winning some local recognition. I'm trying to build the hobby into a second career as retirement approaches. It is as fun as looking at rocks, but so far doesn't pay as well."

Ricky Ray Davis (B.S. '76) recently returned to Colorado after 23 years working for Saudi Aramco in Dhahran, Saudi Arabia.

Patricia Wood Dickerson (B.A. '70, Ph.D. '95) writes, "From bedrock in a desert canyon of the Big Bend to sea stacks in western Iceland, it's been a fine year in the field, in the UT geology library and on the road with natural history excursions. It was gratifying to be study leader again for a Smithsonian tour in Iceland—a lively, inquisitive group of travelers—through glaciers, volcanoes and bouldery black sand beaches. Shortly after returning, I served in the same role for a Road Scholar excursion in New Mexico. We walked on young basalts there, too, though not as fresh as the Icelandic rift lavas. Other instructional action included helping to plan field training for NASA astronauts, although a dislocated knee knocked me out of the actual training exercise in the Rio Grande rift near Taos. Another project, sponsored



Steve Brasfield (B.A. '78), with his wife Carol, is an actor, writer and comedian living in Los Angeles.



2013-14 Alumni Events

Clockwise, from above: Scott Tinker, director of the Bureau of Economic Geology, recognized Bonnie Weise (B.S. '74, M.A. '79) as BEG's Alumnus of the Year at the JSG alumni and friends reception at AAPG. GeoFORCE alum Marissa Vara (B.S. '14) enjoys her last tailgate as a student. Advisory Council member Bud Scherr gets to know students at the 125th anniversary celebration. Byron (middle) and Connie Dyer (B.S. '58) reconnect with Dan Smith (B.S. '58) at the Evening of Thanks celebration. JSG students show their Longhorn pride at the annual tailgate party. Master's candidate Matthew Ledvina takes the opportunity to visit with alumnus Doug Brown (B.S. '84) at the Evening of Thanks. Graduate student Maureen Walton helped welcome Carlotta Chernoff (B.S. '92, M.A. '95) to the Barrow Founders Circle.



by Brewster County in Texas has been the creation of roadside exhibits about the geologic and human history of the county. Collaboration with Jim Bones, a photographer and naturalist, has resulted in displays on Marathon Basin, Paisano volcano (Davis Mountains) and the Sunken Block rift basin (Big Bend National Park). Meanwhile, Joe Reese (JSG Ph.D.), Dennis Trombatore and I are converting Bill Muehlberger's selected slides, taken by astronauts aboard shuttle and space station, into topical suites of digital images. Those teaching sets will be publicly accessible via the UT Digital Repository. Spring brought a return by canoe into Mariscal Canyon to sample and map a recently uncovered ignimbrite in the canyon floor (before the river and windblown sands buried it again!). Studying the thin sections now. It's been a year of stimulating explorations with friends and colleagues at JSG, TCU, Texas Tech and in Edinboro, Pennsylvania. Rifting is a recurring theme—some of my Rio Grande rift research has been published in a recent GSA special paper. Our Marathon Basin work is yielding new data on Rodinia rifting in the region, and we're eager to present that at GSA in Vancouver. Hope to see many of you there! Here in River City I'm enjoying GeoRef work for AGI—learning endlessly from that, from volunteering for Austin Classical Guitar and from dancing Argentine tango and blues!"



A 1973 field trip to Big Bend National Park.

Shirley Dutton (M.A. '77, Ph.D. '86)

received the 2014 Doris M. Curtis Award from the Gulf Coast Section SEPM for career contributions in the development of new concepts for understanding the geology of the Gulf of Mexico basin and other basins worldwide. Shirley is a senior research scientist at the Bureau of Economic Geology.

Abelardo "Lalo" Garza-Hernandez (B.S. '75)

has lived in Parral, Chihuahua, Mexico since 1976, owns his own mining consulting business, providing services to several major and junior mining and mineral exploration companies, as well as being involved in other mining ventures in Mexico. He can be reached at abgarza@grupogamo.com.



Charles "Chip" G. Groat (Ph.D. '70) continues as president and CEO of The Water Institute of the Gulf.

Charles "Chip" G. Groat (Ph.D. '70) continues as president and CEO of The Water Institute of the Gulf, a not-for-profit independent applied research organization based in Baton Rouge, Louisiana, that began operations in February 2012 under his leadership. The Water Institute's program encompasses coastal, deltaic and water systems in Louisiana, the Gulf of Mexico and internationally.

Charles Kreitler (M.A. '72, Ph.D. '74)

writes, "2013-2014 has been a busy time. Important news first. My wife Berf and I became grandparents. Our son Jason and his wife Susan had a little boy Henry, now 8 months old. Fascinating to see them grow so fast! I retired from LBG-Guyton almost three years ago. I still do some work for them. I also teach a course in the Energy and Earth Resources Program at UT's Jackson School during the spring semester on water resource issues in the Southwest. Timely topic! We have become reverse snow birds, spending summers in the Adirondack Mountains (upstate New York) and winters in Austin. Can't beat it."

Ray Leonard (M.A. '77) writes, "I continue to experience the uncertainties of a deepwater wildcatter in West Africa as president and CEO of Hyperdynamics. It is nice to be back in Houston after so many years abroad. I am very happily married and my three children work in Angola, Argentina and Alaska; they all have found suitable partners and



NASA's Matthew Rodell Talks Water and Drought

Matthew Rodell (Ph.D., '00), chief of the Hydrological Sciences Laboratory at NASA's Goddard Space Flight Center, spoke at a conference on extreme weather events held in September 2014 at the University of Texas at Austin and sponsored by the Jackson School of Geosciences. He spotlighted NASA's Gravity Recovery and Climate Experiment (GRACE) mission and its potential to detect and help predict droughts and floods.

I am delighted to have three grandchildren and fourth on the way! I can be reached at rclfioc1@aol.com."

Robert A. Levich (M.A. '73) writes, "Retired 10 years from U.S. Department of Energy's Yucca Mountain Project. Working part-time with Arizona-based mining company with gold mining concessions in West Africa. Stella and I split our year between our homes in Las Vegas, Nevada and Senya Bereku, Ghana, where we have built a home on four acres of land above a 50-foot sea cliff on the Gulf of Guinea. Old friends are welcome to come over and spend time listening to the waves crash on the Pan African quartzites and quartz schists at the base of the cliff below our house, and wander along the adjacent coconut-lined beaches. I can be contacted at cpgeologist238@yahoo.com."

Robert Michael Looney (B.S. '71, M.A. '77) writes, "Still operating as Black Pearl Exploration, Houston, Texas. Primary areas of operation include Texas Gulf Coast and Louisiana with a couple of joint venture partners. Discussing merger possibilities with one of our partners. We spend a lot of time in Idaho during the summer on Lake Pend Oreille, site of the Missoula Ice Age floods. Lots of interesting geology. Continue to enjoy my time on the FANS Board and helping to get the message out about what the Jackson School has to offer."

James P. McCalpin (B.A. '72) writes, "For the past four years, I (and my company GEO-HAZ, www.geohaz.com) have been very busy finding faults—active faults, that is. Mainly I do seismic hazard studies related to oil and gas pipelines, LNG terminals, nuclear power plants, nuclear waste repositories and hydropower projects. A lot of time in helicopters, and on the ground, watching for bears on field traverses. Using the helicopter/bear method, I've mapped/characterized active faults crossing the proposed Alaska gas pipeline, the existing TAPS oil line in Alaska and two proposed gas pipelines in British Columbia (Coastal Gas Link and Prince Rupert Gas Transmission). We even developed a protocol for real-time GPS/GIS fault mapping from helicopters (McCalpin and Carver, 2013). Also reviewed surface faulting studies for proposed Lelu Island, BC, LNG terminal. In the nuclear power world, seismic hazards have increased visibility since 2011 and the M9 Tohoku earthquake. Recent review projects include seismic source characterization for Thyspunt NPP (South Africa), Diablo Canyon NPP (California) and Embalse NPP (Argentina). In September 2014 I travel to the Shika NPP in Japan to advise on a suspected active fault near a reactor building. The 'Fukushima effect' also impacts siting and design of nuclear waste repositories, leading to my reviews of surface faulting hazards at the Forsmark and Olkiluoto nuclear waste repositories (Sweden

and Finland). Seems like everyone is getting these, except the U.S. Meanwhile, in those countries without nuclear or oil and gas, hydropower projects are on the rise and require seismic risk studies. We analyzed surface faulting hazards and trenched suspected active faults for the Yesa Dam, Spain; San Pedro and seven Lagos damsites, Chile; the faults near Joes Valley Dam and the Chief Toquer damsites, Utah; and Penley damsites, Colorado. Closer to home, I continue to consult for Colorado ski areas on slope stability issues. Recent engineering geology projects were at Aspen Mountain, Buttermilk, Keystone, Eldora, Breckenridge and Vail. At least while mapping and drilling there, I don't have to look over my shoulder for bears ... normally. I can be contacted at mccalpin@geohaz.com."

Joseph A. "Joe" Medina (B.S. '74) writes, "Working Permian Basin New Mexico in Houston. Hoping this finds my former classmates and other UT geo-friends happy and in good health!"

Harry W. Mueller III (Ph.D. '75) writes, "Still enjoying being retired in Fort Collins, Colorado. Enjoy seeing all my old friends from UT at the AAPG annual conventions. Still participating in our local geological association here in Fort Collins."

Kenneth E. Nemeth (M.A. '76) writes, "I have begun my term as president of the Houston Geological Society. I have been serving on the AAPG IBA Committee for six years now."

John W. Preston (B.S. '70) writes, "Well, still picking squiggles after all these years and like the blind hog and the acorns, find a few drops of grease from time to time."

David Henry Walz (M.A. '74) writes, "Toddy and I both retired from teaching in the summer of 2013. Toddy taught junior kindergarten and kindergarten in our home county's public school system for nearly 30 years and I taught geology for 37 years at Reynolds Community College in Richmond, Virginia. In May 2014 I was honored with the status of professor emeritus from the college. Our older son, Jonathan, teaches anthropology/archaeology at Rollins College in Winter Park, Florida. He specializes in East Africa, South Asia and the Indian Ocean. Our younger son, Kris (born in

Austin), and his wife, Meg, live and thrive in Montpelier, Vermont.”

Steve White (B.S. '78) writes, “Still enjoying prospecting in the East Texas Basin.”

1980s

Fred H. (B.S. '83) and Teresa Harkrader Becker (B.S. '82) write, “The oil patch has been good to us and we have fond memories of the GEO 660 field camp. Our daughter Lauren will be working in the oil industry in Houston soon and our daughter Lindsay will be working toward her Ph.D. at Stanford. We enjoyed a Flying Longhorns trip to Machu Picchu and the Galapagos and plan to go on more in the future.” Fred plans to retire from Shell in 2015. Teresa has recently retired from consulting and is enjoying their new home in Marble Falls, Texas.

Alan Berryhill (B.S. '81, M.A. '84) recently relocated from Houston. He is president of Cross Point Environmental and Restoration Services in Austin.

Patricia Bobeck (M.A. '85) returned to UT-Austin in 2011 for a Ph.D. in hydrogeology. Translation of Henry Darcy's *The Public Fountains of the City of Dijon* and its publication in 2004 increased her curiosity about French hydrogeology, led to several summer vacations spent in France, and finally the decision to return to UT. She is conducting research on Jean-Baptiste Paramelle (also known as Abbé or Father Paramelle), a 19th century French hydrogeologist who began looking for water back when geology was called geognosy. Based on reading available books and his own observations, Paramelle developed a method of finding groundwater on the dry karst plateaux of Lot (France) in 1827. His fame spread to neighboring departments and by the time of his retirement in 1854, he had found water in more than 10,000 locations in 40 of the 80 departments of France. In 1856 he wrote a book called *The Art of Finding Springs*. This best-selling book popularized the use of groundwater in France. Henry Darcy favorably reviewed Paramelle's method and book. Patricia's project includes the translation of Paramelle's book, an evaluation of his contributions to the history of hydrogeology, an analysis of his method and an application of his method

to karst terrain in the United States. Prior to and during her Ph.D. work, Patricia has been teaching thesis and dissertation writing workshops in the geology department. She teaches separate workshops for native speakers of English and for international students. Teaching international students allows her to tap into her expertise in teaching English as a foreign language; prior to studying geology in the 1970s and 1980s, she obtained a master's degree in linguistics and taught English in the Caribbean, South America and Hawaii. The Paramelle project and the writing workshops offer an opportunity to integrate all of her academic skills, including her bachelor's degree in French. She writes, “I'm delighted that during my travels in France, almost every day a French person tells me that he or she wishes he or she spoke English as well as I speak French—I have achieved one of my major goals in life!”

Bruce Calder (B.S. '81) works for TxDOT and writes, “I am only marginally involved in geology these days (at my job). On the side, I dabble some in the oil and gas world and occasionally perform City of Austin and Texas Commission on Environmental Quality (TCEQ) geologic assessments on the Edwards Aquifer recharge zone.”

David Chow (B.S. '85) writes, “My daughter, Carla, graduated from the University of Houston with a bachelor of business administration in marketing. She is working for White Picket Realty. I am still working for Marathon Oil in Houston. I completed my first triathlon this year. I also run in age group track meets and play soccer. I volunteer for the Houston Dynamo major league soccer team and the Houston Women's Soccer Association.”

Michael Jamison Clark (B.A. '89) writes, “Checked out Haleakala National Park on Maui for New Year's. Yes, it does look like Mars there!”

Steven Crews (B.S. '82) recently changed jobs, moving from Hess to Apache, where he is the petroleum systems analyst for the international New Ventures group. Steve and Bonny live in central Houston, spending as much time as possible in the Colorado Mountains. Steve can be reached at steven.crews@apachecorp.com.

William Demis (M.A. '83) writes, “Mary (M.A. '84) and I continue to live and work in Houston. We both enjoy our respective jobs, Bill at Southwestern Energy and Mary at CoreLab. The new twin peak in U.S. oil production brought on by fracking has been a renaissance to the industry and to our country. Both our children are in post-graduate education. Neither child wanted to major in geology after a lifetime of family driving vacations interrupted by constant stops at road cuts, where passersby give quizzical and annoyed stares at mom and dad waving their arms at nothing (to the non-geologist). Our son, John, is in medical school in San Antonio. Our daughter, Eleanor, is at UCLA for a doctorate in physical chemistry.”

Alan Dutton (Ph.D. '82) is now the Amy Shelton and V.H. McNutt Distinguished Professor at the University of Texas at San Antonio.

Kevin Frenzel (B.S. '87) writes, “After almost 20 years away, I have finally returned to Austin and wow, has it changed! I was managing exploration activities for a uranium mine in South Texas, but unfortunately, the market crashed following the tsunami in Japan. So I am now with the Texas General Land Office, managing the Coastal Erosion Planning and Response Act program and enjoying life back in Austin.”

Tatiana Frierson (B.S. '85) writes, “Retired Dell/Perot Systems after 24 years tenure, but retirement was short-lived. I have now joined Hewlett Packard in the enterprise services division, supporting the business process services organization. I'm in Dallas and would love to connect with old UT geodog folks. Don't hesitate to reach out to me at tatiana.frierson@hp.com.”

Charles Goebel (B.S. '80) writes, “Still drilling (mostly good!) wells near San Angelo. Saw a few outcrops recently while on vacation in New Mexico—beats working in front of computer screens by a long shot! Youngest offspring, Clara, will be a junior at UT this fall.”

Griffin Buchanan “Bill” Howard IV (B.S. '82) writes, “I have a new company, Discover E&P LLC, doing exploration primarily in South Louisiana and the Texas Gulf Coast. We are looking for additional areas to explore. This after 23 years with a

partner as Flare Resources Inc. My email is bhoward@discoverep.com. I would enjoy hearing from you.”

James P. Immitt (M.A. '81) writes, “I thoroughly enjoy the amazing geology and the utilization of technology in exploration of the subsalt deepwater Gulf of Mexico for Eni in Houston. Recently ‘had to’ walk the beaches of Nova Scotia for a salt diapir field course—absolutely beautiful and a lovely change of temperature in July. Pam and I are still transitioning from Austin to Houston and finding lots of positives. It’s good to have many fellow Longhorns here. Our daughter Angela has joined the Navy as a hospital corpsman and is in basic training at Fort Sam Houston in San Antonio. We are very proud of her. Our son Adrian is studying psychology at Colorado University in Boulder and we are very proud of him too.” Jim can be reached at jim.immitt@yahoo.com.

Ernst H. Kastning (Ph.D. '83) writes, “I am enjoying my ‘retirement’ years after teaching hydrogeology and geomorphology for 28 years at Murray State University in Kentucky, the University of Connecticut and Radford University in Virginia, and most recently after four years with the New Hampshire Geological Survey and Department of Environmental Services. I am now a geological consultant on karst processes and a freelance writer. My wife, Susan, and I live in Concord, New Hampshire, and in Radford, Virginia. I have been writing for magazines, speleological and historical journals, and my book on Natural Bridge (Virginia) will be available in October 2014 (Images of America series, Arcadia Publishing). Several other books are in various stages of preparation. While still an active karst geologist, my interests have drifted heavily into historical research and writing. I can be contacted at ernst@skyhopper.net.”

L. Scott Kelley (B.S. '86) writes, “Currently, I am a manager of geology for Exxon’s Fort Worth Basin (Barnett) and mid-continent divisions. Because my area extends from North Texas to the Panhandle across Oklahoma and Kansas up into Michigan and Illinois, the geological opportunities are always changing. Dozens of plays and new horizontal targets give my teams a lot to process and discover. We are having a lot of fun—almost as much

fun as we did in the Picuris Mountains of New Mexico back in the 1986 field camp! Please give my best to all of the folks at the Vertebrate Paleontology Laboratory.”

Richard Alan Kolb (M.A. '81) resides in Cary, North Carolina, and can be reached at rick.kolb1@gmail.com.

David Lemke (B.S. '82) writes, “Working for Halliburton, managing a few software test teams for the Landmark DecisionSpace products. It’s hard to believe I’ve been living in Houston for 32 years. I yearn to leave here and retire in northern New Mexico, catch fish and hike in the mountains.”

Bruno Maldonado (B.S. '82) writes, “Hello fellow Longhorn rock hounds. I just finished six days of hiking up and down the Western Alps in France studying passive margin geology. I got up close to some amazing outcrops. I put my knees and lungs to the test. The longest hike was on the order of 6 miles round trip. Ugh! My lungs were put to the test on the way up and my knees hurt all the way down. I guess it is back to the gym if I want to continue doing what I love best. As for work, I am now at Apache working offshore in the northern part of South America. On a more personal note, I became a grandfather since I last wrote in the *Newsletter*. I have a 2-year-old granddaughter named Sofia. Yes, it is the Spanish spelling, although her mother is Canadian. I will have to work on my knees (or get them replaced) in order to keep up with her. My best to the UT Department of Geological Sciences for instilling this love I have for geoscience. I will try to pass this on to Sofia. Adios for now.” Bruno can be reached at bruno.maldonado@apachecorp.com.

Pete McMahon (M.A. '84) is with the U.S. Geological Survey in Denver.

Robert Murray (M.A. '85) writes, “This year we moved downriver and downstream from Pittsburgh and the headwaters of the Ohio to New Orleans and the mouth of the Mississippi, from carbon capture and storage to the Strategic Petroleum Reserve, from sand and shale to salt, and from trying to put post-combustion carbon back in the ground to actually putting pre-combustion carbon back in the ground. Instantly charmed by the Big

Easy, we are letting the good times roll even if it means gaining a pound or two. The only real question seems to be where to eat next. If you find yourself rounding this bend in the river, I can be reached at robertcmurray@cox.net.”

Deborah Susan Pfeiffer (M.A. '88) writes, “Still working as an international exploration manager at BHP Billiton in Houston. Ron is working for Whitney Bank and our oldest daughter graduated from Texas Christian University in May with a degree in geology (and got married a week later!). Our other two daughters are juniors at TCU. One is working toward a double degree in environmental science and geology and the other is a nursing major.”

Nick Pollard (B.S. '84) writes, “Been living and working in Tyler, Texas, for 24 years now. On second round of private equity money and enjoying the ride.”

Jerry Schwarzbach (B.A. '83) writes, “Another child starting at UT in the fall! Wish it wasn’t so hard for a student whose father and grandfather both majored in geology at UT-Austin to get into a geology class. Still enjoying living in Tyler, flying my single-engine plane, raising cattle and working.”

Scott Simmons (B.S. '87) writes, “We are still enjoying the good life in Fort Collins, Colorado. I have started my own business focused on integrated energy and sustainable products development, but still doing some consulting in the geospatial arena. This allows more time for the family, mountain biking, fly fishing and skiing—which is perfect.” Scott can be reached at scotts@lrange.com.

Stephen W. Speer (M.A. '83) writes, “Blessed to have five grandsons now. After having moved here 11 years ago, Therese and I find that life is as good as ever for us in the South Carolina Lowcountry. Still engaged in New Mexico oil and gas production and also involved in a couple of hospitality and event ventures here in Charleston, so staying pretty darn busy but not so much that we can’t find time to play a bunch of tennis. Hello to all of our Dirty Dozen teammates and sure hope life is going well for each and every one of you. Cheers!”

Burgess H. Stengl (B.S. '85) writes, "Wow, I can't believe that another year has come and gone, making it 29 years since I graduated from UT. It's been over 12 years since I started with Republic Services and I am enjoying life in Spring, Texas. Angela is now teaching her second year of fourth grade in Klein ISD after many years teaching second grade. Our son Kyle is a junior at Klein Oak High School and is now driving (please watch out while in the area). Kyle recently attended UT band camp in Austin and had a great time on campus. It's amazing how many new buildings now exist where streets and eggroll vendors once stood. Our daughters reside in Hutto and Spring and are doing fine. With three grandchildren, Angela and I stay busy throughout the summer months. Hello to all my fellow 1985 grads, and hello also to Walt Boyle, Will Green and Jimmy Russell."

Michael Stowbridge (B.S. '82) writes, "I am working as consultant geologist in Abilene, Texas. I'm researching and mapping new prospects in the Abilene and Wichita Falls areas. It is good to work from idea to well completion. It was also good to hear from my friends from UT and their successful lives." Michael can be contacted at mstowlink@att.net.

Peter R. Tauvers (Ph.D. '88) writes, "After two years in Miri, Sarawak (offshore Philippines), and two years in the Hague (offshore Sub-Saharan Africa) I am back in Kyiv and now principal exploration geoscientist for Shell Ukraine E&P 1 LLC. I've now been with Shell for more than 25 years. Also, my wife and I run a small fine art gallery in Kyiv called Gallery Pete-Art (www.pete-art.com). Peter can be reached at prtauvers@mac.com.

Joseph W. Versfelt (B.A. '84) writes, "Now four years at Apache, with two years in Argentina and now two years in Egypt, both as region exploration manager. Drill and grow, fantastic field work. Absolutely love it. Returned to the UT campus in July to show our son, now a senior in high school. I can be reached at jversfelt@comcast.net or joe.versfelt@apacheegypt.com."

Barry Wethington (B.S. '85) writes, "Currently in India as vice president for BP. Retirement is just around the corner! Pleased to say my son graduated in May from the

Jackson School and is headed to Oklahoma University to conduct his master's program." Barry can be contacted at wbwethington@gmail.com.

Gail Fisher Worrell (B.S. '82) writes, "Hello Class of '82! Still working for ExxonMobil doing environmental compliance for our pipeline operations. Danny and I are proud Longhorn parents with both daughters at UT-Austin! Sophie is in the Jackson School and Anna is starting this year at McCombs School of Business. If you are in Austin, please look us up! Go Horns!"

"DANNY AND I ARE
PROUD LONGHORN
PARENTS WITH
BOTH DAUGHTERS
AT UT-AUSTIN!"

—GAIL FISHER WORRELL

Susan Wygant Young (M.A. '85) writes, "Still with ConocoPhillips, just passed my 30-year work anniversary! Now working with the Permian shale group and still involved with our Unconventional Reservoirs Network of Excellence to capture and share learnings and best practices. Located in Houston."

1990s

Robert Blodgett (Ph.D. '90) writes, "Life has been very full since I last reported in the *Newsletter*. For the past three years I have been one of four principal investigators for the National Science Foundation-funded Supporting and Advancing Geoscience Education in Two-year Colleges (SAGE 2YC) program. This has involved designing, organizing and leading six professional development workshops for two-year college (2YC) geoscience faculty, including two for Texas workshops held at the UT Institute for Geophysics. The program's focus has been on helping 2YC faculty prepare students for geoscience careers and university transfer, on working effectively with all types of students in a single class and on developing leadership and community among 2YC geoscience fac-

ulty. In addition to workshops, I have helped build the SAGE 2YC website for 2YC geoscience faculty at serc.carleton.edu/sage2yc. Overall the SAGE 2YC program has been a very rewarding experience, although often it has seemed like working two jobs, since I continue to teach 12 to 14 classes each year at Austin Community College. My other recent professional achievement has been becoming a fellow of the Geological Society of America. This recognition meant a great deal to me since the other community college professor to become a fellow before me was one of my mentors, Dottie Stout. The great news in my personal life is my marriage to Jeff Hudson, my partner of 27 years. We were married this past summer at the Moose Meadow Lodge in Duxbury, Vermont, with the support of 70 friends and family. One of Jeff's vows was that he now accepts that geologic field trips are a normal part of family vacations. Jeff is a group psychotherapist in private practice here in Austin." Robert can be reached at rblodgett@austinctc.edu.

Laura Martin Dobson (M.A. '90) writes, "Living in Cedar Falls, Iowa. Employed as marketing coordinator for St. Patrick Parish and School. Mom to Kelley, Chris, Courtney and Jon, the first two off at college and the last two still at home. Missing Texas but visit occasionally to see family and friends."

Malcolm Ferris (M.A. '93) is celebrating 21 years at the Texas Commission on Environmental Quality.

Mark B. Gordon (Ph.D. '90) writes, "The year started out a bit rocky at Shell, but now I am working in New Ventures and should be settled for the next few years. I enjoy working in tectonics and in diverse geology. Vacations are back to the norm: Hawaii, Romania and Reno." Mark can be reached at mark_b_gordon@yahoo.com.

Doug Henderson (M.A. '96) writes, "I reached the 15-year milestone as the leader of a mapping firm specializing in water resource management applications, including sediment mapping. The most fun of all though are my occasional 'guest lecture' opportunities at a local elementary school teaching the kids about geology. (This year was volcanoes, assisted by some excellent supplementary material sent to me by Leon

Long.) The kids study far more Earth science than I was ever presented at that age and so a nice opportunity exists to amplify their interest in the fascinating topics and also make them aware that rather than being a doctor or lawyer when they grow up, they could be an earth scientist instead! A way more fulfilling career goal kids, even if mom or dad doesn't think so. I can be reached at d.henderson@utexas.edu."

Russ K. Johnson (B.S. '97) is senior project manager with Weston Solutions, Inc., in Austin.

Kaveh Khorzad (B.S. '98, M.S. '00) is president of Wet Rock Groundwater Services. The firm is busy developing wells in Houston, Central Texas and Val Verde County.

Kevin Pasternak (B.S. '95) is senior hydrogeologist and project manager with URS Corporation in Austin. One of his projects is coordinating the background monitoring program on the Colorado River alluvium and terrace deposits east of Austin.

Alex Riter (Ph.D. '99) is with the University of Maryland. She is researching the effects of the BP Macondo well failure on Gulf of Mexico ecosystems.

Christina Massell Symons (M.S. '97) resides in Coronado, California, and can be reached at chris.symons@mac.com.

2000s

Samuel William Beckham (B.S. '10) resides in Midland, Texas, and can be reached at sam.w.beckham@gmail.com.

Rebecca Boon (B.S. '08) has just published an article titled "Attribute-based fracture inference in a faulted carbonate play" in *Interpretation*. She is now with Newfield Exploration Co. in Houston.

Johnathan Bumgarner (B.S. '02, M.S. '05) will start as the chief of hydrologic investigations for the USGS Minnesota Water Science Center in June. John writes, "As the investigations chief, it's a great opportunity to work with the scientists and technicians conducting USGS hydrologic studies across the state. Specifically, I'll coordinate the scientific,

technical and administrative direction of water resources investigations and communicate with federal, state and local cooperators and stakeholders. We're going to miss our home state of Texas, especially our friends and family, but are looking forward to this next great adventure and will visit often."

Joseph Coleman (B.S. '07) resides in Houston and can be reached at joseph.coleman@fwelc.com.

Matthew Davis (M.S. '05) writes, "Back from Canada and feeling pretty glad to stand on American soil for July 4th." Matthew can be reached at matthew.davis@encana.com.

Ron Dildine (B.S. '03) recently took a position as regulatory coordinator at Uranium Energy Corporation in Corpus Christi, Texas. Ron writes, "My wife Tara and 3-year-old son Jack are greatly looking forward to becoming beach bums in our spare time." He is also a new member of the Corpus Christi Geological Society and the local Society of Mining Engineers.

Anne Dunckel (B.S. '09) graduated with her masters in environmental science from the University of Virginia in the spring of 2014. She has started a position as the monitoring program manager at Stream-Watch, a local Charlottesville nonprofit that collects water quality data about the surrounding Rivanna watershed using a group of volunteer citizen scientists.

Blair Avant Francis (B.S. '07, M.S. '09) and her husband Luke welcomed their second daughter, Lily, in May 2014. She joins her sister, Molly, as the next generation of geoscientists!

Marcus Gary (B.S. '01, Ph.D. '09) and his wife Robin and son Jake announce the recent arrival of "Mac." Collin "Mac" McKinney Gary was born on April 9. Marcus says that he is named after Robin's great grandpa McClaren and an ancestor of Marcus named Collin McKinney. Mac weighed 9 pounds, 2 ounces at birth, earning him the title "Big Mac!"

Sally Holl (M.S. '04) is with the USGS in Austin and she is the new desert landscape conservation cooperative geographic information systems (GIS) and data coordinator.

Sally leads a GIS and data working group. She says the group meets monthly. Anyone with interest in GIS and desert climate science is welcome to contact her at sholl@usgs.gov to participate. Sally has been an enthusiastic and effective leader of the Austin-Adelaide Sister City Society for the past two years.

Roslyn Kygar (B.S. '04) has been with the TCEQ for nine years.

Joel Le Calvez (Ph.D. '02) is currently a geophysics advisor in Schlumberger, managing the Answer Product Center (processing and interpretation) of the Microseismic Services Organization.

Leslie Llado (B.S. '07) is now the integrated community development program manager at the nonprofit A Glimmer of Hope in Austin. She manages the water programming with most of the projects in northeast Africa, particularly in Ethiopia. Leslie writes, "It's pretty fantastic."

Lauren Green Martin (B.S. '07) and husband, Pascal Martin, are happy to announce that their son, Graham, was born Feb. 7, 2014. Jeremy Greene (M.S. geophysics '84) is the proud granddad. Lauren is currently spending half her time working at Apache Corporation and the other half grooming Graham to become a third-generation Longhorn geologist.

Madelyn Percy (B.A. '09) writes, "After teaching for five years in public high schools, I am returning to school to seek a Ph.D. in geology from the University of North Carolina at Chapel Hill."

Hilary Strong Petrizzo (M.S. '09) and her husband, Daniel, recently welcomed the newest addition to their family, Zoe Elizabeth Petrizzo. She was born on June 18, 2014, joining big brother Dominic Michael, born Dec. 3, 2012. Hilary currently works as a production geologist for Oxy Long Beach Inc., soon-to-be California Resources Corporation—Long Beach office. Hilary can be reached at hilarystrong@gmail.com.

Wendy Robertson (B.S. '06, Ph.D. '14) was at the International Association of Hydrogeologists 2013 Congress in Perth, Australia,

where she presented her research on recharge in the arid basins of the Trans-Pecos region of Texas. She has accepted an offer as assistant professor at Central Michigan University.

Kristina Shevory (B.A. '03) won the Alicia Patterson Foundation Fellowship this year to write about the future of U.S. warfare in the wake of the war in Iraq and the drawdown in Afghanistan. The fellowship is one of the most prestigious in journalism, awarding \$40,000 to eight reporters nationwide to write exhaustively for one year about their subject of choice. Shevory is a U.S. Army veteran and UT geology degree holder.

Jonathan Skaggs (B.S. '01) writes, "Since graduating in 2001, I have worked as an environmental consultant performing subsurface characterization and cleanup projects. My wife and I moved to San Francisco, California, in 2003 and returned to Austin in 2012 to be closer to family after having our son, Asher. I can be contacted at jonathan.skaggs@amec.com. Cheers!"

Jonathan Wells Snatic (B.S. '02, M.S. '13) has left the USGS and is with a consulting firm in Louisiana.

Nicholas Sommer (B.S. '03) accepted a geologist position at FourPoints Energy in Denver.

Nataleigh Vann (B.S. '09, M.S. '13) resides in Houston and can be reached at nataleigh.vann@gmail.com.

Roderick "Rick" Williams (B.S. '04) resides in Dallas and can be reached at rick.williams@martinmarietta.com.

2010s

Meredith G.L. Brown (M.S. '12) writes, "This fall I started a Ph.D. at the University of Maryland to study the effect of climate change on agriculture and food security. I can be contacted at mglbrown@umd.edu."

Randy Caber (M.S. '10) writes, "After over four years of working at Anadarko Petroleum Corporation, I have decided to pursue my MBA full-time at the University of Notre Dame in their accelerated one-year program. I am hoping to stay within the natural resources/energy industry but be more focused

on the actual commodities, investments or business development side of the industry. I am slated to graduate in May 2015 from Notre Dame with an emphasis on investments."

Brandee Carlson (B.S. '13) will be pursuing graduate studies at Rice University.

Trevar Compton (B.S. '14) resides in Kilgore, Texas, and can be reached at tcomp13@yahoo.com.

Edward "Ted" Cross (B.S. '11) has started work at ConocoPhillips in Houston after graduating with an M.S. from the University of Arizona.

Kara A. Dias (B.S. '11) graduated in May 2014 with a M.S. in geology from Stony Brook University. She began working with Environmental Resources Management in Houston in June.

Tim Eischen (B.S. '12) is employed at The Nature Conservancy and can be reached at teischen@tnc.org.

Rania Eldam (B.S. '13) writes, "After finishing up my second internship with Occidental Petroleum Corporation in Houston, I will be starting my M.S. at Colorado School of Mines this fall. In this first year, I will begin the field work for my thesis project, a geochemical fluid flow study, and work as a teaching assistant for two geology classes. I will also be starting my tenure as a graduate research fellowship recipient, as awarded by the National Science Foundation. In addition to my studies, I am currently working with members of Association for Women Geoscientists to reinstate the Laramide Chapter in Denver and will act as the alternate AWG Rocky Mountain delegate for this upcoming year. I am looking forward to mentoring young students in the Denver area and expanding the network of the geoscience community."

Caleb Jacobs (B.S. '11) graduated from Texas Christian University with M.S. in geology in August 2014 and began work in June as an exploration and development geologist at Matador Resources in Dallas.

Tiffany Kocis (B.S. '14) is working with Al Standen's (M.A. '87) consulting firm this sum-

mer. She will be pursuing graduate studies at the University of California-Davis next fall.

Daniel Le (B.S. '14) has taken a position with GSI Environmental in Houston.

Alessandra Millican (B.A. '11) writes, "I am coming up on three years of happy employment as an associate geologist at Environmental Resources Management and am being paid to travel the world to perform environmental consulting work. I've been very fortunate to work with all aspects of the oil and gas industry from site remediation, fracking, acquisition due diligence, site assessments, soil and groundwater contamination delineation and much more. ERM has served as a pathway to get involved in other practices, and I'm quickly becoming an industry expert in air quality and climate change's leak detection and repair sector. I have even recently started up a small custom dessert business here in Austin and have taken up an apprenticeship under Stephen Jay Gould's former apprentice. In my spare time, I actively enjoy whale watching, falconry and setting unrealistic goals for running marathons. I have no husband or kids yet, but I do have a cat with heterochromia iridium and a paddleboard."

Frank Morgan (B.S. '11) started work as a geologist for Devon Energy in Oklahoma City on Jan. 6, 2014.

"EXCITED TO BE STARTING MY PH.D. AT HARVARD THIS YEAR. I WILL BE ... BUILDING OFF MY PALEONTOLOGY MASTER'S DEGREE FROM THE JACKSON SCHOOL!"

—ZACHARY MORRIS

Zachary Morris (M.S. '13) writes, "Excited to be starting my Ph.D. at Harvard this year. I will be studying the evolution of vertebrate craniofacial development and building off my paleontology master's degree from the Jackson School!"

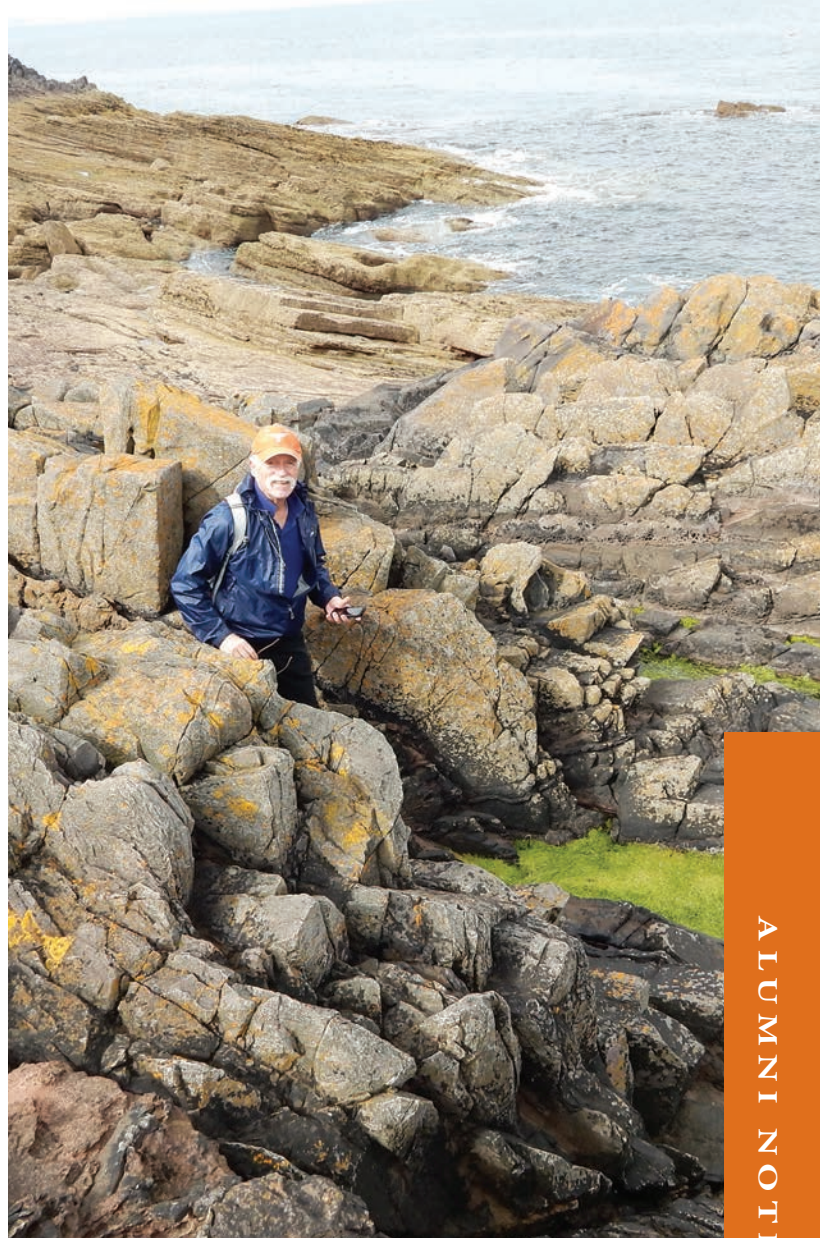




Scenes from the JSG and Texas Exes alumni Scotland trip

From Aug. 23 to Sept. 3, 2014, Jackson School of Geosciences alumni joined the Flying Longhorns alumni group to tour Scotland. The group took a historic and cultural journey through the country, visiting Glasgow, Edinburgh, Loch Ness, the Isle of Skye and other areas of the Scottish Highlands. Alumni were also treated to geological field trips led by Ian Dalziel, a Scottish-born geologist and research professor at the Jackson School. Dalziel led the group on geological tours of Assynt in the northwest Caledonian front, the dormant volcano Arthur's Seat and the famous geological phenomenon Siccar Point.

Clockwise from top left: Glencoe, considered one of Scotland's most beautiful spots. Don Miser (Ph.D. '87) in Geilston Garden. Pat Abbott (M.A. '66, Ph.D. '73) at Siccar Point. Boat cruise on Loch Lomond (left to right: Charles Riggs, Harold Dunn, Bruce McCommons, Diane Merrill and Bob Merrill). Diane and Bob Merrill, Ian Dalziel, Pat Abbott and Eugenia Sangines, Mike Floyd, Karen Cochran and Bruce McCommons at Knockan Crag National Nature Reserve. At left, a sheep dog demonstration with working border collies in the village of Kincairdie. At right, a visit to the Edradour distillery.





Brandon Okafor (B.S. '12, M.S. '14) is now a hydrogeologist at URS Corporation.

Laurie Christine O'Neill (M.S. '14) resides in Sacramento, California, and can be reached at LCONeill@texas.edu.

Brandon Okafor (B.S. '12, M.S. '14) has taken a position with URS Corporation in Houston.

Megan Franks Plenge (Ph.D. '12) writes, "In the past year, I've gotten married and had a baby, a little girl named Ramona Jane. The same week the baby was born I accepted a visiting assistant professor position at Trinity University in San Antonio."

Makoto Sadahiro (M.S. '14) resides in Englewood, Colorado, and can be reached at sadahiro@utexas.edu.

Audrey Sawyer (Ph.D. '11) has taken a position at Ohio State University. She has been at the University of Kentucky.

Derek Sawyer (Ph.D. '10) is now an assistant professor at The Ohio State University's School of Earth Sciences.

Isaac Smith (Ph.D. '13) writes, "After graduating in 2013, I spent nearly eight months in Paris funded by the Fulbright Foundation.

While there I applied for a postdoctoral position at Southwest Research Institute in Boulder, Colorado, and was hired. I moved to Boulder in May 2014 and I am enjoying my new home. Things are great, and I owe much to the Jackson School."

Lindsey Sydow (M.S. '13) accepted a position with Pastor, Behling & Wheeler, LLC, in Round Rock.

Nathaniel Van Oort (B.S. '13) has taken a position with the Texas Water Development Board in Austin.

Barbara Wortham (B.S. '13) has accepted an offer to pursue graduate studies at Boston College.

Syed Daniel Zafar (B.S. '12) will pursue graduate study in civil engineering at the University of Colorado.

Armand Mikhail Zulfitri (B.S. '14) writes, "I had an awkward moment at work where I realized I was basically doing homework eight hours a day. Fortunately I've had plenty of practice. I can be contacted at armandzulfitri@gmail.com."

Friends of JSG

Marion DeFord (spouse of the late Ronald K. DeFord, professor emeritus of geological sciences) resides in Austin and can be reached at mariondeford@ix.netcom.com.

Jack M. Sharp, Jr. (professor in the Department of Geological Sciences) writes, "There will be an indefinite hiatus in the *UT Hydrogeology News* of the University of Texas at Austin. I am signing off as the editor and writer, as I will be on a one-year leave of absence at the National Science Foundation. I believe I sent out the first monthly letter in June 2004 (my oldest on record) and it has been sent out monthly since then except for the six months in 2010 when I was with the USGS. It has been enjoyable being able to brag about the accomplishments of UT, the hydrogeology program and our former students. Keeping in touch with alumni and friends of our program has also been a pleasure. I shall return to UT-Austin in August 2015 and will keep my email and office mailing addresses in the interim. I will return to

campus on an approximately monthly basis for a few days to meet with students, fulfill my duties with the Austin Geological Society and hopefully make one football game."

William "Bill" Woods (administrative associate at UT-Austin's IC2 Institute) writes, "Over Thanksgiving, Francisco and I went to New York City, my first trip. While there, we got married on my birthday (nice birthday celebration!) and took in a show, a musical and the Metropolitan Opera. In December we traveled with friends to Fortaleza, Brazil, for the Christmas holidays. Over spring break we went to Taos, New Mexico, with the same friends and got to hike in the Rio Grande gorge on a beautiful day and participate in their wedding ceremony. Next trip is in the works. I continue to work part-time with IC2 out at the West Pickle Research Building and enjoy keeping up with UT folks."



2015 RESEARCH SYMPOSIUM

Alumni and friends are invited to attend the 2015 student-led Jackson School Research Symposium on Feb. 7 in the Texas Union Ballroom at the University of Texas at Austin. Visit www.jsg.utexas.edu/research_symposium for more information. Read about the 2014 symposium on page 14.

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MEMORIALS



Alumni & Friends

Larry Barnett (B.S. '59) relocated to Heaven on Sept. 25, 2013. Larry, as he was known to family and friends, was born in Galveston, Texas, on Feb. 19, 1934, to L.T. Barnett, Sr. and Theresa Irene Barnett of Texas City, Texas. Larry was a longtime resident of Austin, Texas. Larry attended Texas City High School where he earned a basketball scholarship to Wharton Junior College. After leaving Wharton, Larry set his sights on the University of Texas at Austin. Post enrollment he placed his academic career on hold



Larry Barnett

in order to serve two years in the Army as specialist during the Korean Conflict. Upon receiving an honorable discharge Larry returned to the University of Texas, completed his studies and graduated with a B.S. in Geology. With degree in hand, Larry began to forge a career in Central Texas real estate, receiving numerous accolades and honors in both the residential and commercial industry. Larry was distinguished as the first recipient of the CCIM (Certified Commercial Investment Member) designation in Austin.

In addition to real estate, Larry participated in the intricacies of the Texas oil and gas industry as a landman. Larry was the quintessential, dyed-in-the-wool, Texas Longhorn and could be found on college football game day sitting in the stands or squarely in

front of a radio or television cheering on his beloved Longhorns. Larry also had a love for the arts; he was an ardent admirer of the classical artists, the Three Tenors and honed his own talents with singing Schubert's "Ave Maria" in Latin. Larry had an adventurous spirit and loved to travel. He visited Europe and Greece but his favorite destination was the peaceful shores of Hawaii and many memories were made on the islands with his travel buddy and wife, Callie. Larry loved his home and his two faithful, canine companions, Cuddles and Honey Bunny, and enjoyed all that life brought him.

Larry met his wife of forty years, Callie Schaefer Meyer, in 1974 and the two of them blended their hearts and homes as loving and proud parents and grandparents. Larry's legacy will live on in his sons: Trey Barnett and wife Micki of Spring, Texas, Tim Barnett and wife Ninna of Houston, Texas, Stephen Barnett and wife Patricia of Meridian, Texas, Blake Meyer and wife Janet of Austin, Texas and Missy Meyer Gattis of Richmond, Texas. Larry's and Callie's thirteen grandchildren will continue in their grandfather's footsteps as they all have inherited his sense of adventure, love for the arts and education and a very witty sense of humor.

Robert E. Beatty (B.S. '54) passed away on May 30, 2014, in San Antonio, Texas, at the age of 89. He is preceded in death by his wife, Marilyn (Geisler) Beatty, sister Barbara (Beatty) Sullivan, and his parents Robert E. and Julia E. (Bodet) Beatty. Surviving family members include his niece Susan (Sullivan) Yvanovich and nephews Jay and

Brian Sullivan. He was a graduate of Central Catholic High School and attended Texas A&M University where he was a member of the Corps of Cadets and Theta Xi fraternity. He later earned a B.S. in geology from the University of Texas at Austin. Subsequent military service included duty assignments in the United States Navy. He retired from the Texas Railroad Commission after 25 years of service as a regional director regulating Texas oil and gas production. His was very involved in the community spending most of his life residing in the Monte Vista Historical District within San Antonio. He enjoyed civic associations, which included memberships in The Harp and Shamrock Society of Texas, San Antonio Conservation Society and the South Texas Geological Society.

Our Uncle Bobby had an irrepressible zest for life including a passion for fashion and travel. He met his wife Marilyn later in life and they traveled the world, sharing with us wonderful memories of their numerous trips and escapades.



Robert E. Beatty

Together they were our historians, passing down family legacies and a full appreciation for decorum, etiquette, and entertaining. The camaraderie of their conversations will be sorely missed; Uncle Bobby was the life of the party and he knew it!

Walter E. Belt (B.S. '43), age 91 of Georgetown, Texas, passed away on Jan. 30, 2014. He was born in Wallis, Texas, in 1922. Parents were Walter E. Belt, Sr., and Winnie Allen. Walter graduated from the University of Texas at Austin in 1943 and had a long career as a geologist and as a petroleum landman. He is survived by his wife of over 70 years, Virginia Duckett Belt, four children, five grandchildren and two great grandchildren and numerous other relatives.

Fred Blackmar (B.S. '55), age 81, passed March 29, 2014. Fred was born on Oct. 6, 1932, in Taylor, Texas, to Kenneth and Bettina Blackmar but grew up in Luling, Texas along with his brothers Guy and Jim. It was in Luling, Texas that Fred would meet Carolyn, his wife of 59 years. Fred

went on to graduate from the University of Texas at Austin in 1955 where he was a member of the Beta Theta Pi fraternity, the Naval ROTC and the Texas Cowboys. Fred then joined the U. S. Navy, earned his wings and proudly served as a naval aviator for 22 years. He flew AD's, S-2's and the E-2C Hawkeye aboard aircraft carriers USS Ranger, USS Yorktown, USS Midway and the USS Constellation. His distinguished career included serving as the CO of VAW-115, Air Ops Officer aboard the USS Constellation and numerous medals and awards before retiring in 1976 from the CNATRA staff in Corpus Christi, Texas.

Retiring from the Navy allowed Fred to pursue a second career in golf. Having been an accomplished player himself as evidenced by winning the 1965 National Left Handers, the Texas State Left Handers six times and the Inner Service Championship; he touched the lives of many as a golf instructor for adults and juniors alike. Fred also excelled creatively as a restorer of old persimmon woods. Fred's other passion was rocks. Specifically, he had a deep love of Laguna agate and various crystals. In fact, he annually shared some of his better specimens at the Corpus Christi Gem and Mineral Show having been a long standing member of the Gulf Coast Gem and Mineral Society. Fred is preceded in death by his son Donald and survived by his wife Carolyn, daughter Allison, her husband Bill Hunt and his children Tom and Maley, son Phil his wife Carol, their children Kristin, Kelli, her husband Pete Maginot and son Peter, Philip and his wife Ashley, and Mark and his fiancée Savannah Lester.

Erich B. Blohm (B.S. '54) was born on Oct. 6, 1930, in Poth, Texas, and entered eternal life on April 11, 2014. Erich was devoted to his family and Good New Lutheran Church. He enjoyed hunting with his best friend and brother Boobie Blohm. Erich was an admirer of nature and taking pictures. His most admirable trait was helping people in their time of need. He was a very well rounded person as he could fix a car engine, hunt animals, and play sports with anyone. He graduated from University of Texas at Austin in 1954, then joined the Navy until 1958. In 1959, he started his 30-year career at Kelly Air Force Base in electronics. He was preceded in death by his wife Janis Stanton Blohm, his parents

Walter and Hulda Blohm, brothers Ben, Willy and Bobby Blohm, sisters Gertrude Swanner and Amanda Thompson. Erich is survived by his son Erich Craig Blohm and wife Julie, grandson Erich Stanton Blohm and stepdaughter Makari Jacobs, his brother Walter Blohm, sister Elsie Lance of Redmond, Oregon, and sister-in-law Elizabeth Blohm of Portland Oregon.

Charlene J. Bolden (spouse of the late Gerald Pat Bolden, B.S. '51) was born on March 9, 1929, in Marysville, Texas, to Stephanina and Fred Johnson. On the death of her father in 1937, the family moved to Kerrville where she grew up in the home of her aunt, Mary Haberman. She graduated from Tivy High School and Schreiner Institute. In 1949, she moved to Austin. In 1951, she married J.L. Hutchison Jr. They moved to Midland in 1952 where he was employed by Gulf Oil Corporation. They were transferred to Roswell, N.M. in 1960 and returned to Midland in 1971. She was associated with University Lands - Oil, Gas and Mineral Interests from 1973 to 1994. She was a member of First Presbyterian Church, Chevron Retirees Association, Permian Basin Geological and Geophysical Auxiliary and was 1980 President of the Desk and Derrick Club of Midland. J.L. Hutchison Jr. died in 1983. In 1989, she married G. Pat Bolden. He died in February, 2013. She was also preceded in death by a sister, Bernice Johnson. Survivors include sons, Mark Hutchison (Tracy) of Austin and Jay Hutchison (Cyndi) of La Grange; daughter, Sharon Ott (Rich) of Houston; sister, JoAnn Mandriota (Frank) of Bayport, N.Y.; brother, Fred Johnson (Martha) of Burnet; granddaughter, Amy Hutchison of Austin; and the children of Pat Bolden, Craig Bolden (Sylvia) and Cathy Bolden, all of Houston.

Josephine N. Bluntzer (spouse of Robert Lee Bluntzer, B.A. '60), age 74, passed away on Aug. 12, 2014. She was born on April 14, 1940, in Port Arthur, Texas, to Francis Oliver Nicklin, Sr. and Josephine Mellers Nicklin. After she graduated from Bishop Byrne Catholic High School in Port Arthur, she earned a bachelor's degree in 1962 and master's degree in education in 1965 at the University of Texas at Austin. Jo taught sixth grade in Port Arthur, Texas and at Joslin Elementary School in Austin through 1968. Jo was a very dedicated, loving and outstand-

ing wife to her husband of 48 years, mother, grandmother and friend. She loved living in Austin and took advantage of the cultural activities it offered. Jo was an avid reader and never stopped loving to learn and being a teacher at heart. Jo was very active in her children's and grandchildren's lives and liked to visit and chat with her neighbors and friends. She was a member of the Austin Junior Forum, Women's Art Guild, and the UT Quest Continuing Education Group. Jo is preceded in death by her parents. She is survived by her husband, Robert Bluntzer and son, Peter Bluntzer, both of Austin, Texas; daughter and son-in-law, Alice and Joshua Ley, and grandchildren Andrew and Kate, all of Englewood, Colorado; and brother, Oliver Nicklin of Chicago, Illinois.

Bryan R. Bracken (M.A. '82), age 57, entered into rest on Aug. 10, 2014, surrounded by his wife and sons. Born in Kansas City, Bryan and his family moved to San Marino, California, in 1966. He graduated from Polytechnic High School in Pasadena in 1975, and moved on to get his B.A. in geology from Colorado College in 1979. It was at "CC" that Bryan fell in love with the science of geology, continuing on to earn his M.S. from the University of Texas at Austin in 1982 and his Ph.D. in 1987 from the University of Utah. When beginning his doctorate studies, Bryan uncovered a love to surpass geology when he found Judy, and they married in September 1983.

Bryan was employed by Chevron after the completion of his schooling, starting in Hobbs, New Mexico, then Houston, and finally settling in San Ramon in 1991. His passion and enthusiasm for geology inspired countless students and fellow geologists. Known as an excellent field scientist, Bryan taught and mentored many of his colleagues, leading field schools in the beautiful wilds of Utah, New Mexico and several unique worldwide destinations. During his 27 years with Chevron, he set his sights on long-term goals and never wavered from them, culminating in his dream job in clastic stratigraphy research. At home in San Ramon, Judy and Bryan teamed up to raise three wonderful sons. Bryan was involved in almost everything they did, from school activities to sports to scouting. A natural teacher, he introduced his sons to his love of nature and the mountains. He had a rare talent for

growing the biggest tomato plants in San Ramon! Bryan was happiest when surrounded by his family, whether it was hiking in the mountains or at home watching a movie. As an Eagle Scout himself, Bryan served as a leader of his sons' scout troop for several years and enjoyed adventurous outings in the mountains and oceans. He continued mentoring young men as they worked up to their Eagle Scout rank even after his sons were no longer in the troop. Bryan lived his scout values daily and was an excellent example to his sons and countless other young men.

After Bryan was diagnosed with cancer in 2009, he continued to work and enjoy a full life until about six months before his death. He endured several years of various treatments, never complained, and remained positive and upbeat throughout those years, serving as a model of strength and resilience to all of us. Bryan is survived by his wife Judy of 31 years, sons Cameron, 28, Ryland, 25, Stewart, 23, mother Janice Bracken, five nieces and seven nephews. He outlived his father Dan Bracken (1919-1971), his sister Frances Gay Kohen (1958-2005) and his brother Dan (1955-2012). Bryan will be missed by all who crossed his path, especially by his wife and three sons.

Patricia A. Buffler (spouse of former professor Richard Thurman Buffler), an internationally esteemed researcher known for her work on some of the world's largest studies on childhood leukemia and environmental health, and a former dean at the University of California, Berkeley's School of Public Health, has died. Buffler died of a stroke while in her campus office on the evening of Sept. 26, 2013. She was 75. At the time of her death, Buffler, who held UC Berkeley's Kenneth and Marjorie Kaiser Chair in Cancer Epidemiology, was leading several large research programs related to childhood leukemia and other childhood cancers. Among them is the California Childhood Leukemia Study, which Buffler launched in 1995 to investigate the relationship between diet, genes, infections and environmental exposures and the development of leukemia.

Buffler was also principal investigator of the Center for Integrative Research on Childhood Leukemia and the Environment, funded in 2010 by the National Institute of Environmental Health Sciences and the U.S. Environmental Protection Agency (EPA)

to study the role of prenatal and early life exposures to carcinogens in the development of leukemia. While best known for her work on childhood cancers, Buffler's work covered a broad range of environmental health issues, including the effects of secondhand tobacco smoke and electromagnetic radiation. In the 1980s, Buffler chaired a scientific advisory panel formed by the Semiconductor Industry Association to evaluate the risks of miscarriage among its workers. Buffler was born Aug. 1, 1938, in Doylestown, Pennsylvania. When she enrolled in the Catholic University of America in Washington, D.C., she became the first person in her family to go to college. She graduated in 1960 with a bachelor's degree in nursing and biology, and then moved to New York where she worked as a public health nurse in Harlem.

While she was in New York, Buffler met her future husband, Richard Buffler, a U.S. Navy communications officer stationed in Rhode Island, on a blind date. The couple married in 1962 and soon moved to California. While Richard Buffler obtained his Ph.D. in geology at UC Berkeley, Buffler worked as a public health nurse in Alameda County. She then earned her master's in public health in 1965, and a Ph.D. in epidemiology in 1973, both at UC Berkeley.

From 1974 to 1991, Buffler held various faculty positions at the University of Texas, starting as an assistant professor in the Department of Preventive Medicine and Community Health in Galveston, and leaving as a full professor of epidemiology at the School of Public Health in Houston. While in Texas, she also directed the Epidemiology Research Unit at the university. Among Buffler's long list of career achievements are membership in the Institute of Medicine and the American College of Epidemiology, and being named a fellow of the American Association for the Advancement of Science. She was also president-elect of the International Epidemiological Association. She served as advisor to the World Health Organization, the U.S. Department of Energy, the U.S. EPA and the National Research Council, among others.

Buffler also served on scientific advisory boards of several major corporations and industries, including the Scientific Advisory Panel on Electromagnetic Health Effects of the Electric Power Research Institute and the DuPont Company's Epidemiologic Review Board. In 1985, Buffler was named by the

state governor to the Texas Women Hall of Fame. Buffler is survived by Richard, who shared homes with her in Berkeley, Calif. and Santa Fe, N.M.; son Martyn Buffler of Austin, Texas; daughter Monique Does of Berkeley; and five grandchildren.

Donald Malcolm Campbell (B.A. '55), passed away on Oct. 10, 2013, Donald Malcolm Campbell. He was 83. Born in San Antonio, Texas, to the late Clyde and Janice Campbell, he spent his childhood and early adult life in Texas. Mr. Campbell graduated from University of Texas at Austin with a degree in geology, working as a geophysicist for different petroleum companies before being retained by the federal government for whom he worked the rest of his career, traveling extensively throughout the United States and much of South America. While working for the government Mr. Campbell met Carol Burdette whom he married in May of 1973. They lived in Colorado, San Antonio, Texas and Maryland. After retirement he worked for the Frederick and Harford County Public School System as a substitute teacher and an inclusion helper, and most recently for the Harford County Public Library. He is survived by his loving wife of 40 years Carol Campbell, his daughter Robin Smith and her husband Edward and his step-son David Flynn; his granddaughter Kimberly Campbell, who was the light of his life. Along with his parents he was predeceased by his brother Robert Campbell.

Howard E. Ellis (B.S. '51), 88, formerly of Victoria, Texas, passed away Aug. 1, 2014, at PRMC in Kerrville, Texas. He was born in Newton, Texas, to Virgil Oscar Ellis and Maude Mary Frances Hext Ellis on Sept. 3, 1925. He married Marjorie Louise Gilstrap on Jan. 26, 1951, in Austin, Texas. He attended many schools in Texas as his father was a bridge engineer with the Texas Highway Department, moving as each bridge was completed. He graduated from the University of Texas at Austin, where he was a member of the Sigma Nu fraternity. He worked for the Texas Railroad Commission, the Social Security Administration, and finally for Victoria Bank and Trust, which eventually became Wells Fargo.

He was a veteran of World War II, serving in the U.S. Navy. An active Boy Scout leader for over 25 years in the Gulf Coast Council

(renamed the South Texas Council), Howard was the recipient of the Silver Beaver Award, a national distinguished service award. He was inducted in the Order of the Arrow Honor Society, earning his Ordeal, Brotherhood, and Vigil. He served on the 1973 National Jamboree staff in Valley Forge, Pennsylvania. His three sons earned the rank of Eagle Scout. His daughter earned the equivalent award in Girl Scouts. Howard was a valued member of First Presbyterian Church in Victoria, Texas, for over 40 years where he served proudly as a Deacon and Elder. In his later years, he served as a construction supervisor for many small projects before moving his membership to First Presbyterian Church in Kerrville.

An AVID Texas Longhorn fan, Howard, affectionately known as "Tex" to family and friends, actively supported all of the university's sports, especially football. He attended home games for 65 years from 1948 through the fall of 2012 missing two home games to watch his youngest son play a Saturday varsity football game. He was president of the Victoria Texas Exes chapter and thoroughly enjoyed ribbing the Aggies at their joint luncheon before the annual Turkey Day game.

Howard is preceded in death by his parents and only brother, retired Marine Lieutenant Colonel Frank B. Ellis. He is survived by his wife of 63 years Marjorie G. Ellis. He leaves behind his daughter Debra E. Heath and husband D. Mayo Heath of Lewisville, Texas; his son Stephen H. Ellis of Clear Lake, Texas, his wife Jennifer and their sons, Robert and Matthew; his son David H. Ellis of Kerrville, Texas, his wife Donna and their son Derek; and, his son Henry C. "Hank" Ellis of North Richland Hills, Texas and his sons Caleb and Micah. Other relatives include his brother-in-law Ralph Gilstrap of Draper, Utah, his wife Carolyn, and their children, Christopher and Mollie; his niece Dana Ellis Smith, nephews Christopher H. Ellis and Jeffrey B. Ellis, and their children.

Bruce W. Fields (B.S. '51) passed away on Aug. 26, 2014. He was born on Oct. 27, 1924 in Sparenberg, Texas. Bruce's parents were Jessie Belum Fields and Beckham Woodard Fields. He was one of seven children. Bruce graduated from Lamesa High School and proudly served his country during World War II. Bruce enlisted in the United States Army at the age of 18 where he worked

independently in the Allied Supreme Command Post in Kandy, India, where the headquarters was located. Also known as the Seven Wonders of the World Botanical Gardens. He had the opportunity to work side-by-side with many world famous generals like General Louis Mountbatten from Great Britain and General Joseph Stillwell from the United States. After returning from World War II, Bruce attended the University of Texas at Austin on the G.I. Bill where he earned a Bachelor of Science degree in Geology in 1951.

He met and married the love of his life while at the University of Texas, Mary Lois Applewhite Fields. Bruce worked as a petroleum geologist for Union Producing and Phillips Petroleum until he went independent in Corpus Christi in 1960. One of Bruce's contributions in the field of Geology happened while on a University of Texas student field trip. His professor John A. Wilson stated "the day you found the jaw in Tornillo Flat was one of those lucky days." Bruce's discovery changed the age of Big Bend Park from Cretaceous to Paleocene and Eocene which made Big Bend Park a much younger age. He was a member of SIPES, AAPG, Corpus Christi Geological Society and the Longhorn Foundation.

Martha M. Finklea (spouse of Lawrence Finklea, B.S. '54), 85, of Sonora, affectionately known as Jodie by all who knew and loved her, passed peacefully at home Aug. 19, 2014, surrounded by family. A dedicated wife, devoted mother, doting grandmother and dear friend, she was preceded in death by her mother, Martha, and loving stepfather, William "Willie" Miers; her father, Andrew Moore and stepmother Nellie; and half-brother Andy Moore. Jodie was born Nov. 5, 1928, in Austin, Texas. Jodie attended Sonora High School and the Hockaday School in Dallas before graduating from Austin High School. She went on to receive a degree in home economics from the University of Texas at Austin where she was involved in intramural sports and won the campus wide posture contest.

While at UT, Jodie made many lifelong friends as a member of the Delta Gamma sorority. Jodie met Lawrence Finklea in the spring of 1951, and they married on Aug. 14, 1952, at the historic Burton Parish Episcopal Church in Colonial Williamsburg,

Virginia. They remained in Virginia where Lawrence was stationed with the U.S. Army at Fort Eustis. In 1954, they returned to West Texas to live and work on the family ranch. Jodie's happiest times were spent on the ranch keeping up with her children at a time when all three were in diapers. As they grew, Jodie was a constant fixture in their lives: she taught 4-H cooking to Marsha's friends and supported her children as they competed in 4-H wool, mohair and grass judging competitions. She was a "homeroom mom" for many years, as well as a Cub Scout den mother. Constantly on the move, Jodie loved golf and instilled a love for the game in her grandchildren. Summer weekends were spent with friends on the Devils River, checking trotlines in the middle of the night and trips to Ruidoso for the horse races. Jodie traveled the world but when asked to name her favorite place, her answer was always the same: Sonora, Texas, where she was a mother and grandmother to many in the community.

Throughout her life Jodie remained active in the Fling Ding Club, the Sonora Women's Club, the Sonora Women's Golf Auxiliary, the Sonora Rodeo and the La Tarantella Dance Club. Jodie was passionate about Broncos athletics, traveling hundreds of miles to watch the teams play. Those left to honor and cherish her memory include her husband of 62 years, Lawrence; her two sons, Bill and Larry; her daughter, Marsha Cardwell; her two grandchildren, Margo and McCurdy Cardwell; her half-sister, Angie Wright; nieces Deanna Wright Tovar and April Finklea Beckerley; nephews Peter Finklea and Keith Wright; and many, many friends.

Above all, Jodie was fun. Her zest for life was rare and precious and she possessed a spark that brightened the world for all who knew her. Life in Sonora will not be the same without her. She will be missed by all. The family would like to thank the staffs of Lillian M. Hudspeth Memorial Hospital in Sonora and Shannon Medical Center in San Angelo for their compassion and care over the past months.

Goldoni E. Flack (B.S. '51) died at his home in Georgetown, Texas, on April 15, 2014, after being cared for lovingly in his last days. G.E. Flack was born in Caddo, Texas, on Feb. 1, 1924, to Elmer L. and Emma L. (Smith) Flack. His parents migrated to Texas with Elmer's three brothers and a sister. The



Goldoni E. Flack

family followed the oil boom of Texas. G.E. grew up in Monahans, Texas. He graduated from Monahans High School in the class of 1942. Upon graduation, he joined the Army Air Corps Pilot program, commissioned second lieutenant at 19 years of age. On Feb. 3, 1943, he attended Aviation Cadet School in Altus, Oklahoma, where he became a flight instructor. He served with the 557th AAFBU in Great Falls, Montana, the 565th AAFBU in Reno, Nevada. On April 12th, 1945, he was assigned to the 1337th Air Transport Command in Sookerating, India. There he flew "The Hump" over the Himalayas, from India to China, ferrying supplies for the troops and "The Flying Tigers." He was awarded the following medals: Asiatic Pacific Campaign Medal, Victory Medal, Bronze Service Star, American Theatre Campaign Medal, and The Chinese Memorial Medal.

Upon Honorable discharge from the military, G.E. Flack entered the University of Texas at Austin. There he met the love of his life, Ruth E. James. They married on Dec. 23, 1947. They enjoyed 65 years of marriage and had two sons, Stephen and David. Goldoni is preceded in death by his parents, Elmer and Emma Flack; his step mother, Helen Kinney; sister, Letha Grantham; and his loving wife, Ruth. He is survived by his sons, Stephen and David Flack; two grandchildren, Amber Flack and Justin Flack; niece, Yvonne Dobkins; and nephew, Rodney Grantham.

Paul Giraudin (B.S. '48), was born Oct. 18, 1920, to Paul, Sr. and Mary Crow Giraudin

in Gainesville, Texas. After high school, Paul attended Cooke County Jr. College before transferring to the University of Texas at Austin. World War II interrupted his education and Paul was commissioned into the US Army Air Corp as a second lieutenant, assigned to various aviation squadrons. His love of flying from his teens allowed him to be accepted as a pilot trainee immediately. In a cooperative agreement with the British, he was awarded his wings both from the Royal Air Force and the U.S. Army Air Corp. Among the more memorable assignments was flying C-46 cargo planes over the "Hump" between India and China. During his time in the Air Force, he met and married Bettie Pat Parham. They were married on Dec. 15, 1945. He was honorably discharged as a first lieutenant and returned to UT where he completed his B.S. in Geology. He was hired by Marathon Oil Company and retired in 1970, having worked in Amarillo, Wichita Falls and Corpus Christi. Paul was a member of First Christian Church in Corpus Christi where he was recognized as an Elder for Life. He also worked on the staff as Church Administrator for 10 years.

Following his retirement he devoted his energy to his woodworking talents. Many people brought their broken furniture to Paul for repair during his 50 years in Corpus Christi. "Fixing" things was just something he loved to do. His other love was music, both playing and singing. In his early years, he played drums in the Gainesville Community Circus, and the University of Texas Longhorn Band. He continued his musical interests as a bass in the church choir and as a charter member of the Corpus Christi Civic Chorale. He never had formal musical training, but did have an ability that was surpassed only by the pleasure he received from participation.

During his 40-plus years with the Chorale, he had the opportunity to travel and perform in Mexico City, and numerous locations throughout the U.S., including New York City and the Kennedy Center in Washington, D.C. Paul is survived by his son, Paul Giraudin, III, wife Elsie of Katy, Texas, and daughter, Patrissa Getz, husband David of Corpus Christi. Seven Grandchildren; Nicole Martinez (John), Scott Giraudin, Rachel Giraudin, & Clayton Giraudin, Laura Dow (Scott), Lisa Vickers (Bo), David Getz, Jr., and seven Great-Grandchildren, Luke,

Colt & Lilah Dow, Addison and Kyle Martinez, Cooper and Riley Vickers.

C. Clyde Hamblin (B.S. '50) expired on Aug. 10, 2014, at the age of 90 years. Clyde was born on May 11, 1924, to Verna Ruth Thornbury and George Herbert Hamblin in Austin, Texas. He was predeceased by his parents; his brother, Herbert Andrew Hamblin; his sister, Lola Ruth Collons; and his son, George Spencer Hamblin. Clyde is survived by his wife of 70 years, Martha Hamblin; three grandchildren; six great grandchildren; and many nieces and nephews. Clyde attended schools in Austin, Texas, graduating from Austin High School before joining the Marine Corps during WW II. He married his high school sweetheart, Martha Poole, in Norman, Oklahoma, on Jan. 25, 1944, while he was stationed at the Naval Air Base in the Marine Air Wing.



C. Clyde Hamblin

He proudly served his country in the Marine Air Wing during World War II in the Philippines and occupation of China and again in the Korean War. After leaving the corps, Clyde returned to his hometown and earned a B.S. degree in Geology from the University of Texas at Austin. After graduation, he was employed by Union Producing Company in Houston, Texas, Tennessee Gas Transmission Company, later Tenneco, in Corpus Christi, Texas, Denver, Colorado, and Oklahoma City, Oklahoma before moving to Midland, Texas. In 1961, he became a founding partner in HMH Operators and later was an independent lease broker and operator of oil and gas properties. He was a petroleum pioneer.

Music played a big part in his life and he loved all kinds of music. While in Austin High School, he played the clarinet in the marching band and the "fiddle" in a country western band called the West Side Ramblers. While stationed at the Naval Air Station in Norman, Oklahoma, he played clarinet in the Marine Marching Band and the bass violin in the dance band. He sang in a barbershop quartet in Midland and was in the chancel choir at St. Luke's United Methodist Church for 54 years. He also served on the Administrative Board at St. Luke's and was a lay

delegate to the Northwest Texas Annual Conference of the Methodist Church. Clyde also was a member of the Society of Independent Professional Earth Scientists and the American Association of Professional Landmen for 50 years.

Miles H. Hardy (B.A. '52) passed into the presence of our Lord on Jan. 3, 2014, at age 87. He was a loving father and husband, and a kind and gentle friend to all. Born on Sept. 21, 1926 in Pearsall, Texas, he was a student at Pearsall High School and graduated in 1944. He attended the University of Texas at Austin and earned a degree in Geology. He married Lois Darleen Glover in 1956. Henry worked for the Texas Department of Transportation for 34 years before retiring in 1992. He also served 39 years with the Texas Transportation Federal Credit Union in various positions. He loved music, both listening to classical or jazz, and singing in the church choir at Trinity United Methodist Church, attending Spurs basketball and San Antonio Mission baseball games, gardening and reading. He is survived by his wife Darleen, two daughters, Joni and Julie, and two granddaughters, Rebekah and Sarah.

Hubert A. Henry (B.A. '48) was born on Oct. 13, 1919, in Pleasanton, Texas. He attended elementary school in San Antonio, Texas, and graduated from Austin High School in Austin, Texas. In 1941, he entered the U.S. Army as a private. He retired from the Air Force Reserve after 25 years of military service, including five years on active duty. He held enlisted, warrant officer, and commissioned grades to the rank of Major. Hubert Henry graduated from The University of Texas at Austin in 1948 with a bachelor's degree in geology. In 1955, he became a Registered Geological Engineer.



Hubert A. Henry

He joined the Texas Highway Department in August, 1948, as a research assistant in the Highway Design Division. During the next few years he worked in Research and Development. The Highway Department's engineering geology program was one of his major activities. In 1953 he was given the

added responsibility for developing highway illumination designs and assistance. He was then the head of the Automated Division when it was formed in 1965 and served in this position until his retirement in 1985.

Hubert served on many professional committees throughout his career. In 1972 he served as the Scientific Director for the NATO Advanced Study Institute on Computer Systems in Highway Design in Copenhagen, Denmark, and was an invited participant in the International Colloquium on Integrated Systems in Civil Engineering at the University of Liege, Belgium. In 1975, he was the overseas guest speaker for the Symposium on Computer Applications in Pretoria, South Africa. He loved traveling to these places and having the opportunity to share his knowledge with other engineers. He was very active in a variety of professional engineering organizations and received many invitations to speak and participate in conferences all over the world.

He married Peggy Ruth Evans on Dec. 26, 1948, and they celebrated their 58th wedding anniversary before her death in 2007.

Hubert loved to go to his place on Lake Travis and spent as much time there as he could. He enjoyed working in his beautiful yard and entertaining at his home. He was a Mason and a member of the Ben Hur Shrine Temple in Austin, Texas, for many years. He is preceded in death by his wife, Peggy Henry and his son, Leslie Evans Henry. He is survived by his son, Jim Henry (Austin) and his daughter, Kathleen Moore and her husband Mike Moore (Denver, CO). He is also survived by eight grandchildren and seven great grandchildren, numerous nieces, nephews, cousins and other extended family.

Eleanor M. Hoover (B.S. '56), age 88, passed away Jan. 7, 2014, in The Woodlands, Texas. Ellie was born Feb. 20, 1925, in Bomarton, Texas, where she graduated from high school. She later attended the University of Texas at Austin and received a Bachelor of Science degree in Geology. She accepted a position as geologist with Humble Oil and Refining Co. (Exxon-Mobil) in 1956 in Corpus Christi, Texas. She transferred to Houston in 1968 where she worked in the Exxon Exploration Department until retirement in 1993.

Ellie was active in both community and professional affairs. She was a member and

officer of the Houston Geological Society, American Association of Petroleum Geologists (AAPG), Corpus Christi Geological Society, Parent Teachers Association and Conroe Band Boosters. She was a member of the Magnolia Bend Volunteer Fire Department for 24 years where she served as both firefighter and board member. She was also a long serving Commissioner for Montgomery County Emergency Service District 5, a Life Member of the University of Texas Ex-Students Association and a member of the University of Texas Longhorn Foundation. Ms. Hoover was preceded in death by her husband, Robert C. Hoover, her parents Mary Marak Macha and Louis J. Macha and her brother George J. Macha. She is survived by her three children, Carol, Sharon and Mark. She is also survived by a sister, Marilyn Cloud; and various nieces and nephews.

Eleanor was a member of the Sacred Heart Catholic Church of Conroe, Texas. She was baptized in St. John's Catholic Church, a designated Texas Historical Landmark in the small community of Bomarton, Texas located in Baylor County in a part of Texas known as the Rolling Plains, about ten miles west of Seymour, Texas, which is on the Salt Fork of the Brazos River. She was immensely interested in history, archaeology and geology. Her work in the field of geology provided many opportunities for the study and enjoyment of these interests.

Gretchen M. James (spouse of the late Otis Lee James, Jr., M.A. '52) passed away Feb. 12, 2014, at the age of 78, in Dallas, TX. A Dallas native, Gretchen was born Jan. 16, 1936, to the late Freda Y. Kadane and Henry E. Wendelborn. She loved growing up in Lakewood, attending Lakewood Elementary and Woodrow Wilson High School, and matriculating to the University of Texas at Austin. She studied Geology, and was on the university ladies golf team.

Before marrying Robert Alfred Hall, of Waco and Valley Mills, Texas, where she spent 11 happy years in town and at the ranch before the family moved back to Dallas, and raising their three children, she was a model for Neiman-Marcus in Dallas. Selected for the feature story about the store, "Texas Shangri-La," in the December 1955 issue of Cosmopolitan, she was likened to Audrey Hepburn. An avid cook, she enjoyed

holding gatherings for family and friends, sharing her love of all things flavorful. Whether it was laid out with family Lebanese recipes, her truly Southern fried chicken or homemade ice-cream and cobbler, Gretchen's table was always a favorite. After dinner games such as Scrabble and Trivial Pursuit, cards or Yatzehe, were often seen at family holiday celebrations. She always strived to bring her family together, and loved to see them happy.

She spent many happy years with her second husband Otis Lee James, Jr., before his passing in 2008. They loved to laugh, and were a loving and caring duo. She is survived by daughter Heidi Hall Bass of Dallas; Audrey Hall (Tim) of Phoenixville, Pennsylvania; and son Robert Alfred Hall, Jr. (Colette) of Wylie; grandchildren, Amber Bass and Timothy and Hannah Hall; great-grandchildren, Trinity and Timothy Hall, Jr.; sister Barbara Wendelborn Thompson. She is preceded in death by her parents and husband Otis Lee James, Jr. Her first husband, Robert A. Hall, passed away on his ranch in Valley Mills on Feb. 21, 2014. They will both be dearly missed and always loved.

Luther G. Jones (B.S. '59) passed away peacefully in his sleep after a lengthy illness on June 28, 2014. Born in Temple, Texas, on June 10, 1930, to Catherine Pantan and Luther G. Jones, Sr., he graduated from Texas A&M high school in College Station and then travelled around Texas working for "Ma Bell." After serving in Army during the Korean War, he attended the University of Texas at Austin on the G.I. Bill, earning a bachelor's degree in Geology. Following a stint of working in the oil fields, he settled in San Antonio, where he worked at Kelly Air Force Base. Luther retired in 1990 and spent his sunset years reading travel books, building various contraptions, and happily pattering around the house. He is survived by his wife of 45 years, Karen Lee, sons Luther (Kristy) and Anthony (Genevieve) and daughter Madeline (Lorne); sister Louise (Bob) King; brother Bill (Carol) Jones; three grandchildren; and numerous nieces and nephews.

David G. Koppel (B.S. '50) passed away Feb. 15, 2014, peacefully and with dignity surrounded by his family. He was born in Houston, Texas, to Mae and Joe Koppel. He attended San Jacinto High School and

graduated from the University of Texas at Austin with a degree in Geology. After several years in the oil business in Texas and Louisiana, he settled in Oklahoma to start a career in commercial real estate and raise his family. He was preceded in death by his first wife, Virginia Flanagan Koppel, son Joseph and daughter Melissa. Years later by his second wife, Donna Farber Koppel. He is survived by his daughter Carolyn Kelley and her husband Sean, son Mike Koppel and daughter Kristy Copeland and her husband Bill, grandchildren Tyler Koppel, Kaitlyn and Jacob Copeland and Laurel Kelley.

Elizabeth A. Lochte (B.S. '56) was called to her heavenly home on March 5, 2014. Elizabeth "Bess" was born on March 23, 1930, in Houston, Texas, the fourth child of Cary and Arthur Sitterle. She grew up in Beaumont attending St. Ann's Catholic School. The family moved to San Antonio in 1943 where Bess attended Thomas Jefferson High School. She attended the University of St. Thomas in Houston and the University of Texas at Austin. She was married for 52 wonderful years to Erwin Richard "E.R." Lochte, Jr. who proceeded her in death in 2004. Bess was a parishioner of St. Gregory's Catholic Church where she was a devout member of the Eucharistic Adoration Adorers. She enjoyed spending weekends at the family ranch in Willow City, Texas, annual trips to Rockport, New Orleans and Las Vegas. Her faith in God always guided her and was the source of her strength.

Her devotion to Christ and the close relationships she fostered among her children and grandchildren is the legacy she leaves. Bess was preceded in death by her parents, sister Jeanne Hicks, brother Arthur "Ossie" Sitterle and son in law David Alan Linahan. She is survived by her children Dr. Richard Lochte III and wife Mary Ann, Cary Lochte Kopecky, Anne Linahan and husband Craig Kirby, Marci Aune and husband Jon, Traci Darr and husband David, nephew Ricky Gregorie and wife Jennifer. She was blessed with 23 grandchildren, Trey, Emily, Beth, Casey, Rich, Randy, Kristie, Katie, Jason, TJ, Chad, Mitch, Betsy, Chip, Ashley, Carson, Coy, Kaylee, Mary Catherine, Liesl, Cary, Keith, Lyndsie and 11 great-grandchildren. The family would like to thank the staff of The Lodge at Leon Springs and her devoted caregivers, "Momma's Angels",

for their love and care especially Felicidad, Cydie, Mia, LaToya, Bernice, Gayle, Dee Dee, Annette, Chris and David. Angels watch over all of you.

Laddie F. Long (B.S. '52) passed away on April 17, 2014. He was born on April 4, 1926, to Fred and Flossie Long in Wright City, Oklahoma, the second of three sons. He moved at an early age to Barstow, Texas, where he grew up and graduated from high school in 1943. Shortly after finishing high school he entered the U.S. Navy flight training program and served in the Pacific area as pilot of a patrol bomber. Upon the discharge from the Navy in 1949, he attended the University of Texas at Austin and received a Bachelor of Science degree in Geology in 1952. He worked for several oil companies as an exploration geologist in the Panhandle, West Texas, New Mexico and East Texas before accepting a position with the University of Texas Lands, Midland office. He retired in 1986 as Manager of Oil and Gas after 22 years in service.

He married his high school and lifelong sweetheart, Faye Echols, in 1946. Four sons were born to this union. He was a long time member of the American Association of Petroleum Geologists, West Texas Geological Society and the Presbyterian Church, which he served as deacon, elder and Sunday school teacher. He enjoyed bird hunting and fishing; especially in the streams and lakes of the Colorado Rocky Mountains. He took great pleasure in attending Navy and squadron reunions, renewing old friendships from the service years. He was preceded in death by his parents and two brothers.

He is survived by his wife of 67 years, Faye Long; four sons, Stephen Long of Taos, New Mexico, Michael Long and wife Dee of Colorado Springs, Colorado, David Long and wife Martha of Terlingua, Texas, and Kevin Long of Marfa, Texas; three grandsons, Lance Keith and wife Maggie of Comanche, Texas, Dustin Polk and wife Sara of Artesia, New Mexico, and Samuel Long; granddaughter, Anna Long of Colorado Springs, Colorado; and by four great-grandchildren, Rylie, Laddie, Tinsey and Ayden. Laddie is also survived by his sister-in-law, JoeAnn Long of El Cajon, California; and many nieces and nephews. The family would like to thank Laura Serrano for the devotion and care that she has provided the last five years.

Lester E. Ludwick (B.S. '50), age 87, of El Paso, Texas, passed away on March 12, 2014. Lester was born on Sept. 21, 1926, in Temple, Texas, to Lester Ludwick and Mona Renker. Lester graduated from Temple High School in 1943. He attended Temple Junior College, and during this time, worked for the U.S. Postal Service and for Scott and White Hospital as a film developer and then an X-ray technician in the X-ray department. During this time, he met his future wife, Martha Richards. They were married on June 5, 1947.

After graduating from Temple Junior College, Lester and Martha moved to Austin, Texas, where Lester attended the University of Texas, earning a Bachelor of Science in geology in 1950. He then began a successful career in the oil and gas industry, joining Standard Oil of Texas in Iraan, Texas. In 1954, he joined El Paso Natural Gas Company in Houston, Texas, as a reservoir engineer. In 1959, Lester and Martha moved to El Paso, Texas, where he continued his career with EPNG until his retirement in 1986. Lester was an avid golfer. He loved music and when the occasion allowed, enjoyed dancing. He enjoyed time with his family, and especially enjoyed time spent during summers with his wife, children, and extended family members at Lake Belton, in Belton, Texas, where he taught his children to water ski and to love being on the water.

He demonstrated his love of his children and grandchildren by his participation and attendance at sports and music events and activities. He was always ready to make an ice cream cone or play a game of backgammon or gin rummy with a grandchild. He enjoyed traveling, and during his retirement years, was able to take many road trips with Martha, traveling throughout the United States. Lester was a loving husband and father and will be greatly missed by his family. He is survived by his wife of 66 years, Martha, his son Larry and wife Donetta of Mansfield, Texas, his daughter Laura and husband Dennis Svatek of Jacksonville, Florida, and his daughter Mary and husband Brent Thompson of El Paso; eight grandchildren, and three great grandchildren.

Robert W. Luker (B.S. '51), age 90, passed away on Feb. 20, 2014, in Corpus Christi, Texas. Bob was born on Sept. 30, 1923, in Austin, Texas to W.F. and Charlotte N. Luker. He served in the U.S. Navy during

World War II and after his tour of duty he married Betty in 1947. He then enrolled in the University of Texas and graduated in 1951 with a B.S. in geology. Immediately after graduation he went to work for the Humble Co. on the King Ranch in Kingsville, Texas. After Humble, he worked for the Seaboard Oil Co. in Dallas and later transferred to Corpus Christi as a district geologist. Seaboard merged with Texaco in 1955 and Bob then became an independent exploration geologist from 1955 to present (Luker Energy).

Bob was an avid hunter; hunting dove and quail, he loved ranching with his favorite bull "Big;" he was a tremendous family man and planned numerous family trips and vacations, and he loved to water ski, skiing until the age of 70. He was a member of AAPG, SIPES, TIPRO, IPAA and CCGS. He is preceded in death by his daughter, Vicki Lynne Luker and daughter-in-law Melissa Ann Luker. He is survived by his wife of 67 years, Betty Luker; children, Steve (Jeanne) Luker, Scott Luker; six grandchildren Austin Luker, Stephanie (Garrett) Weidman, Catherine Pennington, Shaun Dunk, Valena Hanson (Jose Jacquez), Ricky Hanson; two great grandchildren Khloe Jacquez and Cairo Hanson; two brothers Clifford (Ruth) Luker, Ernest (Nannette) Luker; a sister Marge Reuter; numerous nieces and nephews.

William E. Maynard (B.S. '51), 89, of Bastrop died at home on Jan. 24, 2014. He was born on April 7, 1924, in Bastrop, Texas. Billy



William E. Maynard

graduated from Bastrop High School in 1941 and received an associate's degree from Shriner College in 1949 and a B.A. in Geology from the University of Texas at Austin in 1951. He married Clara in 1982 after an eight-year courtship. He is survived by his wife, Clara Maynard, three children: Dawn Kana and husband Chris, Scott Curtis, Craig Curtis and wife Rosie. Grandchildren, Erica Kana, Laura Lee Curtis, Morgan Curtis, Sam Curtis, Dan Curtis. He was preceded in death by his parents William "Ed" and Elsie Maynard and his sister, Betty Maynard. Billy owned Maynard Insurance on Main Street

for over 30 years. He expanded to include a real estate office and savings and loan agency. Billy served on Bastrop City Council, Chamber of Commerce Board, Historical Landmark Commission and numerous church boards.

Robert J. Oliver (spouse of Evan Royal-Oliver, B.A. '02), 61, died Feb. 1, 2014, at his home in Austin, Texas. He was born Nov. 10, 1952, in Bennington, Vermont, and was the son of the late Morris A. Oliver and Josephine Burn Oliver who emigrated from Great Britain after World War II. He was a graduate of Central Dauphin High School, class of 1970. He attended HACC, and joined the U.S. Naval Reserves in October 1976. He graduated from the University of Texas at Austin and worked as a real estate appraiser and later started Bufalo Bob's Chalupa Wagon. He is survived by his wife, Evan Royal Oliver of Austin, Texas; his brother, Michael W. Oliver of Downingtown, Pennsylvania; and his sister, Kathryn O. Armstrong of Linglestown, Pennsylvania. He has five nieces and nephews.

Ora S. Ottmann (spouse of the late Robert "Bob" Ottmann, B.A. '51), age 84, of Houston, passed away July 25, 2014. She was born July 21, 1930, in Seguin, Texas, daughter of Monroe and Elsie Schmitt. Ora graduated from Seguin High School in 1948. She trained as a vocalist and a pianist for 14 years and was a member of the First United Methodist Church where she sang in the choir. Her favorite jobs while growing up involved work at a local candy store, which enhanced her love of chocolate, and a local radio station where she wrote copy for on-air commercials and other broadcasts. After high school she attended The University of Texas at Austin, where she met the love of her life, Robert "Bob" Ottmann, in the biology lab. She and Bob were married in 1950. During Bob's career with Exxon as a geologist, the couple lived in Texas, California, Oklahoma, and Louisiana.

Ora was a devoted mom to her three children, and at various times worked in retail and real estate. She and Bob loved to travel, taking the family on numerous car trips throughout the United States in the early years. During retirement, they continued their love of travel throughout the country and abroad. Ora was also a

proud grandmother, known as “Mimi” to her grandchildren, spending countless hours attending dance recitals, soccer, basketball, and football games. She was preceded in death by her husband, Bob, just months shy of their 59th wedding anniversary; and her daughter, Janis Ann Ottmann. Surviving to cherish her memory are son, Jeff Ottmann and his wife, Margaret Ottmann; daughter Judi Ottmann; grandchildren Kaitlyn and Robert Ottmann; sister Mozelle Howton and brother-in-law Jack Howton, and many other family members and friends.

Rodolfo Prieto Cedraro (Ph.D. '87), age 60, passed away April 5, 2014, in Houston, Texas. Our dear friend Rodolfo left us too soon. Those of us who knew him will always remember him as an honorable man who was dedicated to his family and his profession. He was a scholarly man who had many close friends around the world. Rodolfo was passionate about education; he received a Bachelor of Applied Science in Geological and Geophysical Engineering from The Pennsylvania State University in 1980, a Geophysical Engineering degree from Universidad Central de Venezuela in 1983 and a Doctorate of Philosophy in Geological Sciences at The University of Texas at Austin in 1987. His research resulted in numerous publications. His work career began with Petróleos de Venezuela S.A. where he held many leadership roles until 2003. As a result of his vast knowledge and strong work ethic his career path led to the position of Vice President and General Manager of Suelopetrol Corporation in Houston, Texas. In addition, he shared his knowledge with students at the Universidad Central de Venezuela where he taught for many years.

W. T. Probandt (B.S. '56) passed away on April 25, 2014, following a lengthy illness. He was born on Feb. 22, 1929, in San Angelo, Texas. He served in the Army during the Korean War. He received his bachelor's degree in Geology from the University of Texas at Austin and master's degree in Geology from Texas Tech at Lubbock. After working as a geologist for Anderson-Prichard he struck out on his own finding oil and gas in West Texas and New Mexico. Two of his passions were music and animals; he was involved in many philanthropic causes, including The University of Texas Performing Arts Center

and the Midland SPCA, which was recently taken over by Grand Companions Midland. He is survived by his loving wife of 55 years, Jeanette; two children Teresa Bowman of Ft. Worth and Jeff Probandt of Dallas; grandson Joshua Bailey of Ft. Worth; and pets Shadow and Button. The family greatly appreciates all the calls and visits with Bill over the past difficult years of his life.

T. Donald Reed (B.S. '62) was born to Thomas Ervin Reed and Luna Catherine Seale Reed in Camp County, in the Holly Springs Community of East Texas. He was the only son and the youngest of nine children. Don attended Holly Springs Elementary and graduated from Pittsburg High School in the Class of 1950. He started attending the University of Texas at Austin in 1953 and stopped to serve in the U.S. Army in August, 1955, in the DMZ Police Company in Korea. In June of 1957, he received an honorable discharge from the Army and returned to the University of Texas to continue his studies. While at the university he met Nancy Farrington from Wimberley, Texas, in the fall of 1957, and they were married Feb. 6, 1959. Together they were blessed with three children: Thomas Donald Reed Jr., John Stephen Reed and Maridon Reed Grochowski.

After graduating in 1962 as an honor student with degrees in Geology and Math, Don became employed in Tyler, Texas, as a geophysicist for Pan American Oil Co., which later became Amoco Production Co. While with Amoco, the family was located in Tyler, Texas; Houston, Texas; Tulsa, Oklahoma; and Denver, Colorado. After working with Amoco for 17 years, Don decided to resign and start Geotrace Technologies Inc., his own Seismic Services Co. in Denver. The family continued to live in Denver for 30 years. Through the years, Don was a committed Christian, always active in his church, serving as an ordained Deacon, and adult Sunday school teacher and being involved many other ways. He and Nancy raised their children in the church. Don was also active in his sons' sports as a winning little league baseball and football coach. In 2002, Don and Nancy moved to Argyle, Texas.

In 2004, he retired and sold Geotrace, which by then had branches in Denver, Dallas, Houston, England and Norway. After moving to Argyle, they became members

of Southmont Baptist Church, and later members of First United Methodist Church in Denton, where Don often taught and was President of Searchers Sunday School Class until he had to resign for health reasons. Finally, after a long struggle with chronic lung disease he went to be with Jesus on March 5. Don was loved and will be greatly missed by his family and friends. Don is survived by his wife, Nancy; sons Thomas Donald Reed Jr. and wife Angie, John Stephen Reed and wife Desiree; daughter Maridon and husband Jason Grochowski; grandchildren Austin Reed, Shlby McAdoo, Andrew Reed, Whitney McAdoo, Tyler Reed and wife Abigail, Danielle Reed, Kimberlyn Reed, Alexandra Grochowski, Annaleise Grochowski, and great-granddaughter Elyse Reed.

G. Phil Roberts (B.S. '58), beloved husband, father and friend, passed away on April 21, 2014, with his family at his side. Phil was born in Gilmer, April 14, 1932, the only child to Loraine Powers and Gordon King Roberts. Phil's father owned the Chrysler dealership in Gilmer but was also interested in aviation. He had learned to fly from an old barn-stormer and owned a Waco airplane. When World War II broke out, that put an end to people buying cars. The United States was in desperate need of training for pilots so Mr. Roberts, in conjunction with Kilgore Junior College and the United States Government, opened a training facility for Navy pilots at Elder Field in Kilgore. During this period of time, he met Walter Beech, founder of Beech Aircraft, Wichita, Kansas, who also had a training school for Navy pilots. When the war ended, Mr. Roberts went into business with Walter Beech and was awarded the Beechcraft dealership and distributorship for Dallas and East Texas. Mr. Roberts moved his family to Tyler and established a dealership and maintenance facility for Beech Aircraft Corp. at Pounds Field and in Dallas at Love Field which he managed out of his businesses, Tyler Aero, Texas Aviation and Roberts Aviation (now Johnson Aviation) at Pounds Field. Since Phil was surrounded by aviation, he learned to fly at a very early age and soloed on his 16th birthday in a 40 Horse Cub. He had a license to fly before he had a driver's license.

Phil graduated from Tyler High School in 1949 where he was on the golf team. He attended Virginia Military Institute in Lynch-

burg, Virginia. After spending a summer working for his close friend, Jack Bunn's father, who was in the oil business, Phil decided that the oil patch was his destiny and transferred from VMI to The University of Texas at Austin, obtaining a Bachelor of Science degree in geology and petroleum engineering in 1958. He was a member of the Sigma Alpha Epsilon fraternity. Phil served in the United States Army during the Korean War as a survey specialist based at K-8 Air Force Base in Pusan, Korea, for one year. The next year he served at Camp Hakata on the island of Kyushu in Japan. The general of the base saw Phil playing golf one day, was duly impressed, and asked him to wind up his survey job and take over the base golf course, which he gladly did. Phil was employed as a geologist by Trice Production Co. in Longview in 1958. He was transferred to Houston as district manager in 1961 to 1965 when he became an independent and started his own company, R.O.M. E. (Roberts Oil and Mineral Exploration).

He was a member of AAPG, a lifelong member of the Houston Geological Society and was a founder and president of the Houston Geological Log Library. He was a member of The Petroleum Club of Houston, Memorial Drive Country Club and Westminster United Methodist Church where he married Carrie Anna Crockett McGee in March 1980, in Houston. Phil was a lifelong member of the Methodist Church, growing up in Marvin United Methodist in Tyler, and was a member of the Emerald Bay Community Church, Emerald Bay, Bullard. In high school and college, Phil was well known for his water-skiing ability. Reading a magazine about the 1949 World Water Skiing Championship in France, he was intrigued by the slalom ski but it was not readily available in the U.S. So from the magazine pictures, Phil made his own slalom ski, taught himself how to use it, then taught his friends.

Phil was a marvelous and innovative cook, an avid hunter and fisherman who taught his family that "if you shoot it or catch it, you clean it and eat it." He was an exemplary father to his two boys and actively devoted his time to their activities and upbringing. Phil loved playing golf and snow skiing, but his life's passion was flying and he continued to fly until he was 80 years old. The many, many family trips to exciting places will be remembered and cherished by his family

and it was with great sorrow that he sold his last airplane last year. The end of an era. There was never a dull moment when Phil was around because he was always fun, had a marvelous sense of humor (no one could tell a joke like Phil) and had a zest for life. He had impeccable manners and was truly a gentleman. He never complained or lost hope during his 3 1/2-year battle with cancer and was optimistic to the end. He was looking forward to the birth of another grandchild due in June. He was preceded in death by his parents, Gordon K. and Loraine Roberts, and his grandson, Benjamin V. McGee.

He is survived by his wife, Carrie Anna Roberts, Emerald Bay, Bullard; son, Gordon H. Roberts and wife Kelley, Fort Worth; son, Andrew B. McGee and wife, Elizabeth, New York, N.Y.; cousins, Barbara Pinkston, Buddy Nolley, Suzanne Mayfield; and his best buddy, Frankie, who was his constant companion at home. A special thank-you goes out to Joyce Storey and Yolanda Veezey for the loving care they provided.

Albert L. Sexton (B.S. '40), a native of Orange, Texas, went to his eternal rest in Houston, Texas, on March 21, 2014. Lee was born on Sept. 28, 1918, to William Putnam Sexton, Sr. and Annie Lee McGuire Sexton. He attended the public schools in Orange and graduated from the University of Texas at Austin in July, 1940. Following his graduation, he returned to Orange and married his lifelong sweetheart, Lillian Addington on Oct. 28, 1940. To this union, two sons were born, David Andrew Sexton and Dr. John Alan Sexton. Lee's first job was at Consolidated Steel where he built warships. At the beginning of World War II, he began his career at E. I. DuPont Refinery where retired following 38 years of dedicated service.

Lee was a lifelong member of First Presbyterian Church in Orange. He joined the Madison Lodge #126 in Orange in 1940 where he became a 32nd degree Mason and became a Shriner in 1944 at the El Mina Shrine in Galveston. Lee is predeceased by his parents; two brothers, W.P. Sexton, Jr. and John Graham Sexton. He leaves to cherish his memory his devoted wife of 73 years, Lillian, and their two sons, David and wife, Karen Sexton and Dr. Alan and wife, Jan Sexton all of Houston. Also surviving are grandchildren, Jason and Alice Sexton, Adam Sexton, William Sexton, Laura Sexton, Stefani and

Seth Goldberg, Katherine and Eric Lange and Paul Allison along with great grandchildren, Kailey Elizabeth Sexton and Sarah Britton Lange and his nephew, Charles Sexton.



Mary Alice Nitschke Smith

Mary Alice Nitschke Smith (spouse of the late Joe E. Smith, B.S. '48) was born to Lewis Nitschke and Mayme Cocreham Nitschke on June 4, 1922 in Austin, Texas. She graduated from high school in 1939. She graduated from the University of Texas in 1942 with a Bachelor of Business Administration. She married George Roy Huston in 1943 in Austin, Texas, and lived with his parents in Los Angeles, California, while he was serving overseas during the last year of the war. They had three children: Nancy, Kathleen and George and lived in Casper, Wyoming, and Salt Lake City, Utah, until George Huston's death in 1965. She then moved back to Austin with her three children. Mary Alice married Joe Earl Smith of Beaumont in 1971. They lived in Austin. Joe Smith died in 1987.

Mary Alice's father's family originally came to Austin in the 1850's and she was proud of her early Texan history and could tell endless stories about "Old Austin." She had a wonderful sense of humor and loved being around people; volunteering for numerous clubs, committees and her sorority Alpha Chi Omega; bragging on her grandchildren and being the "life of every party." She was particularly fond of the Sunday Night Supper Club and all of its regulars over more than 20 years. Always playful and fun, she will be greatly missed. Survivors include Nancy Huston of Houston, Kathleen Huston of College Station, George Huston of Austin, and four grandsons: Colin and Corey Liter and Matthew and Zachary Rider.



*Lee Middleton
Hooper Walker*

Ruth Ann Tips (spouse of Craig Adams Tips, B.S. '48), beloved wife, mother and grandmother passed away at home in Banderita on Nov. 11, 2013, surrounded by her family. She was born July 27, 1926, to William and Evangeline Ratcliffe who preceded her in death. Ruth Ann was also preceded in death by her sister Edith Granger. She is survived by her husband of 65 years, Craig Adams Tips; sons Jack Tips and William Ratcliffe Tips; granddaughter Lauren Tips-Smith; great grandchild Jaxon Tips-Smith; sister Evangeline Wilson; and numerous nieces, nephews, and a host of dear friends.

Lee Middleton Hooper Walker, the joy of his parents' lives, passed away on May 22, 2014. Lee was born in El Paso, Texas, on Oct. 25, 1994. He loved the outdoors, dogs, history, hiking, camping, fishing, hunting and learning. He enjoyed Alaska and volunteered with the Student Conservation Association to help care for our National Parks, including the Kenai Fjords National Park. He was a scholar and an academic. He attended St. Clement's and Coronado High School. At St. Clement's, he received the Rector's Award for the highest academic performance, but more dear to his heart was the Outdoor Program awards he received every year. He was one of the top 10 graduates from Coronado High School and competed in debate. He completed his freshman year in 2014 at the University of Texas in Austin, where he was in the Plan II Honors Program and in the Jackson School of Geosciences on scholarship.

Lee was a leader and a kind, polite, honorable, respectful and compassionate

person his entire short life. He held himself to exceptionally high standards. He enjoyed travel and visited Yosemite, Yellowstone, Muir Woods, New Zealand, France, Scotland, England, Durango, Jackson Hole and Washington D.C., among many other places. His most favorite place, though, was hiking through the woods and mountains and he preferred simplicity. He is survived by his parents, Mark Callis Walker, UT Jackson School alum, B.A. '81, and UT Law '85 and Kathleen Campbell Walker, UT Law '85, and his grandparents, Barbara Callis Walker and Arland R. Walker, all of El Paso. He was the only child of Mark and Kathleen. He was cherished every day of his life and always will be. A service in honor and celebration of Lee's life was held on May 29, 2014, at First Presbyterian Church in El Paso.

Shirley W. Whiteside (B.S. '52), born Dec. 3, 1931, in San Angelo, Texas, passed away peacefully in her home after a long battle with breast cancer. She was preceded in death by her parents Niles Baker Winter Sr. and



Shirley W. Whiteside

Glenna (Allen) Winter and two months earlier by her beloved husband of 62 years, Wilfred Drennen (Bill) Whiteside Jr. She is survived by children Tom Whiteside (Judy),

Lee Ann Kreig (Ray) and Will Whiteside (Shannon) and brother Niles Winter (Margot). Shirley attended the University of Texas at Austin, graduating in 1951 with a Bachelor of Science degree in Geology and was a member of the Delta Zeta sorority. But the real accomplishment at UT was meeting the love of her life, Bill, whom she first met dissecting a fetal pig in biology lab. They were married June 21, 1951, and moved to Houston for Bill to attend dental school.

After Bill graduated from dental school and four years in the army at Fort Hood, the family moved to Corpus Christi in 1958. Shirley and Bill were very active members of the First United Methodist Church from their arrival in Corpus onwards and cherished the church and their many friends there. Shirley got involved in all things related to her children including becoming a Cub Scout den mother and a Girl Scout

leader and was a lifetime member of the Parent Teacher Association.

She was a board member for the Robert L. Moore Community Center and made dyeing Easter eggs for the children a family tradition as well as organizing children's activities and other services. Shirley was a charter member of the Key Study Club. She was also an important member of Bill's dental office team, helping with accounting and other administrative functions. She was president of the Auxiliary to the Nueces Valley District Dental Society and served on the board and various offices and committees for the Auxiliary to the Texas Dental Association. Shirley was a Master Gardener and was quoted in a Caller Times article saying: "Truly, I think you are closer to God in a garden than anywhere else. Nature is what supports us, and there is a new gift every day. A new flower, a rainbow, a lizard, a frog, whatever."

She loved going to schools and teaching children about plants, flowers and insects. Her home garden is a beautiful wonder enjoyed by monarch butterflies, lizards, hummingbirds and too many cats. She served as chair of the projects committee of the Beautify Corpus Christi Association and this led to the creation of the Xeriscape Coalition board on which she also served. They worked across a number of organizations to create the Xeriscape Garden at the Corpus Christi Museum of Science and History. She received the Jefferson Volunteer Award for this effort. She and Bill were volunteers at the dental clinic in Progresso, Mexico, helping to bring dental and other care to the poor. Shirley crossed the language barrier by bringing crafts to the children.

She was also a member of First Friday, an organization of support for women with breast cancer. Shirley combined sweetness, persuasion, tenacity and meticulous attention to detail to accomplish whatever she set out to do. She loved people but most especially her true love, Bill. Bill had numerous serious health issues as did she, and both lived to take care of the other. She was not afraid of dying and looked forward to seeing Bill and Jesus, in that order.

Wilfred D. Whiteside (spouse of Shirley Whiteside, B.S. '52), age 82, passed away on May 26, 2014. Bill was born in Houston, Texas, to Wilfred Drennen Whiteside, Sr. and Tommye (Bell) Whiteside on Oct. 16,

1931. He grew up in Timpson, Texas. He began his pre-dental studies at the University of Texas at Austin where he met the love of his life, Shirley Lee Winter, in a biology class. Nothing like dissecting a fetal pig together to spark a lifelong romance! Bill and Shirley married June 21, 1952. Bill attended dental school in Houston, graduating at the top of his class in 1954. He then served four years in the Army Dental Corp at Ft. Hood. They moved to Corpus Christi and opened a dental practice in 1958 after falling in love with the "Sparkling City by the Sea" while on vacation. They soon joined the First United Methodist Church, the source of great life enrichment and many friendships.

Bill combined a talent for attracting and building a top-tier staff with a dedication to excellence and downright fun, establishing one of the most successful dental practices in Corpus Christi. He had a passion for preventive dentistry. His goal was that his patients would take such good care of their smiles that they would put him out of business. Bill was instrumental in establishing the Dental Assisting and Dental Hygiene Programs at Del Mar College. He served as president of the Nueces Valley District Dental Society and as president for the Texas Academy of Dental Practice Administration. He was made a Life Fellow of the American College of Dentistry in 1986. He served as a governor appointee on the Texas State Board of Dental Examiners from 1990 to 1993. He received the Master Practitioner Alumni Award from the University of Texas Health Science Dental Branch in 1998. Bill was honored with the Texas Dental Association Lifetime Service Award in 2009.

Bill enjoyed a good story and reliably kept us laughing. He truly loved people and was first and foremost a mentor in whatever role he served—father, dentist, Sunday school teacher or scout leader. He was very active in Indian Guides, Cub Scouting, and the Boy Scouts of America. He became an Eagle Scout in his youth and later received the Order of the Arrow and the Boy Scout Silver Beaver Award. He was a past president of the YMCA and received their Distinguished Service Award. Bill led Boy Scouts on trips to Camp Karankawa, on canoeing expeditions in Canada, to a national jamboree, and on hiking treks at Philmont Scout Ranch.

Bill was preceded in death by his parents. He is survived by his sister Barbara Ferguson,

and children Tom (Judy), Lee Ann Kreig (Ray), and Will (Shannon). In keeping with his dedication to others, his body has been donated to the University of Texas Health Science Center at Houston. At a future date, his ashes will be buried at Woodlawn Cemetery in Timpson, Texas. Bill's life was one of service, love, laughter and joy.

Mildred A. Williams (spouse of the late James Howard Rucker, B.A. '48) died of natural causes on September 28, 2013, in Tucson, Arizona. Known as "Millie" to her friends and family, she was born on July 28, 1921, in Whitehouse, Texas, to Grady and Jo Robinson Winston. Although the second oldest of five children, she outlived her siblings. Millie grew up in Robstown, Texas; her father was a farmer and her mother was a teacher and both were strong role models for their daughter. When she was 34 she earned a degree in education at the University of Texas at Austin in only three years, while working full time as a single parent. She then taught English, Geography, and Texas History at Baker Junior High in Austin, where she earned the Teacher of the Year Award in 1959-1960.

While still teaching she obtained a master's degree in counseling and found her true vocation as a counselor. Millie spent 20 years in this role in the Austin Public Schools, as Director of Counseling at McCallum and Reagan High Schools. She had passion for music, playing the piano at home as well as at church and Sunday school. Additionally, loved to sew and in high school made all her clothes and this continued throughout her life. At the drop of a hat, she would design and sew outfits for everyone—dresses, shirts, pants and curtains or whatever was needed. Certainly Millie was happiest when doing something for someone else.

She was a dedicated and active member of the Methodist church, a member of Delta Kappa Gamma, a volunteer at the Wesleyan Home, the Caring Place and earned the title of Stephen Minister (a lay minister) through the First United Methodist Church in Georgetown. She always had a deep interest in others, especially young people. At work, she was dedicated to helping students achieve to the best of their ability by directing them to colleges and universities suited to their interests. When asked what was most meaningful, she said it was her students and that

she loved "getting them to see the light." At home and in the community, she was known for putting others' needs first.

Millie outlived three husbands—Walter McGonagill, James Rucker, and Carl Williams. She is survived by three sons—Grady McGonagill (Lanng Tamura) of Brookline, Massachusetts; Richard Rucker (Marianne) of Pflugerville, Texas; and Dan Rucker of San Marcos—and one daughter, Margy McGonagill (Garry Bryant) of Tucson, Arizona. Millie was very proud of her grandchildren, Evan McGonagill and Aurora, Alvie and Max Rucker, and her many nieces and nephews whom all looked up to her.

Leonard M. Young (Ph.D. '68) was born Oct. 20, 1935 in Dallas, Texas, and passed away May 3, 1914. Leonard graduated from Woodrow Wilson High School, Dallas; Rice University, Houston, B.A. Geology; University of Oklahoma, Norman, M.S. Geology; The University of Texas at Austin; and Ph.D. Geology. Young served three years at U.S. Corps of Engineers Research and Development Labs, Ft. Belvoir, Virginia. He was a Professor of Geology for 35 years at University of Louisiana at Monroe. He was preceded in death by his parents, L.E. and Vivian Cheek Young, his brother David Young; sister-in-law Linda Sue Jones Anderson; father-in-law Luther "Cig" Jones; mother-in-law LaVerne Knight. He is survived by his wife, Mary Frances Jones Young, beloved pet, Paris; sister, Mary Black, brother-in-law, John L. Jones (Sharon); brother-in-law, Roy Anderson (Donna); nephews, Roy, "Hank" Anderson (Diane); Brian Anderson (Cheryl); Jeffery Anderson (Brandi); Joby Jones (Lauren); Justin Jones (Audra); great nephews and nieces, Martin Anderson, Hunter Anderson, Colt Anderson, Kealea Sue Anderson, Brooke-Lynn Anderson, Breanna Anderson, Landon Jones, Madison Jones.

The staff and members of the Jackson School of Geosciences community would like to convey our respects to the families of the following alumni and friends:

Olusegun K. Agagu (M.A. '75)

Cheryl H. Gucwa (wife of Paul Gucwa, M.A. '71, Ph.D. '74)

Jack A. O'Mara (B.S. '54)

Edwin C. Robinson (B.S. '50)

Eva K. Worrel (spouse of the late Charles Worrel, Jr., B.S. '51)

Faculty & Staff

Professor emeritus Edward Jonas passed away in January 2014. In lieu of a memorial, which, we offer this edited version of remarks written by Leon Long on the occasion of Jonas' retirement in 1988.

Professor Edward C. Jonas retired from active teaching in the Department of Geological Sciences in May 1988. His entire professional career as a geologist, thirty-four years, was accomplished in this one department.

Ed was one of the few UT-Austin geology professors who was actually a native Texan. He was born in San Antonio of parents whose roots went back to Germany and France. Early experiences, neither sought nor expected, helped channel Ed's career into its unique direction and style. Perhaps the most important was his contact with one of his grandfathers who was a diamond merchant. Even if Ed's love of minerals may not have been genetic, his childhood discovery of gemstones made a big impression on him. Years later he was to design and teach a very popular university course in gemstones.

Ed did not start out as a geologist. His B.S. degree in 1944 was in chemical engineering from the Rice Institute in Houston (now Rice University). The enthusiasm of one of his professors, an authority on the subject of colloids, was influential in steering Ed toward his eventual specialty, the study of clay minerals. But first there was a stint of active duty in the Navy during the later war years. Ed left the Navy as an ensign in 1946, lectured in physics briefly at the University of Houston, and found a job as chemist for the Shell Oil Company where a good friend and mentor was doing research on clay minerals. Despite such close encounters with earth science, in the timescale of Ed Jonas these were all events in the Pregeological Era.

About this time, Ed married Martha Sullivan. After a glorious (Ed's emphasis) summer of honeymooning in Europe, they settled down to a long, stable family life and had three children. Ed and Martha were an extraordinary couple who put much effort into filling their home with charm and beauty. In 1967 they trucked a dilapidated old house in pieces out to Manchaca, south of Austin, and went on to spend years restoring it to be like an authentic Texas farmstead of the last century. Their home contains the amenities

of gracious Southern living: an outhouse, eight fireplaces but no furnace, wood-burning stove, butter churn, and an antique piano.

It was a fascination with clay minerals that attracted Ed Jonas to the University of Illinois where he received his M.S. (1952) and Ph.D. (1954) in association with Ralph E. Grim, his major professor. During part of this time he worked for the Illinois State Geological Survey. Ed was an eager but very green, beginning graduate student when he traveled to his first scientific meeting. There he met Professors Ellison, DeFord, Flawn, and Bell who were to become his close associates. Professor DeFord characteristically launched into a discussion of entropy and Fourier synthesis, subjects that a clay mineralogist should know something about. But an experienced clay mineralogist and a young graduate student are not the same thing. Professor DeFord had Ed absolutely terrified!

Shortly after completing his Ph.D., Ed was to have another scary experience. Upon his arrival as an assistant professor at the University of Texas in 1954, he began to teach the introductory course in physical geology. When one who has had no teaching experience is suddenly thrust into an auditorium facing 250 students, that is an exercise in terror. Ed introduced courses in crystal chemistry, x-ray diffraction and fluorescence analysis, mineralogy of shales, and gemstones. In a department with many students but no surplus of professors, he eventually taught nearly every required course in the B.S. curriculum.

Ed Jonas was an expert in the crystal chemistry of clay minerals. His publications addressed such subjects as the post-depositional alteration of clay minerals, which led to interpretations of how and why the clay minerals in recent and ancient sedimentary rocks are different. His research focused on both the theoretical and applied aspects of the subject. He has studied the bentonites of Texas and South Texas uranium ore deposits. He was the Department's first recipient of an NSF research grant. He was a charter member of the Clay Minerals Society, in



The late Edward Jonas, with wife Martha, was a professor at UT-Austin for 34 years.

which he has been twice elected to council membership, and for six years was treasurer. Industry has also recognized and rewarded Ed's expertise. He has been a long-standing consultant to companies that mine the raw materials kaolinite and other clay products.

Ed Jonas, like all geologists, is basically an adventure seeker. And what better way to have adventure than to travel to remote parts of the earth? Ed and Martha look back with nostalgia on his Fulbright-sponsored 18 months in New Zealand. Other adventures don't hold such fond memories. While Ed was attending a Geological Congress in Prague, the Soviets invaded the city. His trip to Iraq was cancelled when war erupted in the Middle East. One can soon gain a reputation as a harbinger of bad fortune this way, and Ed has kept a petition from 1968, signed by 48 members of the Department, asking him please to stay home next time!

One of Ed's chief pleasures has been his many years or contributing to the general welfare of the Department. After Steve Claibach retired, Ed continued to upgrade the Barron Collection by negotiations that added to it many valuable gems and gem quality minerals. He was the graduate advisor for an amazing 11 years, at a critical time of growth and development of the Department's graduate program. Ed was especially fond of working with the undergraduates. He sponsored the Undergraduate Student Geological Society (our local version of USGS) for 12 years, during which period he led many mineral-collecting field trips to Mexico and elsewhere. Students loved the enthusiasm he showed as he introduced them to the mysteries of geology and of gemstones.

Professor Jonas, you served us long and well. We are grateful, and we thank you!



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