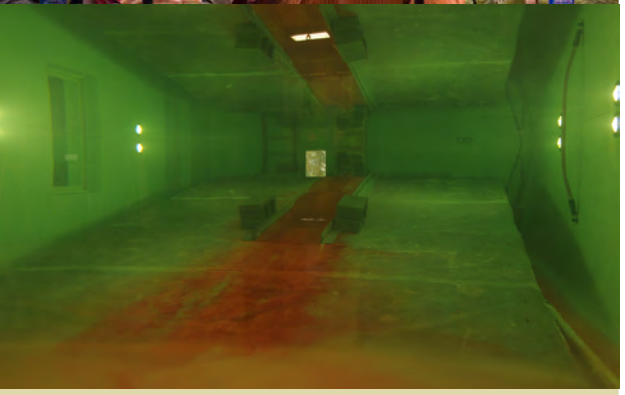

The Newsletter, a tradition since 1950, is published annually for friends and alumni of the Jackson School of Geosciences at The University of Texas at Austin.

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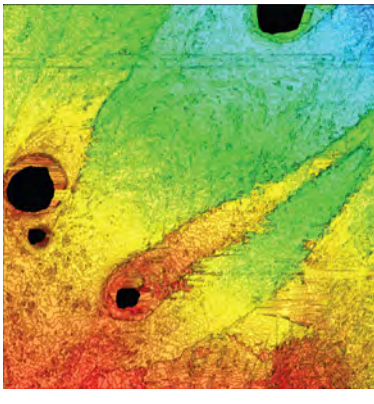


On the cover: A seismic survey of geologic layers beneath the sea-floor near Trinidad. Lorena Moscardelli, Ph.D. '07, a research associate at the Bureau of Economic Geology, noticed features in this image analagous to the surface of Mars, suggesting the planet's hydrologic history. See related story on page 39.

WELCOME

The Jackson School's newly acquired and renovated building, E.P. Schoch, formerly housed the Anthropology Department, just west of Jackson Geological Sciences building.

Dear Alumni and Friends,

World-class discoveries, award-winning students, scientists at the top of their profession, expanding facilities—it's been another great year at the Jackson School.

In April, Jackson School students dominated the awards at the annual AAPG meeting, taking the top three places in the student poster contest and winning the worldwide Imperial Barrel Award (page 34). At the same time our own Ron Steel won AAPG's top educator award, alumnus and Advisory Council member Dan Smith won the Halbouty award, and a team of authors from the Bureau of Economic Geology won AAPG's top publications award.

Two Jackson School researchers were included in *Discover* magazine's top 100 science stories of 2010 (page 20), the only two from UT Austin: Paul Mann and Jack Holt. Paul has since moved on to a professorship at the University of Houston. We wish him all the best.

With the excitement over our recent hires the past several years, it's worth remembering the accomplishments of our senior faculty. This year Tim Rowe in particular enjoyed a string of celebrated research discoveries including unveiling of a new dinosaur species (page 4) and publication of pioneering research on the evolution of the mammalian brain (page 48).

Meanwhile the school continues to set the pace in K-12 outreach. Our award-winning GeoFORCE program will soon expand to Alaska (page 10) and our Friends and Alumni Network (FANs) has just launched a new outreach campaign to high school students. The centerpiece of the campaign is a short film geared toward inspiring students to pursue the geosciences. See page 12 for the web address—you will want to share this outstanding film with all of the prospective geoscientists in your life.

Finally, this fall we moved into the newly renovated E.P. Schoch building, which formerly housed the Anthropology Department. The building almost doubles our footprint on campus, critically needed space as we educate our largest graduate student class ever and continue to enroll large undergraduate classes. The space in Schoch also alleviates the temporary loss of space in the Geology building as we complete our new student center, due to be ready for the fall of 2012.

With the accomplishments outlined in these pages, we remain firmly on the path to becoming the best geoscience program in the country. To be the best, we need strong annual support and visionary gifts that will take us beyond the Jackson endowment. I encourage you to consider a contribution using the form included with this newsletter. And of course, update us on your activities so we can stay in touch and share your news with alumni and friends.

Sharon Mosher
Dean

RESEARCH HIGHLIGHTS

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

Carbon for Oil

A report from the Bureau of Economic Geology and the MIT Energy Initiative urges the U.S. to accelerate efforts to pursue carbon capture and storage (CCS) in combination with enhanced oil recovery (EOR), a practice that could increase domestic oil production while significantly curbing emissions of carbon dioxide (CO_2).

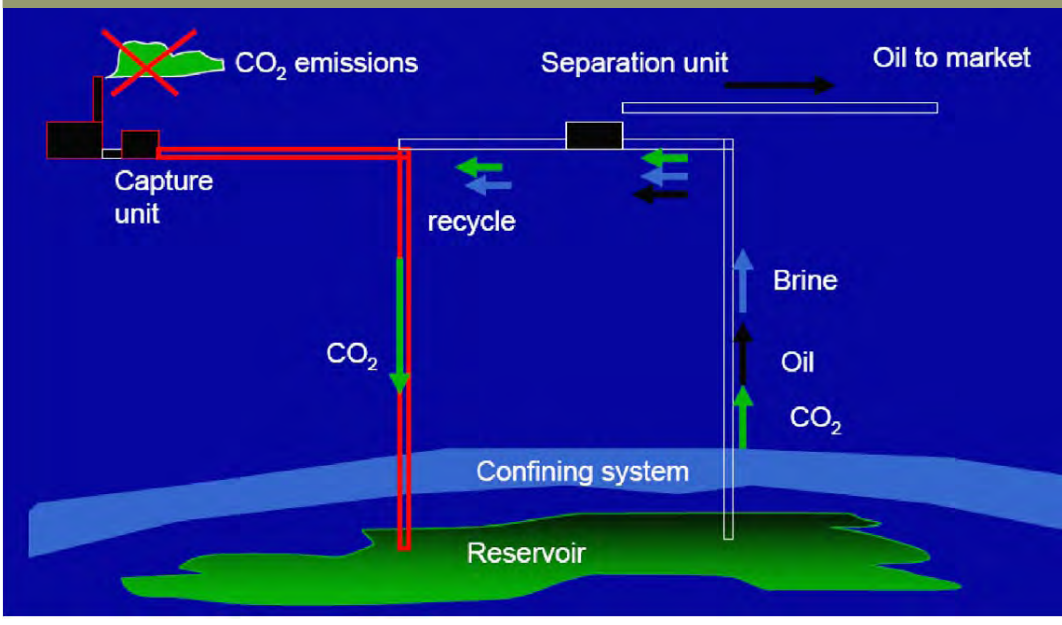
Widespread adoption of combining enhanced oil recovery with carbon capture and storage faces major hurdles, including development of infrastructure, regulation and economic incentives to manage supply and demand of CO_2.

The report, "Role of Enhanced Oil Recovery in Accelerating the Deployment of Carbon Capture and Sequestration," contends the U.S. can overcome these obstacles with sustained research and policy leadership.

According to the report, the potential for storage of carbon emissions through enhanced oil recovery is vast. Scientists believe the principal zones for combining EOR and CCS could accommodate 3,500 gigawatt-years-equivalent of CO_2 from coal power plants, which represents about 15 years of current total output of CO_2 from U.S. coal plants. Recent research suggests the potential for even greater capacity in the Permian Basin of West Texas.

As a tool for enhanced oil recovery, CO_2 injected underground could boost domestic oil production by as much as three million barrels a day by 2030, according to one estimate, an increase of more than 50 percent over current levels. Such a boost to U.S. energy security would simultaneously help reduce the country's carbon footprint.

In a summary for policymakers, Ernest J. Moniz, director of the MIT Energy Initiative, and Scott W. Tinker, director of the Bureau of Economic Geology, make the case for an organized national CO_2-EOR program using anthropogenic CO_2 to "kick-start larger-scale carbon sequestration in the U.S. and meet sequestration needs for a significant period if CO_2 emissions pricing is introduced."



Schematic of a CO_2-EOR System. Components required for sequestration in brine formations that are also common CO_2-EOR are highlighted in red. Source: Sue Hovorka.

Use of anthropogenic CO_2 for EOR has the potential, write the co-authors, to contribute to domestic energy production while accommodating national carbon sequestration needs "for at least a couple of decades, quite possibly more."

Given the rough equivalence between the amount of CO_2 the energy industry needs for oil recovery and the amount produced by coal-fired electricity plants, the authors advocate "a serious look at scaling up CO_2-EOR with government support."

Government support will be critical in part because of the complex factors that have to come together to facilitate EOR, including regulatory changes and development of a new pipeline system to get CO_2 from industrial sources to oil-field sinks. First-mover CCS projects also face high financial hurdles requiring some form of financial incentives.

The authors strongly urge the Department of Energy to implement a comprehensive research and development program that supports ongoing research and maps out a phased implementation for CO_2-EOR.

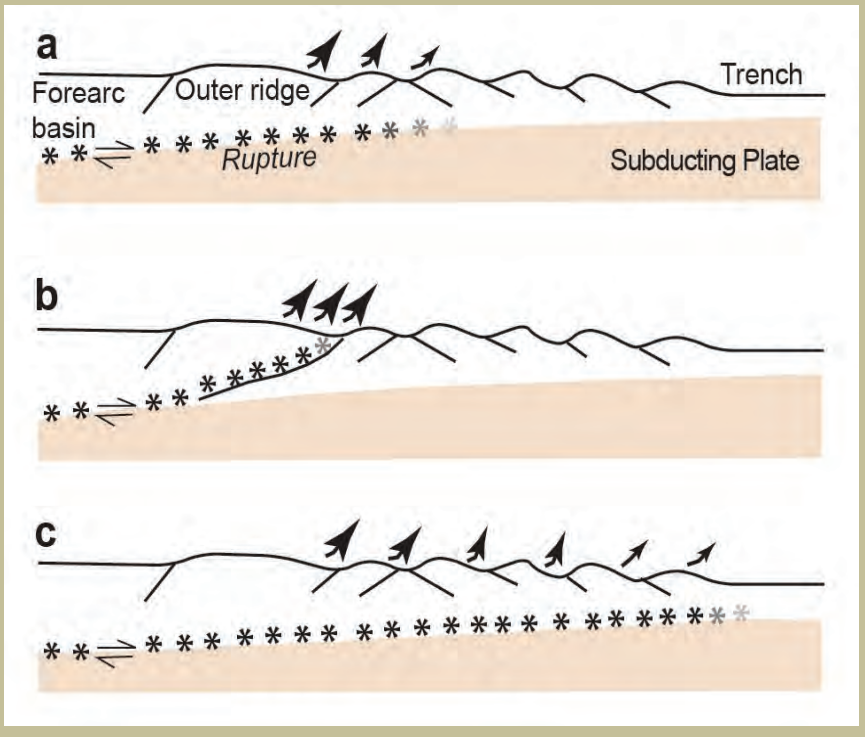
Sean Gulick

Deadly Sediments

An international team of geoscientists has discovered an unusual geological formation that helps explain how an undersea earthquake off the coast of Sumatra in December 2004 spawned the deadliest tsunami in recorded history.

Instead of the usual weak, loose sediments typically found above the type of geologic fault that caused the earthquake, the team found a thick plateau of hard, compacted sediments. Once the fault snapped, the rupture was able to spread from tens of kilometers below the seafloor to just a few kilometers below the seafloor, much farther than weak sediments would have permitted. The extra distance allowed it to move a larger column of seawater above it, unleashing much larger tsunami waves.

"The results suggest we should be concerned about locations with large thicknesses



At a typical subduction zone, the fault ruptures primarily along the boundary between the two tectonic plates and dissipates in weak sediments (a), or ruptures along "splay faults" (b); in either case, stopping far short of the trench. In the area of the 2004 Sumatra earthquake, sediments are thicker and stronger, extending the rupture closer to the trench for a larger earthquake and, due to deeper water, a much larger tsunami.

of sediments in the trench, especially those which have built marginal plateaus," said Sean Gulick, research scientist at the Institute for Geophysics. "These may promote more seaward rupture during great earthquakes and a more significant tsunami."

Early in the morning of Dec. 26, 2004, a powerful undersea earthquake started off the west coast of Sumatra, Indonesia. The resulting tsunami inundated coastal communities, killing more than 230,000 people.

The earthquake struck along Sunda Trench, a subduction zone where the Indo-Australian plate is being pushed below the Sunda plate to the east. The unusual geological formation appears to be the result of ancient sediment that washed out from the Ganges River over millions of years.

The team's results appear in an article lead-authored by Gulick in the journal *Nature Geoscience*.

Kinder, Gentler Dinosaurs

A new species of dinosaur discovered in Arizona suggests dinosaurs did not spread throughout the world by overpowering other species, but by taking advantage of a natural catastrophe that wiped out their competitors.

Tim Rowe, professor of paleontology at the Jackson School, led the effort to describe the new dinosaur in the journal Proceedings of the Royal Society B.

Sarahsaurus, which lived about 190 million years ago during the Early Jurassic Period, was 14 feet long and weighed about 250 pounds. Sarahsaurus was a sauropodomorph, a small but closely related ancestor to sauropods, the largest land animals in history.

Conventional wisdom says that soon after dinosaurs originated in what is now South America, they rapidly spread out to conquer every corner of the world, so smart and powerful they overwhelmed all the animals in their path. Sarahsaurus challenges that view.

One of the five great mass extinction events in Earth's history happened at the end of the Triassic Period 200 million years ago, wiping out many of the potential competitors to dinosaurs. Evidence from Sarahsaurus and two other early sauropodomorphs suggests that each migrated into North America in separate waves long after the extinction and that no such dinosaurs migrated there before the extinction.

"We used to think of dinosaurs as fierce creatures that outcompeted everyone else," said Rowe. "Now we're starting to see that's not really the case. They were humbler, more opportunistic creatures. They didn't invade the neighborhood. They waited for the residents to leave and when no one was watching, they moved in."

Sarahsaurus is named in honor of Sarah (Mrs. Ernest) Butler, an Austin philanthropist and longtime supporter of the arts and sciences.

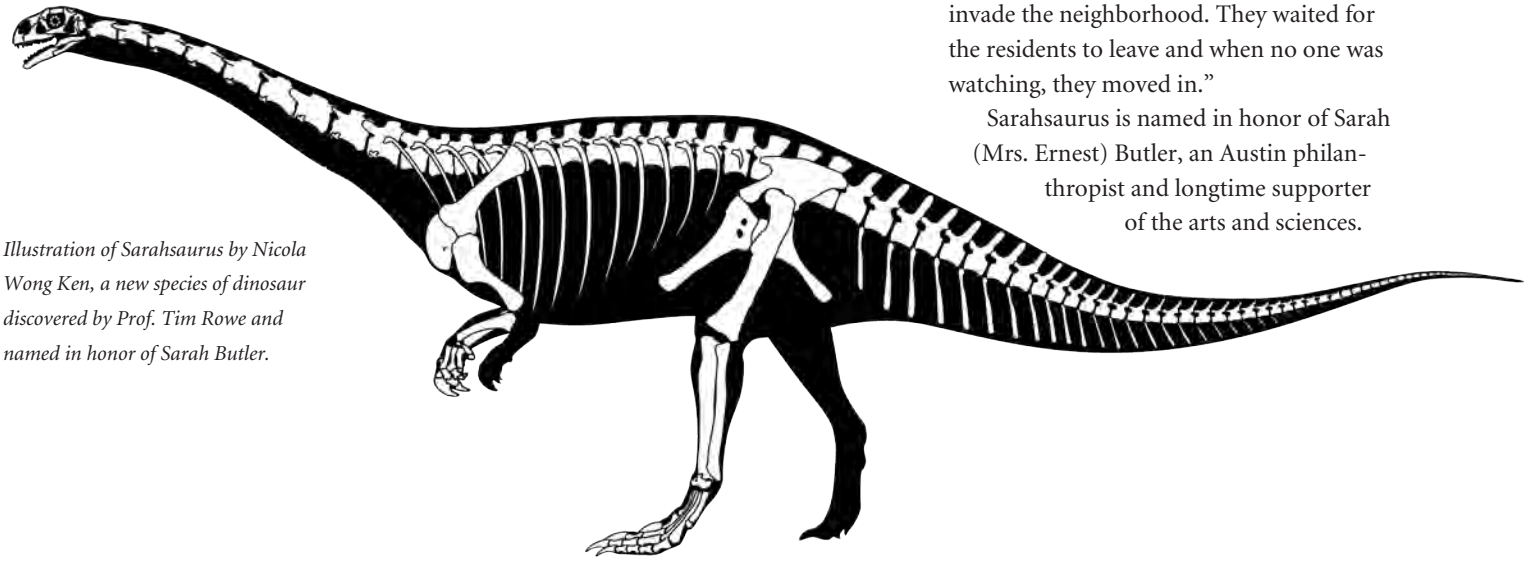


Illustration of Sarahsaurus by Nicola Wong Ken, a new species of dinosaur discovered by Prof. Tim Rowe and named in honor of Sarah Butler.

Climate & the Gulf Coast

Researchers at the Jackson School and colleagues will use a three-year, $1.5 million grant from NASA to develop computer models to study how changes in climate and land use affect watersheds and coastal ecosystems, seeking to improve understanding of the Texas coast, including dead zones that form in the Gulf of Mexico.

"We'll be able to try different experiments and find out what happens when you change variables like irrigation, fertilizer use, urbanization and dams, " said Zong-Liang Yang, a professor in the Jackson School and principal investigator. Yang believes the research will help policy makers, farmers and individuals gauge the impact of their actions on coastal ecosystems.

"The goal is sustainable development," Yang said.

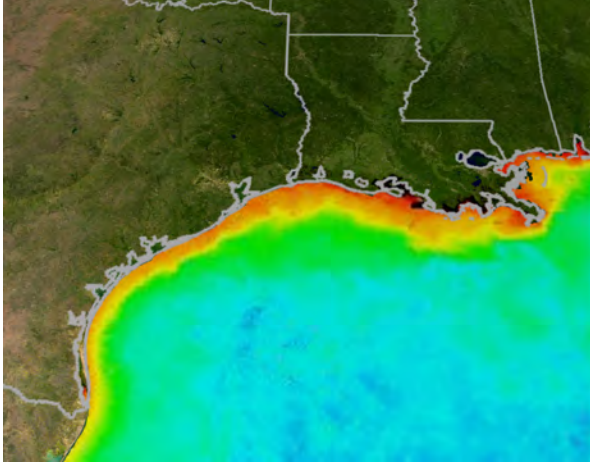
One of the greatest threats to coastal estuaries and bays is eutrophication, where excessive nutrients such as nitrogen cause algal blooms that remove oxygen from the water and kill fish and shellfish, creating a dead zone. Research suggests excessive use of fertilizers in agriculture is a major cause of dead zones. Less certain is how climate change and the shifting of water through dams, diversions and withdrawals affect the delivery of nutrients to the coast.

"Most people don't think about how what they do in one place affects other places far away," said Yang. "But a healthy coast is important for tourism, fisheries and the entire state's economy."

In the first phase of the project, scientists will integrate a series of models—dealing with regional and global climate, weather, land surface, river flow, chemistry and ecosystems—into a unified model framework to study the impacts of land use change and climate change.

"We think as the world warms, we'll experience more intense rainstorms," said Yang. "We'll use our model to study how that might affect the formation of dead zones."

The researchers are developing the models with the flexibility to be applied to other parts of the world that experience widespread and severe dead zones, such as southeast Asia.



Mississippi dead zone. Source: NASA/Goddard Space Flight Center Scientific Visualization Studio.

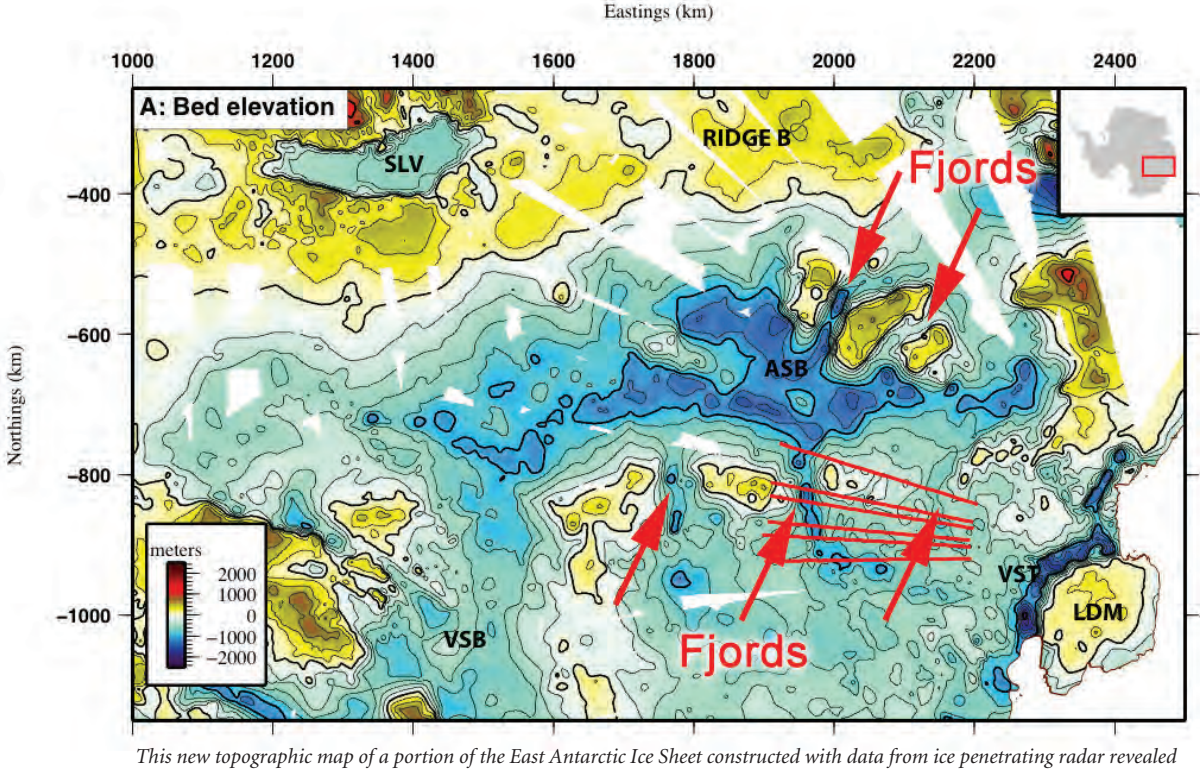
East Antarctic Fjords

Scientists from the U.S., U.K. and Australia have used ice-penetrating radar to create the first high-resolution topographic map of one of the last uncharted regions of Earth, the Aurora Subglacial Basin, an immense ice-buried lowland in East Antarctica larger than Texas.

The map reveals some of the largest fjords or ice cut channels on Earth and provides important insights into the history of ice in Antarctica.

"We knew almost nothing about what was going on, or could go on, under this part of the ice sheet and now we've opened it up and made it real," said Duncan Young, research scientist at the Institute for Geophysics and lead author on the study, which appears in the journal *Nature*.

"We chose to focus on the Aurora Subglacial Basin because it may represent the weak underbelly of the East Antarctic Ice Sheet, the largest remaining body of ice and potential source of sea-level rise on Earth,"



This new topographic map of a portion of the East Antarctic Ice Sheet constructed with data from ice penetrating radar revealed several giant fjords carved by the advancing and retreating ice sheet between 34 and 14 million years ago.

BRIEFS


Duncan Young

said Donald Blankenship, principal investigator for the ICECAP project, a multinational collaboration using airborne geophysical instruments to study the ice sheet.

The new map reveals vast channels cut through mountain ranges by ancient glaciers that mark the edge of the ice sheet at different times in the past, confirming the ice sheet was significantly smaller during warmer periods in the past 34 million years.

Recent lowering of major glaciers near the edge detected by satellites has raised concerns about the stability of this sector of Antarctica.

Scientists at UT Austin's Institute for Computational Engineering and Sciences, and at Australia's Antarctic Climate and Ecosystems CRC are developing models that will use the new map to forecast how the ice sheet will evolve in the future and how it might affect sea level.

Energy = Economy

An overlooked contributor to the economic recession in the U.S. is a decade long decline in the quality of the nation's energy supply, often measured as the amount of energy we get out for a given energy input, says energy expert Carey King.

In economic terms, the quality of the nation's energy supply is referred to as Energy Return on Energy Investment (EROI). For example, if an oil company uses a 10th of a barrel of oil to drill, pump, transport and refine one barrel of oil, the EROI for the refined fuel is 10.

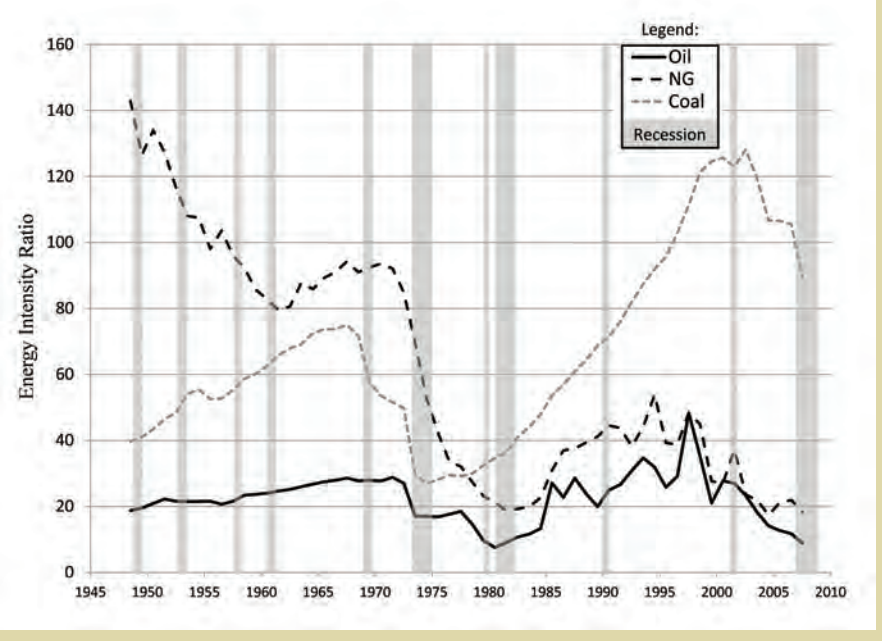
"Many economists don't think of energy as being a limiting factor to economic growth," says King, a research associate in the Center for International Energy and Environmental Policy. "They think continual improvements in technology and efficiency have completely decoupled the two factors. My research is part of a growing body of evidence that says that's just not true. Energy still plays a big role."

King notes the worst recessions of the last 65 years—during the mid-1970s and early 1980s and the current one—were preceded by declines in the energy quality of oil, natural gas, and coal.

In a paper published in the journal Environmental Research Letters, King introduced a new way to measure energy quality, the Energy Intensity Ratio (EIR), which is easier to calculate, highly correlated to EROI and in some ways more powerful than EROI.

To get the U.S. economy growing again, King says Americans will have to produce and use energy more efficiently. That's essentially what the U.S. did after the last energy crisis by raising fuel efficiency standards for cars, increasing use of natural gas for electric power generation and developing new technologies such as Enhanced Oil Recovery to coax more oil out of the ground.

Energy Intensity and Recessions



The worst recessions of the last 65 years were preceded by declines in energy quality for oil, natural gas, and coal. Energy quality is plotted using the Energy Intensity Ratio (EIR) for each fuel. Recessions are indicated by gray bars. In layman's terms, EIR measures how much profit is obtained by energy consumers relative to energy producers. The higher the EIR, the more economic value consumers (including businesses, governments and people) get from their energy.

Moon's Dry Mantle

New research confirms the moon's mantle—a deep layer between the inner core and the outer crust—is dry. This is consistent with early findings from the Apollo missions and dominant theories about how the moon formed.

Researchers at the University of New Mexico, UCLA, University of Texas at Austin and Los Alamos National Laboratory measured the chlorine isotopic composition of lunar basalts and volcanic glass beads collected during the Apollo missions. The team also irradiated a thin film of sodium chloride with a proton beam to assess the potential effect of solar wind on the chlorine isotope ratio of the lunar regolith and soils.

The researchers expected to find a very narrow range of singular values but instead, they discovered a wide range of values 25 times greater than expected.

"The only way to explain the results was that the magmas had no water in them," said Zachary Sharp professor at UNM and lead author.

For Jaime Barnes, an assistant professor at UT Austin's Jackson School of Geosciences, the project was a dream come true.

As a doctoral student at UNM, she wrote a research paper on the glass beads.

"Six years later, I'm holding them in my hands," said Barnes. "Everyone wants to go to the moon. It makes your heart jump a little to hold a piece of it."

—Edited from a University of New Mexico news release.

Save the Voxels

Three-dimensional computing is revolutionizing nearly every field of science, medicine, and engineering.

However, according to Tim Rowe, paleontologist in the Jackson School, and colleague Larry Frank, it isn't living up to its full potential. That's because many of the scientists collecting 3D data and creating visualizations from them aren't archiving them or making them available to the public.

Consider volume elements, or "voxels," the 3D equivalents of pixels. Voxels are the tiny boxes that make up 3D images collected by CT (computed tomography) and MRI (magnetic resonance imagery) scanners.

"Voxel data have generally lacked a coherent archiving and dissemination policy, and thus the raw data behind thousands of published reports are not released or available for validation and reuse," write Rowe and Frank in an invited perspective piece in the journal *Science*.

As new technologies become available, more science can be squeezed out of the same costly-to-collect data. For example, CT and MRI data from the same object can be combined to visualize both hard and soft tissues simultaneously and replicas of scanned objects can be made with "rapid prototyping devices."

"There is urgency to act," write Rowe and Frank. "As second-generation voxel scientists have now begun to retire, their data are on track to die with them …"

Rowe and Frank propose some solutions:

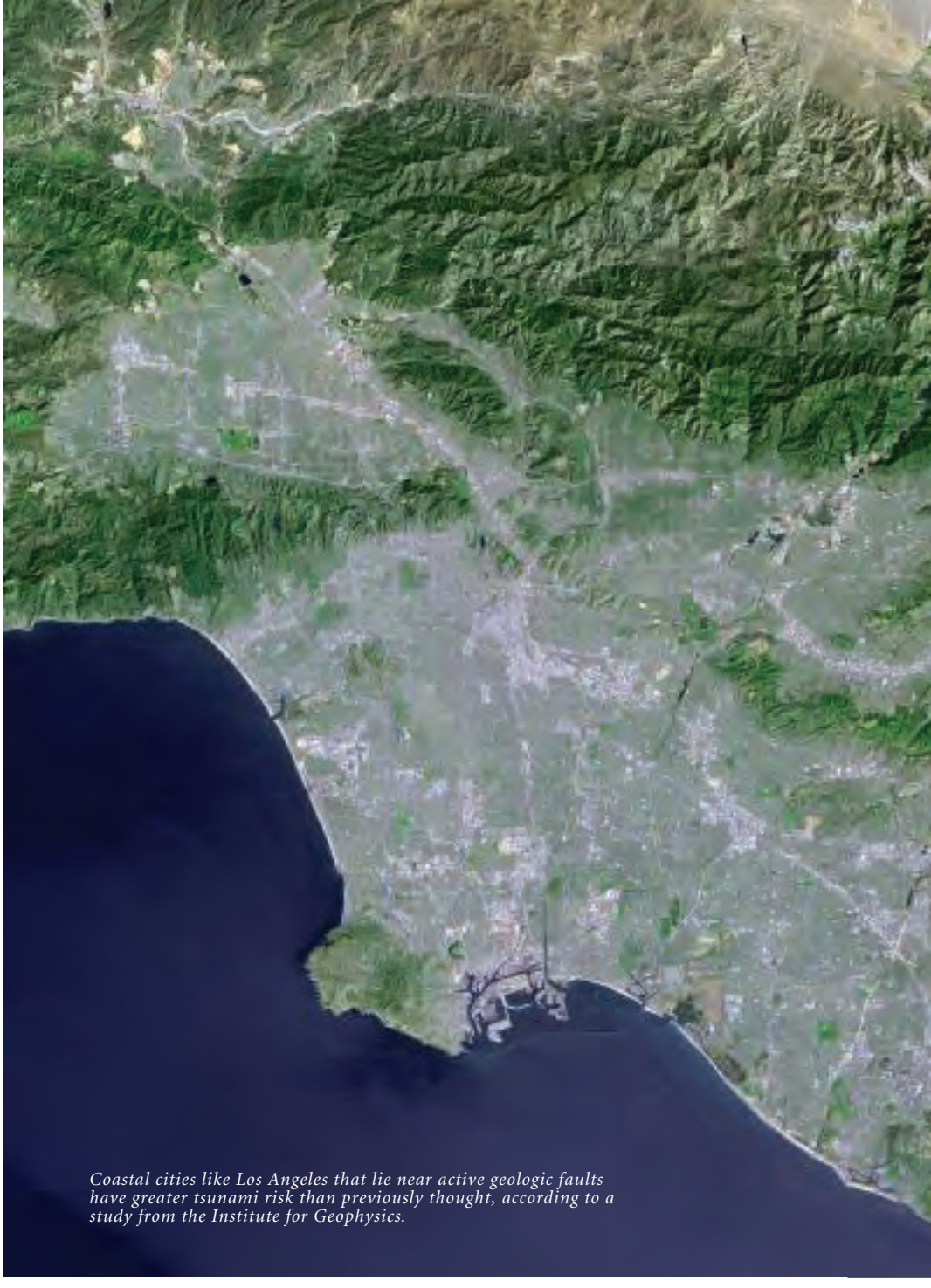
Researchers should replicate the highly successful GenBank model, which archives and makes publically available genetic sequence data for thousands of biological species, to create a "voxel commons".

Publishers, professional societies and funding agencies should set standards for data ownership, latency, and release.

Researchers should develop standards, architectures, interface designs, and metadata for the various flavors of data used in each discipline.

Funding agencies should provide funds specifically for archiving, curating and distributing voxel data.

Academic institutions should provide incentives to researchers to archive and release voxel data, in much the same way they encourage them to publish research results.



Coastal cities like Los Angeles that lie near active geologic faults have greater tsunami risk than previously thought, according to a study from the Institute for Geophysics.

L.A. Tsunami Risk

Geologists studying the Jan. 12, 2010 Haiti earthquake say the risk of destructive tsunamis is higher than expected in places such as Kingston, Istanbul, and Los Angeles.

Like Haiti's capital, these cities all lie near the coast and near an active geologic feature called a strike-slip fault.

Until now, geologists did not consider the tsunami risk to be very high in these places because when these faults rupture, they usually do not vertically displace the seafloor much, which is how most tsu-

namis are generated. This latest research suggests even a moderate earthquake on a strike-slip fault can generate tsunamis through submarine landslides, raising the overall tsunami risk in these places.

"The scary part about that is you do not need a large earthquake to trigger a large tsunami," said Matt Hornbach, former research associate at the Institute for Geophysics and lead author on a paper describing the research in the journal Nature *Geoscience*.

Within minutes after the magnitude 7 Haiti earthquake, a series of tsunami waves, some as high as 9 feet (3 meters), crashed into parts of the shoreline. A few weeks later, a team of scientists from the U.S. and Haiti conducted geological field surveys of sites on and offshore near the quake's epicenter.

The scientists determined the tsunamis were generated primarily by weak sediment at the shore that collapsed and slid along the seafloor, displacing the overlying water. Combined with newly discovered evidence of historic tsunamis, the survey revealed a third of all tsunamis in the area are generated in this way. Geologists had previously estimated only about 3 percent of tsunamis globally are generated through submarine landslides.

"We found that tsunamis around Haiti are about 10 times more likely to be generated in this way than we would have expected," said Hornbach.

Traces in Time

Peter Flaig, a post doctoral researcher at the Bureau of Economic Geology, joined dozens of other scientists earlier this year at a temporary field station in the Transantarctic Mountains, making it the second largest "city" in Antarctica.

Flaig was part of a team looking for trace fossils—signs of animal life such as tracks, nests, burrows or slithery drag marks. A sedimentologist by training, Flaig was there to help work out what the environment was like at the time these traces were made. The team was led by Stephen Hasiotis, a trace fossil expert at the University of Kansas.

Few fossils of land animals exist from the time around a great mass extinction event at the end of the Permian Period 250 million years ago. The scientists were lured to this particular site by the promise of rocks exposed at the surface from before, during and after that event.

Peter Flaig with a Permian tree stump, testament to a much warmer time in Antarctica.

"We wanted to see what types of critters were living in Antarctica at that time, and if there was a change in the trace fossil record across that extinction event," said Flaig.

Among their discoveries: the first horseshoe crabs found in Antarctica; evidence of a shallow saltwater ocean that was once thought to be a large freshwater lake; over a dozen burrows made by mammal-like reptiles after the mass extinction; and a forest of fossil trees more extensive and denser than previously known, testament to a much warmer time.

SPEAKERS & LECTURERS

Put It Back

In March 2011, Tip Meckel, research scientist at the Bureau of Economic Geology's Gulf Coast Carbon Center (GCCC), presented his talk "Put It Back: Geologic Sequestration for Greenhouse Gas Emissions Reductions" at the monthly Austin Forum.

Meckel noted that climate scientists continue to warn about the risks of increasing emissions of carbon dioxide (CO_2), including rising global temperatures and ocean acidification. He said if the U.S. is serious about reducing CO_2 emissions, it will need to start storing some of it deep underground in a process called carbon capture and storage (CCS). He then posed the question: Is CCS ready to be used as part of a greenhouse gas emissions reduction program?

He discussed perceived risks such as contamination of drinking water and induced earthquakes. Research at the GCCC and elsewhere suggests that if CCS is implemented correctly, these risks are negligible. He noted a 2010 Department of Energy study which estimated the volume of geologically suitable storage sites in the U.S. is large enough to store 1800 times the nation's current annual CO_2 emissions. He noted an additional economic incentive for CCS would come from using it to boost oil and gas production in waning fields in a process called Enhanced Oil Recovery.

Given the low risks, vast storage potential and economic incentives, Meckel concluded CCS is indeed ready to be used as part of a greenhouse gas emissions reduction program in the U.S.

Tip Meckel

What An Impact

The Consortium for Ocean Leadership named Gail Christeson a distinguished lecturer for the 2010-2011 academic year. She visited universities across the country promoting the work of the Integrated Ocean Drilling Program. Her talk focused on a crater in the Gulf of Mexico associated with one of Earth's greatest mass extinctions 65 million years ago.

In 1996, Christeson, now a senior research scientist at the Institute for Geophysics, participated in a US-UK geophysical survey that discovered a feature in the Chicxulub Crater called a peak ring, literally a ring of peaks between the center and the crater wall. Some large craters on other planets and the moon display peak rings, but none had been observed on Earth before. They wondered where the peaks came from. Were they made of material dredged up from deep below the impact site or from material that was originally on the rim of the crater that later slid in?


Gail Christeson

Alone, the answer might not seem like such a big deal, but it could help them more precisely estimate how much material was ejected into the atmosphere. And that could help answer a question everyone wants to know: How could one asteroid impact kill off 70 percent of life on the planet? Some theories rely on ejected material blocking out sunlight, leading to global cooling—others on hot material falling back to Earth igniting widespread wildfires.

To find answers, Christeson and her colleagues have proposed drilling into the crater to collect samples and match those to the geophysical data already collected. The proposal was rated very highly, but as of press time, the IODP hadn't made a final decision.

The Consortium for Ocean Leadership has also named Craig Fulthorpe, a senior research scientist at the Institute, a distinguished lecturer for the 2011-2012 academic year. Past distinguished lecturers now at the Jackson School include Peter Flemings, Sean Gulick, and Terry Quinn.

Selection of Outside Speakers, 2010-11

Brian Berkowitz, Weizman Institute of Science, Oliver Distinguished Lecturer, "Anomalous Chemical Transport in Geological Formations: Theory and Observations"

Peter Lichtner, Los Alamos National Laboratory, Oliver Distinguished Lecturer, "Modeling the attenuation of legacy uranium waste at the Hanford 300 Area along the Columbia River"

David Macdonald, University of Aberdeen, "The petroleum potential of Antarctica: a continent too far?"

Mohammed Ameen, Saudi Aramco, AAPG Disginguished Lecturer, "Paradigm Shift in Understanding Fracture Origin and Fracture Influence on Deep Carbonate Reservoir Performance: A Study of Onshore Permo-Triassic Deep Reservoirs in Saudi Arabia"

Mark Zoback, Stanford University, Cuyler Endowed Lecture, "Scientific drilling into the San Andreas Fault: SAFOD's first five years"

From Prof. William Carlson's Dec. 2010 Commencement Address, "The Meaning Behind The Majesty"


Bill Carlson

Graduates: a grasp of this extraordinary connection between humanity and the Earth system — which defines "man's singular place in the vastness of nature," to use Colin Fletcher's words — is the great gift of your study of the geosciences. Your comprehension of it sets you apart from everyone else.

For most folks, today seems not much different from yesterday; this year not so unlike the last; my generation not altogether different from yours. But for geoscientists, who uniquely combine the perspective of deep time with a sense of the immediacy of humanity's need for resources, there's a greater appreciation of the urgency of our situation: we realize that for Homo sapiens, tomorrow will indeed be importantly different from today; next year will be fundamentally different from this one; and the generation after yours will live in a world unforeseeably unlike the one that hosted the generation before mine.

So your degree in the geosciences comes with special responsibilities. Some of you will discover the resources we need to expand civilization; others will find the energy needed to power it. Some of you will protect the soils in which our food is grown and the oceans from which it is drawn. Some of you will safeguard the water we drink and the air we breathe.

But all of you now possess something vitally needed by the rest of mankind: the sure knowledge that Earth and Man are now intimately and inextricably interlinked; its fate is now ours.

Share that great truth with all you meet.

2011 GeoFORCE graduates: 78 graduating high school seniors who participated in GeoFORCE Texas met in Austin in April.

OUTREACH

All Indicators Positive on GeoFORCE Texas

With 615 students taking part in its 2011 summer activities, GeoFORCE Texas continues to help broaden diversity and increase the number of students pursuing STEM-related careers. At the core of the program is the goal "to create a cohort of diverse young students who have an interest in science and keep them challenged and engaged over the next four years of high school so they are prepared to succeed in college." GeoFORCE's numbers continue to reflect a very healthy organization meeting its objectives (see table below).

The program's demographics are 61 percent Hispanic, 14 percent African American, 7 percent Asian, 1 percent Native American, and 17 percent Caucasian. GeoFORCE graduates study in STEM fields in much higher numbers than the national average. As of fall 2011, 57 percent of GeoFORCE graduates are declared STEM majors, including 32 geoscience majors and 25 engineers. While most GeeFORCE college students are in four-year schools in Texas, students are in 11 other states and two Ivy League universities. A further measure of success: The GeoFORCE class of 2011 includes eight valedictorians and 11 salutatorians.

The program continues to enjoy overwhelming support from its industry and government partners. Over the 2010-11 campaign, 17 corporations and five government agencies offered financial support, with most of the financial partners also offering service and in-kind contributions, such as mentoring and field visits, which add immeasurably to the experience for students.

100%	GeoFORCE students graduating from high school
58%	Average graduation rate from high school in schools attended by GeoFORCE students
98%	GeoFORCE students admitted to college
50%	Average college admission rate in southwest Texas and Houston regions
57%	GeoFORCE students pursuing STEM degrees

GeoFORCE Heads for Alaska

New for 2011-12, a partnership with the University of Alaska Fairbanks (UAF) has just gotten under way with the specific objective of establishing a GeoFORCE Alaska program to serve the predominately Native American population of Alaska's North Slope. Ed and Karen Duncan of Great Bear Petroleum were the initial force behind the Alaska project by providing funding and guidance for initial planning. Shell's Denise Butler introduced GeoFORCE leaders to UAF's Rural Alaska Honors Institute

(RAHI), who will be the lead organizer of the program with the Jackson School providing assistance in preparing the guidebook and trip agenda.

The goal is to have 40 rising ninth graders participate in a week-long summer field event in 2012. The program will then be built in a similar fashion to GeoFORCE Texas with new ninth graders brought in each year until a capacity of 160 students is achieved.

Latin American Forum Unites Regional Leaders in Colombia

Researchers from eight different countries across the Americas offered presentations at the Jackson School's 2011 Latin American Forum, in Cartagena, Colombia. The 2011 meeting featured emphases on unconventional hydrocarbons and water-energy issues.

Richard Lowe, exploration vice president of US/Latin America for ExxonMobil, gave an overview of unconventionals and their development challenges. Additional unconventional presentations focused on coalbed methane in Colombia (Marcio Garcia Gonzalez, Industrial University of Santander) and the prospects for marine gas hydrates as an energy source (Nathan Bangs, UTIG).

Exploring water issues, Chip Groat, director of the Center for International Energy and Environmental Policy at the Jackson School, discussed hydrolic fracturing and water quality. Presentations by Suzanne Pierce (Jackson School), Eugenio Figueroa (Universidad de Chile), and Manoel Regis L.V. Leal (Brazilian Bioethanol Science and Technology Laboratory) explored Brazil's challenges maintaining sustainable water resources while cultivating sugar cane ethanol.

Additional presentations explored the regional energy outlooks in Colombia, Mexico, and Cuba, and the global importance of deepwater oil and gas.

The Jackson School started the Latin American Forum in 2005 as a way to bring together government and industry decision makers, scholars and scientists, to foster dialogue around energy and environmental issues across the Americas. This was the sixth forum. Previous meetings have been held in Panama City, Panama, Huatulco, Mexico, Rio de Janeiro, Brazil, and Austin.

Tinker Completes 'Switch'

When most of us believe the public doesn't understand an issue well enough, we may gripe among friends or write a letter to the editor. Scott Tinker decided to make a movie.

One of the country's most sought-after energy lecturers, Tinker, director of the Jackson School's Bureau of Economic Geology, has spent his spare time over the past two years making 'Switch,' a documentary that explores what it will take for the world to transition from oil and coal to their alternatives.

Working with Harry Lynch, an award-winning filmaker with credits for IMAX, PBS, and NBC, Tinker made the film to help people better understand the "most important issue of the century," our global energy future.

"Energy is the most important commodity in the world," notes Tinker. "It powers lighting, communication, computing, transportation, and the manufacture of every product we consume. It's the backbone of economies, the engine of world trade, the largest industry on earth, and the determining factor in climate change. It affects every single aspect of our lives—yet is in the midst of a vast transition."

Much of the public's exposure to energy, says Tinker, comes through sensational news dealing with "oil spills, nuclear accidents, collapsing coal mines, hydraulic fracturing hysteria, fights over windfarms, disagreements on carbon." While these are real concerns, they "tell us little about what's really going on in the world of energy. To make smarter decisions about energy—about our global future—we must be better informed."

In the feature documentary, Tinker travels the world to find out what it will really take to transition from oil and coal to their alternatives. Along the way, he answers vital questions such as: If coal is dirty, why do we keep using it? Can we really

Cameras were rolling on campus as Scott Tinker gave a presentation on "The Future of Energy" for his forthcoming documentary, "Switch," about what it will take to transtion from oil and coal to their alternatives.

clean it up? Will oil get too expensive? Will it run out? How quickly will we adopt alternatives? Which ones? How risky is hydraulic fracturing? How dangerous is nuclear? What are the biggest challenges, and best solutions, to our energy transition? What can each of us do?

As the Newsletter was going to press, Tinker and Lynch were screening the film to test audiences and in the process of seeking wider distribution. If you register to receive the Jackson School's email newsletter (see the alumni and friends section of our Web site), we'll send you updates on television or theatrical showings..

Sue Hovorka of the Bureau of Economic Geology teaches Ursuline Academy students about the mechanics of carbon sequestration.

Fort Valley Partnership Yields New Graduates & Students

The partnership between the Jackson School and Fort Valley State University in Georgia continues to engage and encourage minority youth to study geology and geophysics. Four college students were enrolled at The University of Texas at Austin this year through the partnership. Two of them, Jasmine Langston and Keri Vinas, completed their summer EDMAP project in the fall, creating a geologic map of the Mansfield Dam quadrangle just west of Austin. Both women graduated in the spring with B.S. degrees from the Jackson School.

GeoFORCE also visited Fort Valley State University in the winter and welcomed a group of students to Austin in the spring. These freshmen and sophomores were taking a look at UT with an eye on applying to the university when they have completed their FVSU degrees.

FVSU transfer students, left to right, with Eleanour Snow of GeoFORCE (center): Maurice Dukes, Keri Vinas, Chris Peets, and Jamie Clark. Dukes and Peets transferred to UT Austin Petroleum Engineering this fall and Clark to the Jackson School. Vinas just graduated from the Jackson School.

UT Austin Promotes Girl Talk on Energy and Climate

This spring, Ursuline Academy, a Dallas preparatory school for young women, partnered with UT Austin (the Jackson School of Geosciences and Cockrell School of Engineering) to host "GirlTalk: Energy, Climate & Water in the 21st Century." This special event included a science education workshop and expo open to all Dallas area middle school girls to explore topics related to geology, energy, water resources and global climate issues.

We believe the event was a great success, with more than 140 middle school girls and their mentors participating. We are proud to report that the girls were engaged and excited as they talked about science in the hallways with their parents, teachers and friends. Many of the teachers, who attended as mentors with their students, asked if we would hold a similar event next year.

"GirlTalk" was designed for middle school girls because studies have shown that interest among girls in the sciences diminishes dramatically during the middle school years. With this age group, relevance is the key factor that can help spark that interest. More so than boys, girls need to understand the real-world applications that can come from STEM (Science, Technology, Engineering and Mathematics) careers and particularly how they can help other people and feel the rewards of making a difference in the world. Faculty participation with students helps grow the importance of science in the eyes of the students. It also helps broaden the perspective of the non-science teachers.

During the "GirlTalk" event, Ursuline faculty members and educators from the University of Texas were on hand to answer questions and encourage participation among the attendees.

The science expo featured activities such as:

- A day in the life of a petroleum engineer
- The energy crisis, fact or fiction, and what you can do about it.
- What to do with C02.

These types of discussions are increasingly important as we live in a time characterized by more technology, more science and more math. As the world moves forward in developing new (and cleaner) energy technologies, there will be a need for more trained professionals to ensure that the United States retains its position as a leader in the energy industry.

Based on U.S. Census Bureau data, of the 20 fastest-growing occupations projected for 2014, 15 of them require significant mathematics or science preparation for

graduates to compete successfully for the job. Unfortunately for young girls, STEM careers are not a widely sought after career path. According to the American Association of University Women (AAUW), by the time young women enter college and/or their careers, science fields become highiy male dominated.

What do girls look for in a career? The Extraordinary Woman Engineers Project- a national initiative to encourage girls to pursue degrees and careers in engineering- was led by a coalition of the country's engineering associations including the American Association of Engineering Societies, the American Society of Civil Engineers and the WGBH Educational Foundation. It found that high school girls are motivated by the impression that a job is rewarding and that it is for someone "like me." When interviewed for the study, girls said they wanted their job to be enjoyable, involve working with interesting people, have a good working environment, make a difference, offer a good salary and be flexible.

So, where's the disconnect? This study found that current messages portray STEM careers as challenging and stress the importance of superior math and science abilities. These messages are not relevant to an audience of high school girls because they do not include the benefits and rewards of STEM careers.

Based on the success of our recent GirlTalk event, we encourage other schools to focus on the reality of a science career and science researchnot just on the memorization of the details and facts. As educators, we need to help young girls see the applications and purpose that learning STEM fields will bring them.

STEM careers can allow them to solve world problems- locally or internationally. Bringing in scientists, mathematicians, architects and other STEM professionals who have a variety of professional and personal experiences can be an excellent learning tool. It's all about broadening the perspectives of our young women students and then helping them pursue the careers that will change our world.

—Hilary Olson

Find the new outreach video and other information at the campaign's website, www.BeAGeo.com

FANs Launch Outreach Campign & Video

Earth is Calling: Will You Answer?

The Jackson School's Friends and Alumni Network (FANs) has launched a new outreach campaign, Earth is Calling, to inspire the next generation of geoscientists. Beginning this year, teams of Jackson School alumni will serve as geoscience ambassadors in local high school classrooms to share professional experiences and career opportunities. The goal is to get students and teachers thinking and talking about what you can do with a degree in the geosciences and why it is the science for the 21st century.

The classroom visits begin with a brief and powerful video showcasing the breadth of career opportunities for geoscientists and their crucial role in our global future. The video is an excellent resource for anyone looking to inspire future earth scientists. The video is available to all via YouTube, or you can find it on the campaign's website, www.BeAGeo.com. Please share it with friends, especially teachers and students. In addition to the video and classroom visits, the campaign relies on the BeAGeo.com website, classroom posters, and a short brochure to help inform students.

To volunteer as a geoscience ambassador, contact Julie Paul, assistant director of development and alumni relations, at 512-471-2223, jpaul@jsg.utexas.edu.

A number of friends and alumni supported production of the video:

Interview Subjects
Blair Francis (B.S. '07, M.S. '09)
Luke Francis (B.S. '07)
Laurel Gandler (M.S. '06)
Christi Gell (B.S. '96)
Peter Hargrove (M.S. '10)
Natalia Kalitynska (M.A. '07)
Chris Ochterbeck
Anisa Perez (M.S. '09)
Kira Diaz-Tushman (M.S. '07)

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Dan Smith (B.S. '58)
Bonnie Weise (B.S. '74, M.A. '79)
Hilcorp Energy Company
Nexen Petroleum USA Inc.
Jackson School of Geosciences

IN THE NEWS 2010-11

Links to complete articles, streaming audio and video files, and current In the News items can be found on the news section of the JSG Web site.

Statoil, UT Strike $5M Deal

Austin American-Statesman, **Sept. 20, 2011**

Norway-based Statoil will fund $5 million in geology, geophysics, and petroleum engineering research at UT Austin over the next five years. "Statoil has a growing presence in North America and we are the first university partner they picked in this magnitude outside of Norway. That's a big deal," said Scott Tinker, director of the Bureau of Economic Geology.

Representatives of Statoil with Dean Sharon Mosher and Scott Tinker, director of the Bureau of Economic Geologyy.

Shell, UT Seek Better Shale Methods

Houston Chronicle, **Sept. 13, 2011**

Shell is donating $7.5 million to establish a program at UT Austin to study improved methods for extracting oil and gas from unconventional rock formations. The five-year program's goal is to enhance understanding of the subsurface characteristics of shales, coalbed methane, and other tight, complex formations. The agreement is an important milestone in Shell's effort to bring more energy to market through innovation, Shell Oil President Marvin Odum said.

Natural Gas, Element of Greatness

Oil and Gas Journal, **July 4, 2011**

As a bridge to future renewables and alternative fuel sources, natural gas is the obvious choice, argues Scott Tinker, director of the Bureau of Economic Geology. "For the first time, natural gas is surpassing coal as an energy source," says Tinker. "That's better for the environment by lowering the overall carbon footprint." Nearly 900 of the next 1000 U.S. power plants will use natural gas, predicts Tinker.

Marvin Odum (left) of Shell receives a token of appreciation from UT Austin President William Powers (right).

Coaxing Oil From an Old Giant

Houston Chronicle, **June 26, 2011**

The Yates Field, among the largest ever found in the U.S., has been in continuous production for 85 years. Today, Kinder Morgan is trying to coax more oil from the faded giant through enhanced oil recovery with carbon dioxide. "You're kind of introducing a new person in the neighborhood, so the other folks got to move a little bit to make room," explained Eric Potter, program director for energy research at the Bureau of Economic Geology. The U.S. has an estimated 1.1 trillion barrels of undeveloped oil resources still in the ground and about 430 billion barrels of that is recoverable using today's technology, including enhanced oil recovery techniques like carbon dioxide injection, enough to meet U.S. oil needs for 60 years.

Prices, Tech Drive Permian Boom

Houston Chronicle, **June 12, 2011**

One of Texas' oldest oil-producing regions is undergoing a rebirth, again. But unlike past booms, the latest surge in the storied Permian Basin is being driven by more than just high oil prices. Recent breakthroughs in drilling and extraction technology are giving producers a whole new set of targets to go after. It's a major comeback for a region that's been pumping out huge volumes of crude since the 1920s and still produces one in five barrels of the nation's

oil. "There always seems to be one more place where the oil is hiding," said H. Scott Hamlin, research scientist associate at the University of Texas' Bureau of Economic Geology. The key technical advances have come in two areas: horizontal drilling and hydraulic fracturing.

Groat Offers Perspective on Hydraulic Fracturing

***NPR,* June 11, 2011**

As debate over hydraulic fracturing in gas exploration continues, a number of studies are exploring its effects on the environment, including one by the Energy Institute at the University of Texas at Austin led by Charles Groat. The UT Study is being based on sound science, emphasized Groat. "Many concerns and claims have been made about injuries to water, to air, earthquakes for that matter, and attributed initially to fracking," noted Groat. The key is to examine the scientific evidence fo claims and determine how the regulatory process can "deal effectively with those parts of the [exploration] processes that are the actual cause of the problems instead of attributing them just automatically to fracking."

UT Completes Austin's Largest Solar Power System

***Federal News Service,* May 30, 2011**

UT Austin recently completed installation of the city's largest solar power system. The project consists of two grid-tied solar power systems, one an array of panels over a newly constructed carport west of the Bureau of Economic Geology building. Largely funded by a grant from the State Energy Conservation Office, the combined system will decrease peak demand costs and save 263 tons of CO_2 from being emitted.

Opinion: U.S. Should Back CO_2-enhanced EOR

***Upstream,* May 27, 2011**

The U.S. should work to increase the use of anthropogenic carbon dioxide for enhanced oil recovery (EOR) by funding research and clarifying legal issues, according to university scientists. Oil reservoirs able to accommodate CO_2-driven EOR could store enough of the greenhouse gas to offset 15 years of emissions from all coal-fired power plants in the U.S., according to a report by researchers at the Massachusetts Institute of Technology's Energy Initiative and the Jackson School's Bureau of Economic Geology. In the process, the fields could produce as much as 3 million barrels per day of additional oil by 2030, they say.

Hydraulic Fracturing's Impact

***Gas Daily,* May 10, 2011**

University of Texas researchers will investigate whether hydraulic fracturing causes groundwater contamination, seismic events, and air pollution and will analyze the effectiveness of existing state and federal laws and regulations. "What we're trying to do is separate fact from fiction," said Raymond Orbach, director of the school's Energy Institute at Austin. "Unlocking huge reserves of natural gas could be vital to our nation's energy security. If proven to be safe and environmentally benign, fracking could unleash a bountiful supply of domestic energy for generations, if not centuries, to come." The institute is funding the study.

Charles Groat

Dinos in Living Color

***KUT Radio,* March 25, 2011**

If you picture lizards when you think of dinosaurs, you might want to think again. Many species were feathered and recent evidence shows the colors of some were as bright and varied as a toucan. Julia Clarke of the Jackson School is helping redraw the world's view of dinosaurs by pioneering tools that allow scientists to decipher color in feathered dinosaurs. "What we're doing is using information about how living birds color their feathers to look into the fossil record and interpret basically information we didn't even know to look for."

Texas Silver Mine Gets New Life

***The New York Times,* March 19, 2011**

Known today as a ghost town, 70 years ago Shafter, Texas was home to a bustling community and one of the nation's most reliable sources of silver. A Canadian company is now reviving the mine to take advantage of silver prices that have tripled since 2009. The Jackson School's Rich Kyle, who has explored the mine, said Shafter is a major step for a state that hasn't had significant metal production for decades. "There are a lot of silver resources on the planet certainly a lot larger and much better, but that's not the point," Kyle said. "I'm excited about it personally as a mineral geologist in Texas, a state obviously dominated by the petroleum industry."

Rich Kyle

Minimal Earthquake Risk for Texas Nuclear Facilities

***Austin American-Statesman,* March 15, 2011**

Some environmentalists have seized on the earthquake disaster at Japan's Fukushima

The Bureau of Economic Geology's carport now houses half of Austin's largest solar panel array.

nuclear plant to oppose the South Texas Project expansion of its nuclear facility. But a similar quake is highly unlikely in Texas, geophysicists said. "Just the geological environment here is not one you'd expect to get huge earthquakes," said Cliff Frohlich, a senior research scientist at the University of Texas Institute for Geophysics. "Little earthquakes" shake Texas all the time, Frohlich said. Quakes of magnitude 3 strike in the Panhandle occasionally but are a million times weaker than the earthquakes that hit Japan. With no major plate boundaries in Texas, it's "about as safe as it could get," he said.

Recounting the Dinosaur Wars

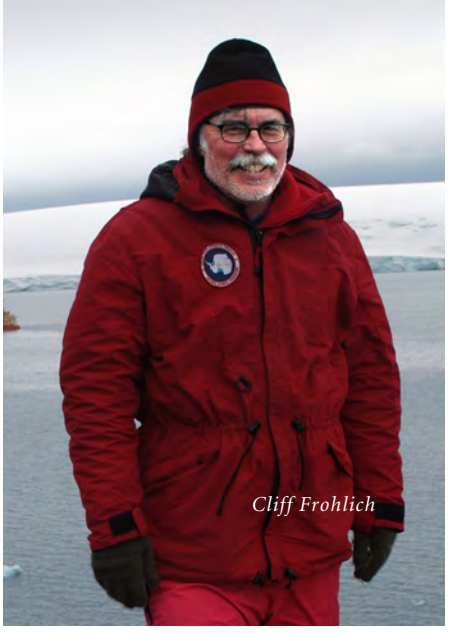
***PBS,* February 2011**

In the nineteenth century two American scientists, Edward Drinker Cope and Othniel Charles Marsh, pioneered many of the great North American discoveries in the young field of paleontology. In "Dinosaur Wars," a PBS documentary, Tim Rowe joined other paleontologists narrating the history of Cope's and Marsh's epic battles for supremacy in their young field. Fueled by their discoveries, the country took great interest in science. "Some of the Congressmen were aghast to think that the federal government, that the United States of America, was paying more for science than any other nation in the world," noted Rowe. The show can be viewed for free online at the American Experience website.

Study Questions Rosy Outlook for Green Jobs

***Reuters et. al,* Feb. 5-7, 2011**

In a story covered around the globe, the Copenhagen Consensus Centre asked Gur-


Cliff Frohlich

can Gulen, a senior energy economist at the Jackson School's Bureau of Economic Geology, to assess the "state of the science" in defining, measuring and predicting the creation of green jobs. Gulen concluded that job creation "cannot be defended as another benefit" of well-meaning green policies. In fact, the number of jobs that these policies create is likely to be offset, or worse, by the number of jobs they destroy. Too many estimates of green job creation include jobs unrelated to green energy or, in the worst cases, are based on overly optimistic scenarios of the sector's expansion.

UT Tests Carbon Storage

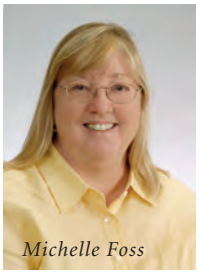
***Austin American-Statesman, Chicago Tribune,* Jan. 22-23, 2011**

A series of experiments and research projects at UT Austin could help spell the future of coal policy in the U.S. The university's research into carbon sequestration underpins the question of how to continue to burn coal without contributing to carbon dioxide emissions. Critical to the project of storing carbon dioxide has been the Bureau of Economic Geology, the oldest research unit at UT Austin. The ground beneath Texas and off its coast, report Bureau scientists, could be a national repository for carbon emissions. And if the carbon were used throughout the state to push out hard- to-get oil, a process known as enhanced oil recovery, the bureau estimates $171 billion in oil would be produced, translating into $26 billion in tax revenue and more than 3 million jobs.

Gulf Coast Warily Eyes Offshore Future

***Christian Science Monitor,* Jan. 11, 2011**

Stricter deep-water drilling regulations mean Gulf Coast waters are likely to yield less oil this year. Energy firms may shift attention abroad. Three months have come and gone since the Obama administration lifted the moratorium on deep-water drilling for oil and gas, but there hasn't been a stampede back to the Gulf of Mexico to sink wells into the ocean depths. New federal rules have led to a wait-and-see situation for operators as they assess higher costs for insurance, maintenance, new technology, and other factors, says Michelle Foss, chief energy economist at the Center for Energy Economics at UT Austin. "This is an enormous dilemma for all operating [oil and gas] companies, all of their backers and investors and shareholders," she says. "If [operators] can't see through the fog to see where things are heading and feel confident about it, they're going to start cutting back, and that's what everyone [in the region] is dreading."

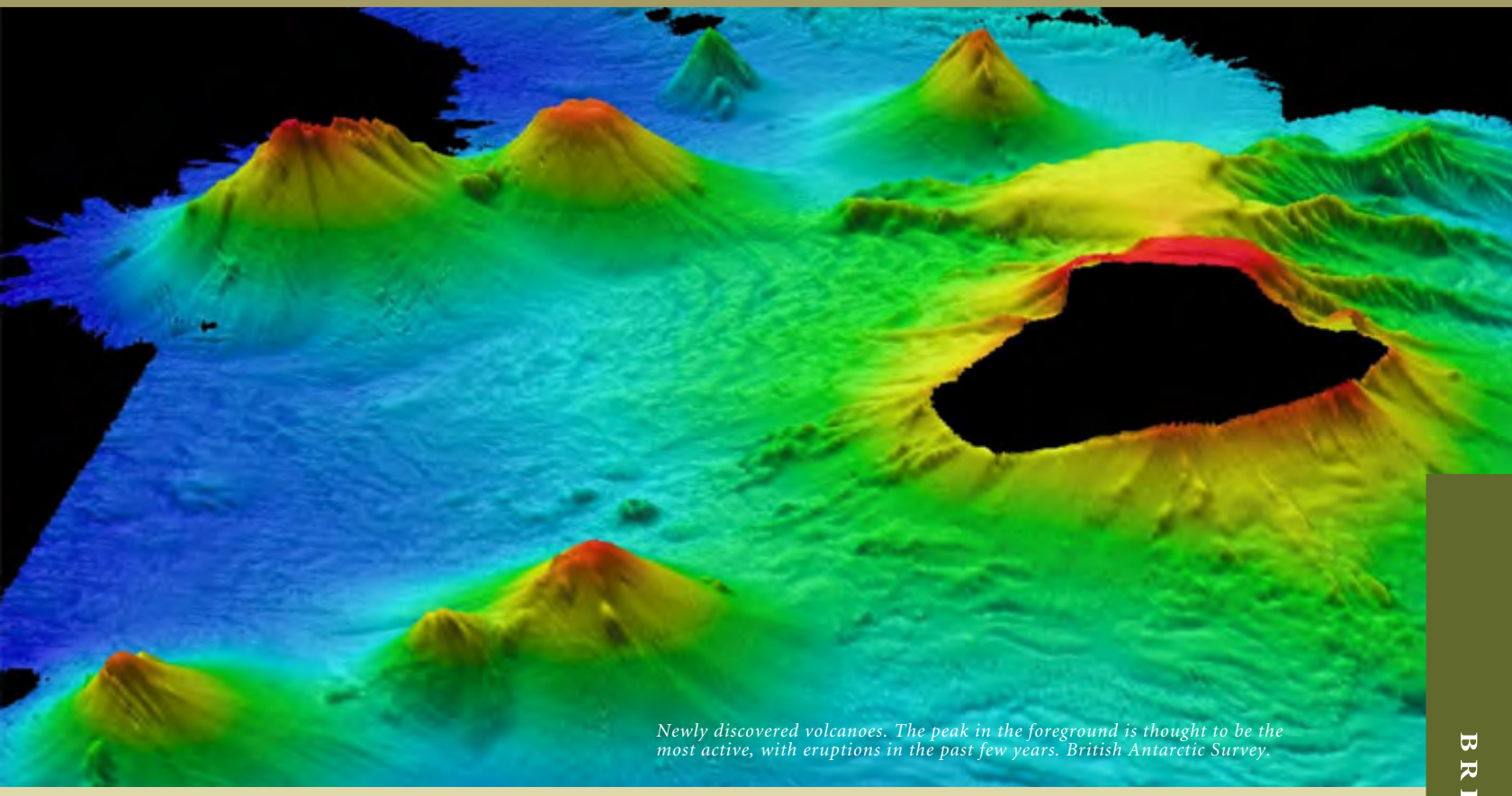

Michelle Foss

Texas Oil Producers Seek CO_2

***The New York Times,* Jan. 7, 2011**

The Obama administration views carbon dioxide as a pollutant that warms the earth, and it imposed new regulations at the beginning of the year to begin to control CO_2 emissions. But to Texas oilmen, carbon dioxide is a useful and scarce commodity vital to extracting hard-to-reach oil reserves. In Texas, the nation's largest oil-producing state, the demand for CO_2 is soaring—because carbon dioxide can help squeeze oil out of formations deep underground—and new carbon dioxide-producing plants are in the works. Last month, Texas air-quality regulators approved crucial permits for two coal-fired power plants that will capture their CO_2 emissions and sell them for use in nearby oil fields. Also in December, a major new pipeline operated by Denbury Resourc-

In the News: Giant Underwater Volcanoes



Newly discovered volcanoes. The peak in the foreground is thought to be the most active, with eruptions in the past few years. British Antarctic Survey.

A dozen massive peaks, some active, can be seen in a novel scan of the ocean floor

By Jessica Marshall, *Discovery News*
July 13, 2011

In the first ever-survey of its kind, a chain of massive volcanoes that rise up to 1.86 miles were discovered lurking beneath Antarctic waters near the South Sandwich Islands in the remote Atlantic Ocean.

Captain Cook discovered the rugged islands in 1775 and wrote of the number of active volcanic islands peeking and erupting above the sea. "But the seafloor was completely unknown. It's never been surveyed at all," said Phil Leats of the British Antarctic Survey who led the new efforts.

The expedition's shipboard sonar scans reveal twelve new undersea volcanoes, some rising nearly two miles from the seafloor. Several of them have clearly been active in recent times. Others have collapsed, forming huge craters some three miles across.

"These are massive mountains on the seafloor," Leats said.

Given the presence of known volcanoes nearby, "It's not surprising, but it's very interesting," said Ian Dalziel of The University of Texas at Austin.

The volcanoes are a result of the South American continental plate sliding under the South Sandwich plate to the east, carrying water down into the deep interior of the earth. The water escapes upward, ultimately leading to eruptions of molten rock.

Strings of these volcanoes tend to occur in a line parallel to the plate boundary.

Ian Dalziel

They represent new continental crust that will grow, with more emerging from the sea over time, and one day smash into another continent.

"We have GPS data to show that the South Sandwich Islands are moving east very fast indeed with respect to Africa," Dalziel said. "It's a very active system."

The findings are exciting for geologists who hope to learn more about underwater eruptions and how new continental crust forms, but they are also a trove of discovery for biologists, because the vents of hot water spewing from the ocean floor create a novel environment for life.

"We know there's a whole different ecosystem of new life forms that exist around those hot areas," Leat said.

The findings also raise awareness of a hazard to humans. Such volcanoes often have unstable slopes, and if the entire side becomes unstable it can slip down in a sudden rush, generating a tsunami.

"This is quite well known," Leat said "Clearly this has happened in this area. We can see the scars. We can see the quite large slump deposits, which must have caused quite large tsunamis, so clearly it's an area where this kind of hazard does exist."

As remote as the South Sandwich Islands may be, the 2004 Indian Ocean tsunami showed that tsunamis can have devastating consequences great distances away from their origins. The west coast of Africa would be particularly vulnerable to a tsunami triggered by the newly found volcanoes, Dalziel said.

es of Plano began ferrying carbon dioxide from Mississippi to oil fields near Houston. Carbon dioxide is a "fantastic solvent," said Susan Hovorka, a scientist with the Gulf Coast Carbon Center at the Jackson School of Geosciences. In a nearly liquid form, it can mix with the underground oil, making the oil more fluid and easier to extract. When a project has finished producing oil, the vast majority of the carbon dioxide stays underground and will not leak out of the tiny pores it is wedged into, said Ms. Hovorka, whose team has monitored two oil fields in the state and verified the gas did not escape.

Meet Nice-O Saurus

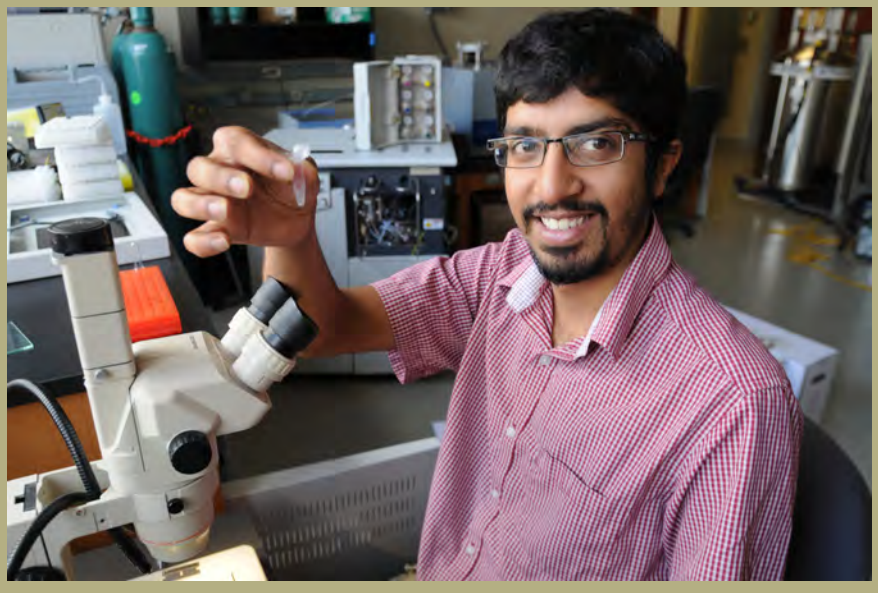
Associated Press, MSNBC, et. al, **Oct. 6-7, 2010**

Dinosaurs might not have been the mighty conquerors everyone thinks they were. Instead of overwhelming the world with force, dinosaurs might have instead moved in when no one was looking. A new species named Sarahsaurus, discovered by the Jackson School's Tim Rowe, suggests that instead of overpowering weaker species, dinosaurs came into dominance by taking advantage of a catastrophe that wiped out the competition. "We used to think of dinosaurs as fierce creatures that out-competed everyone else," said Rowe. "Now we're starting to see that's not really the case."

Round Top Rare Earth Deposit

UPI, Asian News Service, et. al, **Oct. 6-7, 2011**

Texas Rare Earth Resources Corp. has executed a 20-year lease with the Texas General Land Office covering 860 acres at Round Top Mountain in Hudspeth County, Texas. The mass of the Round Top rhyolite body has been estimated by Texas Bureau of Economic Geology geologists to be at least 1.6 billion metric tons. The heavy to light rare earth ratio of 67% seen to date is highly encouraging. There also exists a possibility that other minerals containing other rare elements such as niobium, tantalum, zirconium, hafnium and lithium may be co-produced.



Indian Graduate Student is Upbeat at UT

The Hindu, **Nov. 1, 2010**

This profile written by Jackson School graduate student Kaustubh Thirumalai appeared in one of India's largest newspapers, The Hindu*, circulation 14 million.*

Studying geosciences, regular cycling, good food and a great music scene

As is wont with most of us young Indians, I pursued a bachelor's degree in engineering. Always intrigued by wildlife and the outdoors, I was looking for different avenues to convert my passion into a career. However, I didn't want to waste my engineering degree.

During my second year of college I became interested in climatology and in specific, palaeoclimatology—the science of deciphering ancient climates. Soon I obtained research intern positions at the Indian Institute of Science (Bangalore) and Physical Research Laboratory (Ahmedabad).

Opting to pursue my doctoral studies I decided to apply to graduate schools. I was looking for a reputed school located in a pleasant city and importantly, one that was a leader in my field. I obtained fully-funded admission into the Jackson School of Geosciences at The University of Texas at Austin. Choosing a school for a Ph.D. is tricky business. Remember, you are planning on spending at least five to six years of your life in the same department. The most crucial aspect is that you must fit with your advisor and research group.

UT is a wonderful university and Austin is an interesting place with very pleasant weather (no harsh winters). There are tonnes of intriguing spots to visit and you can always consider yourself occupied when you get free time (however rare that may be in a grad school!), be it with parks, museums or the nearby caves.

There is a strong cycling culture in Austin and it just takes me under 10 minutes to bike to work. People here are very friendly and are ever ready to give you a helping hand. The music scene is fantastic with gigs happening on a daily basis catering to fans of diverse genres (including an obscure death metal fan such as myself). You can satiate any sort of culinary craving thanks to numerous restaurants and I've had no problem being a vegetarian. There is a significant Indian population in Austin and of course there are many good Indian restaurants.

The University of Texas is home to many prolific scientists and researchers including greats such as George Sudarshan and Steven Weinberg. It has been affiliated with numerous Nobel laureates. The Jackson School of Geosciences is a leading geology department with cutting-edge facilities and vast research interests ranging from dinosaurs to energy to climate modelling (to name a few).

In order to survive in a grad school, one has to be focused on research and should enjoy what one does. I am fascinated by palaeoclimatology. My lab geochemically analyses corals, foraminifera (small marine organisms) and speleothems (cave deposits) which give us clues about past climates through their isotopic signature. Sample collection leads us to interesting places such as the Solomon Islands and the Caribbean.

The laidback attitude of Austin and the breadth of academic excellence makes UT an ideal place for graduate studies.

AWARDS & HONORS 2010-2011

Abbreviations:
AAPG = American Assoc. of Petroleum Geologists
AGI = American Geological Institute
GCAGS = Gulf Coast Assoc. of Geological Societies
GSA = Geological Society of America
SEG = Society of Exploration Geophysicists
SVP = Society of Vertebrate Paleontologists

Faculty & Researchers

William Ambrose
Wallace E. Pratt Memorial Award, AAPG

Jay Banner
Member, Academy of Distinguished Teachers, UT Austin / Friar Centennial Teaching Fellowship, Friar Society

Chris Bell
Outstanding Educator Award, JSG

Florence Bonnaffe
Wallace E. Pratt Memorial Award, AAPG

Daniel Breecker
LIFT Award, UT Research & Educational Technology Committee / G. Moses and Carolyn G. Knebel Distinguished Teaching Award (Graduate), JSG

L. Frank Brown Jr.
Wallace E. Pratt Memorial Award, AAPG


Dean Sharon Mosher and Ursula Hammes

William Carlson
Outstanding Teaching Award, UT Board of Regents / G. Moses and Carolyn G. Knebel Distinguished Teaching Award (Undergrad), JSG

Elizabeth Catlos
Texas Exes Teaching Award, Texas Exes

Gail Christeson
2010-2011 Distinguished Lectureship, Consortium for Ocean Leadership

Ian Duncan
Outstanding Service Award, BEG

Peter Eichhubl
Most Cited Paper 2006-2010, Journal of Structural Geology

Sergey Fomel
Two of the Top 30 Presentations, SEG Annual Meeting / Conrad Schlumberger Award, European Association of Geoscientists and Engineers

FRAC
FRAC paper in Top-50 most cited articles, Tectonophysics / Three FRAC papers in Top 25 Articles, ScienceDirect

Gulf Coast Carbon Center Frio Project
CSLF Recognition Award, Carbon Sequestration Leadership Forum

Ursula Hammes
A. I. Levorsen Best Paper Award (co-author), Gulf Coast Section, GCSSEPM/ GCAGS Annual Meeting

Tucker Hentz
Wallace E. Pratt Memorial Award, AAPG / Third Place, Gordon I. Atwater Best Poster Award GCAGS

Jack Holt
Among 100 Top Stories of 2010, Discover Magazine

Farzam Javadpour
Outstanding Service Award as Associate Editor, SPE-JCPT, Society of Petroleum Engineers

Banner Recognized for Teaching Excellence

Jay Banner, professor in the Jackson School and director of the Environmental Science Institute, was honored this past year with two of the most prestigious teaching awards at the university: a Friar Centennial Teaching Fellowship from the Friar Society and membership in the Academy of Distinguished Teachers. In April, members of the Longhorn Band interrupted a lecture to serenade him while a representative of the Friar Society presented him with a jumbo check. His election to the Academy of Distinguished Teachers was announced in June. The Academy, consisting of just 5 percent of tenured faculty, provides leadership to improve the quality and depth of the undergraduate experience.

BRIEFS

Rich Ketcham
Among 50 Most Cited Articles 2005-2010, Journal of Structural Geology / G. Moses and Carolyn G. Knebel Distinguished Teaching Award (Intro Geology), JSG

Steve Laubach
Among 50 Most Cited Articles 2006-2010, Tectonophysics / 38th Most Cited Article of All Time, International Journal of Coal Geology

AAPG Awards Reunite Teacher and Student

By Barry Friedman. Excerpted with permission from the March 2011 **AAPG Explorer**.

This year's AAPG award-winning researcher was honored on the same stage with one of his former professors, winner of AAPG's top educator award. Ole J. Martinsen, vice president and head of exploration research for Statoil ASA, Bergen, Norway, was honored in April at the AAPG Annual Convention and Exhibition as this year's winner of the Robert R. Berg Outstanding Research Award.

His former professor Ronald J. Steel, David Centennial Chair at The University of Texas at Austin's Jackson School of Geosciences, as well as the Sixth-Century Chair of Sedimentary Geology at the University of Aberdeen, Scotland, was one of two people receiving the Grover E. Murray Distinguished Educator Award on the same stage.

They met in a classroom at the University of Bergen in Norway. At the time, one was coming back to academia; one was about to make his mark. But for both, the meeting marked a significant first in their lives.

"There is nothing like field teaching. Doing this in icy Spitsbergen, at 79 degrees north, is very rewarding."

"I had been working in Norsk Hydro for nearly nine years (first in research, then in exploration)," Steel said, "and was about to leave and return to the University of Bergen as professor in reservoir geology.

"In planning my new academic career in 1990 and looking for graduate students and collaborators, I had heard about a young and enthusiastic, recently completed Ph.D. student, Ole Martinsen."

Martinsen, in fact, turned out to be Steel's first post-doctoral student. He not only recalls the moment but recognizes its significance, saying that Steel's influence was "very instrumental" in his academic and professional career.

"I guess the Bergen story was more sort

Ron Steel

of Ron being the senior project founder and organizer who got me involved," Martinsen said of those early days, "and I was a junior executor, more than the typical professor-post-doc student relationship."

Steel, who has remained in education since the early 1990s, believes there is a special, almost inexplicable joy in academia.

"It has been a great pleasure for me to have been a teacher for so many years and in three countries," Steel said. "I'm not sure that it was always the teaching itself, but it was often a great experience to air current research concepts and ideas with graduate student classes, such as Martinsen."

Steel said this sharing of ideas—this kinship—is more common in the United States than it is in Europe.

Martinsen said he also believes the kinship is an important one, albeit one that, for him, manifested itself in business.

"There have been many scientific challenges and some professional ones," he said, "but I feel the geological community is one of great positivism and where scientific passion totally overcomes professional struggles."

One gets the sense that for Steel, the rewards of the relationships mean as much as the awards he gets for doing his job.

"Students are unfettered and have endless capacity, and so they provide great feedback in such situations," he said.

"Geology, in addition, lends itself to field teaching, and there is nothing like field teaching to get commitment and excellence from students! Doing this in icy Spitsbergen, at 79 degrees north, is very rewarding."

Martinsen's friendship with Steel is one that endures.

"It is a very interesting way of crossing paths yet again," he said of the fact that both will be honored in Houston.

Steel agrees.

"Yes," he says of the coincidence of their two awards, "it would seem to be an unusual intersection! Although we never did have much joint research after Ole's post-doc period, we cross paths and talk frequently at gatherings and conferences because of our common interest in sedimentology and Norsk Hydro (now Statoil).

There is something else, too: "When Ole also gets tired of management, maybe we will work again together," says the teacher.

"This would be quite a lot of fun," says his old student.

Steel Named Chair of Department of Geological Sciences

Four months after receiving his AAPG teaching award, Ron Steel was named chair of the Department of Geological Sciences at the Jackson School to replace outgoing chair Steve Grand.

"Ron is an outstanding researcher and award-winning teacher," said Sharon Mosher, dean of the Jackson School. "He will provide strong leadership in a time of change as we continue to increase the breadth and depth of our programs."

Steel is a sedimentologist/stratigrapher with research focus on sedimentary basins and interpretation of their infill, including the occurrence of oil and gas. He is interested in the role played by river deltas in the growth of continental shelves, the new theory of autostratigraphy and sediment budget partitioning in source-to-sink transects across continental margins.

Steel has authored or co-authored 150 peer-reviewed articles in mainstream journals/books and has edited seven books.

Jung-Fu "Afu" Lin

Jung-Fu "Afu" Lin
CAREER Award, National Science Foundation

Robert Loucks
Wallace E. Pratt Memorial Award, AAPG
A. I. Levorsen Best Paper Award (co-author), Gulf Coast Section, GCSSEPM/GCAGS Annual Meeting

Paul Mann
Among 100 Top Stories of 2010, Discover Magazine

David Mohrig
Outstanding Paper, Journal of Sedimentary Research
G. Moses and Carolyn G. Knebel Distinguished Teaching Award (Graduate) JSG

Lorena Moscardelli
2010 Publication of the Year (co-author), BEG

William Muehlberger
Marcus Milling Legendary Geoscientist Medal, AGI

STARR (William Ambrose and Ursula Hammes)
Outstanding Research Award, JSG

Suzanne Pierce
LIFT Award, UT Research & Educational Technology Committee
Fulbright NEXUS Scholar, Fulbright Program

Eric Potter
Wallace E. Pratt Memorial Award, AAPG

Rob Reed
A. I. Levorsen Best Paper Award (co-author), Gulf Coast Section, GCSSEPM/GCAGS Annual Meeting

Stephen Ruppel
Third Place, Gordon I. Atwater Best Poster Award, GCAGS
A. I. Levorsen Best Paper Award (co-author), Gulf Coast Section, GCSSEPM/GCAGS Annual Meeting

Eleanour Snow
Second Place Paper, 2010 GCAGS Meeting

Ronald Steel
Grover E. Murray Distinguished Educator Award, AAPG

Fred Wang
Wallace E. Pratt Memorial Award, AAPG

Michael Webber
Dads' Association Centennial Teaching Fellowship, UT Board of Regents

Lesli Wood
Third Place, Thomas A. Philpot Excellence of Presentation Award (co-author), Gulf Coast Section, GCSSEPM/GCAGS Annual Meeting
2010 Publication of the Year (co-author), BEG

Chris Zahm
Faculty Advisor, Winning Team, 2011 Imperial Barrel Award competition

Promotions

Bayani Cardenas
Associate Professor

James Gardner
Professor

Tip Meckel
Research Scientist

David Mohrig
Professor

Two JSG Research Scientists Make *Discover*'s Top 100

Two Jackson School researchers were included in *Discover* magazine's top 100 science stories of 2010: Paul Mann of the Institute for Geophysics (who as of fall 2011 is a professor at the University of Houston) appeared in item No. 35 for his research on the Haitian earthquake zone. Jack Holt of the Institute appeared in story No. 40 discussing his research on Mars' polar ice cap.

Brandon Okafor

BRIEFS

Seay Nance
Research Associate

Jeffrey Paine
Senior Research Scientist

Eleanour Snow
Associate Director of Outreach

Michael Young
Senior Research Scientist

Leadership Positions

Michelle Foss
Member, Technical Advisory Council, Natural Resource Charter

Sean Gulick
Co-Chief Scientist, IODP Leg 341 IODP / Co-Chief Scientist, IODP Chixculub Experiment IODP

Bob Hardage
President, SEG

Steve Laubach
Elected Editor and Member, Executive Committee, AAPG

Sharon Mosher
President-Elect, AGI

Scott Tinker
President-Elect, GCAGS

Students

Paola Arias
Best Student Poster Award, AGU

Kenny Befus
Jack Kleinman Award for Volcano Research, USGS / Petrography Contest (Grad 2nd), JSG

Ashley Bens
First Place, Imperial Barrel Award, AAPG

Rocio Bernal-Olaya
Third Place, Student Poster Competition, AAPG

William Burnett
Tech Sessions Best Speaker (PhD), JSG

Meredith Bush
Thelma Lynn Guion Library Staff, JSG

Henry Campos
First Place, Student Poster Competition, AAPG

Edward "Ted" Cross
Estwing Hammer, JSG

Katherine Delbecq
Outstanding TA, JSG

Michael Fairbanks
First Place, Imperial Barrel Award, AAPG

Anjali Fernandes
Best Student Oral Presentation, AAPG

Justin Fitch
First Place, Imperial Barrel Award, AAPG

Meaghan Gorman
Tech Sessions Best Speaker (MS), JSG

Lisa Helper
GSEC Student Service, JSG

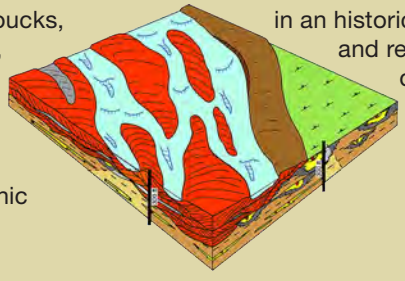
Jamie Levine
Petrography Contest (Grad 1st), JSG

Bureau Researchers Share AAPG's Pratt Memorial Publications Award

The American Association of Petroleum Geologists presents the Wallace E. Pratt Memorial Award to honor the author(s) of the best AAPG Bulletin article published each calendar year.

Seven co-authors from the Bureau of Economic Geology shared the award given at the 2011 AAPG Annual Meeting. William A. Ambrose, Tucker F. Hentz, Florence Bonnaffe, Robert G. Loucks, L. Frank Brown Jr., Fred P. Wang and Eric C. Potter received the Pratt award for "Sequence-Stratigraphic Controls on Complex Reservoir Architecture of Highstand Fluvial-Dominated Deltaic Lowstand Valley-Fill Deposits in the Upper Cretaceous (Cenomanian) Woodbine Group, East Texas Field: Regional and Local Perspectives," which appeared in the February 2009 AAPG Bulletin.

The paper presents a sequence-stratigraphic and new depositional model for the lower Woodbine Group in an historic East Texas field and represents a marked departure from previous geologic characterizations.



Detail of block diagram from the award-winning paper summarizing sequences and depositional systems in the lower Woodbine Group in the East Texas field.

Vishal Maharaj
Third Place, Thomas A. Philpot Excellence of Presentation Award, GCAGS / Exxon-Mobil Geoscience Award, ExxonMobil

Kristine McAndrews
Second Place, Student Paper Competition, SPE HSSE Conference

Erin Miller
First Place, Imperial Barrel Award, AAPG

Jennifer Olori
Romer Prize, SVP

Brandon Okafor
Student Employee of the Year, UT Austin

Wendy Robertson
Outstanding TA, JSG

Jillian Rowley
Petrography Contest (UG 1st), JSG

Eugenio "Jay" Santillan
Outstanding Student Paper Award, AGU

Audrey Sawyer
Outstanding Student Presentation, ASLO Summer Meeting, American Society of Limnology and Oceanography

Julia Schneider
Outstanding Student Paper Award, AGU Fall Meeting, Mineral and Rock Physics Section, AGU

Tim Shin
Petrography Contest (UG 2nd), JSG

Ben Siks
First Place, Imperial Barrel Award, AAPG

John Singleton
Outstanding TA, JSG

Calla Smith-Dowling
Thelma Lynn Guion Library Staff, JSG

Yanadet Sripanich
The American Mineralogist Undergraduate Award, Mineralogy Society of America

Students Win Big at AAPG

Jackson School students—Henry Campos (right), Kurtus Woolf (center) and Rocio Bernal-Olaya (left)—won the top 3 prizes in the Student Poster Competition at the annual meeting of the American Association of Petroleum Geologists in Houston in April. It was the first time a single university has had that distinction since the awards were first given in 1996.

Michelle Stocker
Outstanding TA, JSG

Kongrath Suwannasri
Second Place Geophysics Poster-AAPG Student Expo, AAPG and SEG

Dolores van der Kolk
Top Ten Poster Presentation, AAPG International Conference & Exhibition, Calgary AAPG / HGS Outstanding Student, Houston Geological Society

Kurtus Woolf
2nd Place, Student Poster Competition, AAPG

Yao You
Best Poster, SIAM Conference on Mathematics & Computational Issues in the Geosciences, SIAM / Best Presentation, AGU Fall Meeting, AGU

Staff

Philip Guerrero
Outstanding Service Award, JSG

Eleanor Picard
Staff Excellence Award, JSG

Doug Ratcliff
Walter Excellence Award, JSG


Dolores van der Kolk

LIBRARY REPORT

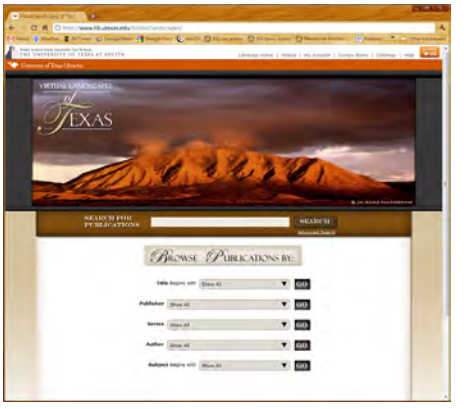
By Dennis Trombatore

Studies show graduate students are the major drivers of library usage, and as our graduate student population continues to grow and diversify, the Walter Library is working to remain responsive to their needs, as well as engaging in broader planning activities to remodel and revise services and collections to lower costs and increase productivity.

This past year, the Walter Library has reaped another windfall, as the Bureau of Economic Geology has given permission for us to review the UNOCAL library, mothballed at the Houston Core Research Center for several years. This library, as extensive as the earlier ARCO collection we absorbed, has proven to contain many items not owned by UT Austin. We have shipped almost seven pallets of materials to Austin to be processed and as yet have only looked at about half of the UNOCAL materials. The good news is our GRA, Meredith Bush, has been extraordinarily productive this year, and we are making strides to move most of this new material into the collection quickly.

The bad news is that Carol Russell, who ran the Tobin Geologic Map Collection for almost 30 years, has retired, and her position has been lost. Our 3.5 full-time equivalent (FTE) staff is now 3 FTE, and the rest of the staff will have to absorb Carol's duties and try to make up for the loss of her expertise. On a day-to-day basis, this is manageable, but it creates a hole in our structure that will have service repercussions. Students are being trained to handle the daily tasks in the map collection, but this forces us to rearrange staffing. We have eliminated our slowest day, Saturday, and may have to redirect some of our GRA's time to helping catalog materials for the map room, which will take time away from the big gift processing projects and other things we are trying to accomplish.

Additional staff losses in the university libraries' cataloging department, particularly in language expertise, will also slow our processing time somewhat, and will force us to do more of the work in geology, taking time away from helping users and doing other local projects. We may even have to outsource some of the work, paying an outside organization to produce catalog records for us, which will take resources from collections budgets.



Screen shot of the revamped Virtual Landsapes of Texas online archive at http://www.lib.utexas.edu/.

While we have not made any significant single purchases this year, we continue to order new materials apace in both paper and electronic formats. Staff losses in acquisitions and accounting have also slowed progress. The individual effects are small, but cumulative, and not in the best interests of those we serve.

As this is being written, the major serials and database cancellation project we prepared has not come to pass, yet. Nevertheless, the coming biennium will be the most difficult in decades, and hard choices lay ahead. In the effort to re-invent themselves for the generation to come, the UT Libraries are engaged in a year-long planning process that we hope will result in a sustainable structure that continues to support the academic mission of the university with excellence. The Walter Geology Library has a truly magnificent legacy collection and a bold start on a trove of electronically delivered information, new and old, to improve and propel the research process. We still have adequate staff with the requisite skills to control and push this information where it needs to go – into the hands of students, faculty and research scientists. This is what we need to focus on maintaining through short-term losses and into better days to come.

One of our initiatives, the Virtual Landscapes of Texas web site at http://www.lib.utexas.edu/books/landscapes/, has been completely restructured and redesigned through the efforts of Library staff in digitizing and computing services, and through the work of Calla Smith-Dowling, who oversaw the project on our end, and completely reconstructed the metadata files to make the site searchable and consistent. Now that we have more than 600 documents on the site, with more to come, it became necessary to not only refresh, but rebuild the files. We are thrilled that well known West Texas photographer Jim Bones has donated several photographic images to improve its appearance, and we are proud of the new look and feel of the site. In lieu of a national program to preserve and promote this legacy literature, we felt it was necessary to take responsibility for our own materials and make them more accessible for the digital generation. We hope you find it useful. Please send us your feedback.

We are also pushing to digitize as many master's and doctoral theses as possible – to preserve them, to promote them, and to make them more accessible. New graduate work is being loaded into the UT Digital Repository <http://repositories.lib.utexas.edu/>. We have been asking permission to scan and create PDF copies of older theses and dissertations, which are also being loaded into the repository, but so far, only about 5% have been done from Geological Sciences. If you graduated between 2001 and 2009, your thesis or dissertation may have been turned in on a CD or other storage device, but in most cases we do not have the appropriate permission to load the file on the website. No matter when you graduated, if you are interested in having your thesis or dissertation added to the digital repository, please get in touch with us and we will walk you through the permission process.

In staff news, Calla Smith-Dowling and Meredith Bush are this year's Guion Staff Award winners. Dennis Trombatore continues to serve on the GeoRef Advisory Committee, and managed to do some geo-touring on his visits to Nova Scotia and Ireland this past year. We are proud to now host three indexers for the GeoRef database out of the Walter Library—Pat Dickerson, Kitty Coley and Laura Hunt.

The rift flank of the central Gulf of Suez as seen from Gebel Samra, Sinai Egypt. Photo: D. Stockli. Stockli uses geochronology techniques to study tectonic processes such as the rifting of continents.

All in the Timing:

DANNY STOCKLI'S GEOLOGIC TIME STAMPS REVEAL SECRET LIFE OF ROCKS

Like many kids in the Indiana Jones generation, Danny Stockli wanted to be an archaeologist when he grew up. In high school, he volunteered at ancient Roman digs in his native Switzerland. Like most of us though, the dream changed somewhere along the way.

"I don't have a gun or a whip," he said, "but field work is pretty adventurous. I've driven through the Sahara Desert. I've worked in the Columbian jungle. I've been fortunate enough to do field work in Tibet and places where they haven't seen someone blond. As a geologist, you get to go places most tourists don't go."

His weapon of choice, which for obvious reasons stays back home, is a lab full of mad scientist equipment—desk-sized mass spectrometers and lasers, centrifuges, fume hoods, and plenty of tubes, wires and radiation hazard signs. With it, he reconstructs the thermal history of rocks based on the rate at which different radioactive isotopes decay and their daughter products are incrementally lost due to heating. The tools can reveal when mountains formed, erosion occurred, faults shifted, and petroleum traps formed, among other things.

The primary technique he uses, evocatively known as (U-Th)/He, is based on the relative abundance of uranium, thorium and radiogenic helium in certain minerals.

Using the technique, he and his doctoral student John Lee showed that part of the Grand Canyon was far older than the 6 million years commonly cited for the entire canyon. He and his colleagues have used the technique to argue for the existence of a controversial type of continental rift in western Tibet.

For the oil industry, he's applied the technique to determine when source rocks were producing hydrocarbons and at what point the overlying seal or trap formed. That information could be worth millions. If, for example, the seal was formed after the hydrocarbons, then they likely migrated away, meaning what looks like a good reservoir based on seismic and other geophysical data might turn out to be a mirage.

Meet more new faculty

Danny Stockli is one of 19 faculty members the Jackson School has hired since 2008. You can find profiles of all hires since 2005 along with some features on other faculty and research scientists on our website. Go to our People pages and look for the "Scientists Profiles" link.

Mentors

As an undergraduate at the Swiss Federal Institute of Technology, Stockli took an introductory geology class in which various professors took four week rotations teaching. One was the legendary British structural geologist John Ramsay.

"It was somewhere between science and art," he said. "You were glued to every word he said."

Ramsay showed lots of striking slides of deformed rocks and fossils. Tectonic forces that are imperceptible on human scales burst to life. Stockli decided then to become a structural geologist.

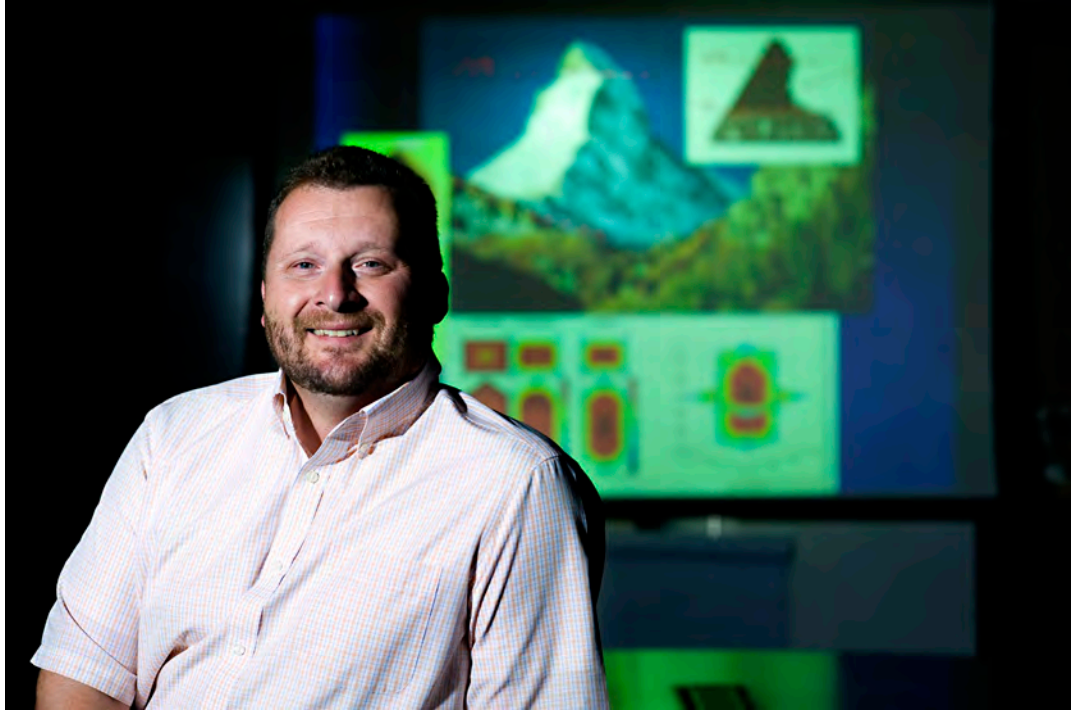
"It goes to show that whether we want it or not, as a teacher, we can have a tremendous influence on people's lives and

careers," he said. "Most of us could have ended up in any field of natural science or earth science, but exactly what we choose has a lot to do with a mentor."

For his Ph.D., Stockli went to Stanford University and focused on how the enigmatic Basin and Range Province in the Western U.S. was formed. An "army of caterpillars marching toward Mexico" is how one geologist described the rumpled topography of alternating mountain ranges and valleys. Geologists generally agree that extension, or the pulling apart of Earth's crust by tectonic forces, gave rise to the unusual formation, but they continue to argue over the details. Conventional wisdom held that the province went through several periods of extension. Stockli used the tools of thermochronology to estimate the location, timing and magnitude of each period.

And that's where the big surprise came. He found that much of the extension occurred simultaneously across the entire province in a very short time (geologically speaking).

One tool that was critical to his work—you guessed it, (U-Th)/He—was just being developed by Kenneth Farley at the California Institute of Technology. Stockli brought his samples to Farley's lab to do that part of the analysis and he started to see ways the tool could be applied to all sorts of other problems in earth science. After graduating, he joined Farley's lab as a post doc. Like his happy encounter with John Ramsay a decade earlier, his interactions with Farley changed the trajectory of his career. He became so fascinated with the tools of thermochronology that he began to transition from a pure structural geologist to a geochemist.



As an assistant professor and then associate professor at the University of Kansas, he set up his own (U-Th)/He lab. It became one of only three major, dedicated labs for the technique in the world. Why so few? The equipment is expensive and it doesn't come pre-packaged—you have to have some mechanical and electrical know-how. And the technique itself is still relatively new, so the pool of people who know how is limited.

"We did 7,000 samples last year," said Stockli. "People come from around the world to collaborate with us."

Although he didn't invent the technique, Stockli has worked to push it far beyond its original capabilities. In the early days, it was limited to apatites and zircons, minerals found in granites and sandstones. He's now developing the technique for other minerals such as magnetite, monazite, serpentinite and blueschists, allowing him to expand into different environments and probe different temperature ranges.

"Each mineral has a different sensitivity to temperature," he said. "So we can date a multitude of minerals to get a more comprehensive understanding of the thermal history of rocks."

New Chapter

This past summer, Stockli moved his entire (U-Th)/He lab to the Jackson School, where he is now a professor. The University of Kansas graciously allowed him to take the unique facility, which he constructed with KU start-up funds, with him. With the addition of Stockli and his lab, the Jackson School is emerging as a leading center for geo- and thermochronology.

The U-Th/He technique is often used in conjunction with a technique known as apatite fission-track that Rich Ketcham, professor in the school, specializes in. Together, a more complete picture of a rock's thermal history can be deduced.

"Rich is one of the preeminent geochronology people," said Stockli. "We'll be in cahoots."

Stockli also plans to collaborate with other scientists working in related areas, including Mark Cloos, Brian Horton, Luc Lavier, Terry Quinn, Tim Shanahan, Liz Catlos and Jaime Barnes.

Stockli is bringing to UT the remainder of a $2.4 million stimulus grant from the Department of Energy (plus cost sharing from partners University of Oklahoma and Sierra Geothermal Power Corp.) for geothermal research.

One of the big obstacles to exploiting geothermal energy around the country is the high cost of exploration. Some geothermal hotspots give themselves away by releasing steam at the surface, such as in Yellowstone and The Geysers in northern California. Most of the resources, however, are hidden. Some experts say the field of geothermal exploration is about where petroleum exploration was in the early 20th century.

Stockli and colleagues have used the thermal history of rocks in Nevada's Clayton Valley, about 150 southeast of Reno, as well as geophysical data, to predict the locations of long lived thermal anomalies. Next year, the team will drill rock cores to confirm the locations and conduct flow testing. Ultimately, the goal is to show investors that the exploration tools Stockli and others have developed do a good job of predicting the performance of geothermal resources.

Many of his other research projects focus on extensional tectonics and rifting processes in the Middle East and the western U.S.

In a new research direction that takes him closer to his early interests, Stockli plans to wade into an archaeological controversy that has been brewing for more than three decades.

At some point in the ancient past, the island of Santorini (a.k.a. Thera) was rocked by one of the largest volcanic eruptions in recorded history. It destroyed Minoan settlements and deposited a layer of ash on much of the eastern Mediterranean region. Historians have suggested it was the inspiration for the legend of Atlantis. Based on pottery and other artifacts, archaeologists have dated that event to about 1500 BCE. It's become a key date in the chronologies of several Mediterranean civilizations, including the Greeks, Egyptians and Minoans. Then in the 1970s, scientists measured radiocarbon dates for the ash layer that placed the eruption more than a century earlier. If correct, it would be a major headache for historians.

Until recently, the (U-Th)/He technique wasn't able to accurately measure such young ages. But Stockli's new lab will include a higher sensitivity mass spectrometer, which will allow him to measure volcanic samples with much less helium and should finally allow him to weigh in on the controversy.

"It's funny," he said, "it's not so much the archaeological outcome I'm interested in. I've completely transitioned to a geologist. It's about the tinkering of getting the technique to work rather than the outcome. I must be healed from my Indiana Jones syndrome." ✷

– Marc Airhart

The Continental Drifter:

IAN DALZIEL'S JOURNEYS THROUGH SPACE AND TIME

SCIENTISTS

Ian Dalziel (pronounced Dee-ELL) is a jocular and spirited Scotsman. As a boy growing up in Glasgow, he and his parents would spend their summers in the Scottish Highlands. They'd rent a cottage on a windy speck of an island called Iona, which had an ancient stone abbey, puffins, and more sheep than people. You could walk the entire coastline in a day. He wasn't much of a rock hound, but he did enjoy being out in the open air exploring.

"I went to what turned out to be famous geological localities," said Dalziel, research professor at the Institute for Geophysics in the Jackson School of Geosciences.

One of them, the Moine Thrust Belt, was among the first known thrust faults, in which older rocks are thrust up and over younger rocks. Geologists postulated that it formed as Europe piled into a stable northwestern foreland that turned out to have been part of ancestral North America, squeezing Scotland to form the Caledonian mountain chain. The only way to make sense of what happened there was through the controversial hypothesis of continental drift, the idea that Earth's continents move over time.

It was an idea that fascinated Dalziel. In the mid 1950s, he studied at the University of Edinburgh, home of Arthur Holmes, a pioneer in geochronology who had promoted continental drift for years.

"Edinburgh regarded continental drift seriously at a time when it was considered a crackpot idea in the U.S.," said Dalziel.

The idea had been around for decades, but over the next 10 or 20 years, evidence mounted and, modified by the realization that the Atlantic seafloor was spreading, the hypothesis evolved into what we now know as plate tectonics. With GPS measurements, it became established as fact.

Dalziel, who has devoted his career to reconstructing the ancient geography of Earth through plate tectonics, could hardly have started in a better place. Some of the earliest evidence in support of continental drift came from Scotland. As far back as the 1850s, scientists had recognized that fossil trilobites in northern Scotland were identical to ones found in North America, but not to those from other parts of the world. Likewise, in the early 1900s, identical rock formations were found in both regions.

After completing his Ph.D., Dalziel joined

Join Dalziel and colleagues for an Antarctic cruise at the end of 2012. See details on inside cover of this *Newsletter*.

the faculty at the University of Wisconsin, Madison, which ran a geophysical and polar research center. Wisconsin researchers had recently participated in the first grand scientific traverses of the Antarctic made on huge snowcats during the International Geophysical Year of the late 1950s.

Scientists in Wisconsin were trying to understand how South Georgia, a tiny island made up of rock from South America, ended up 2,000 miles away in the Scotia Sea. Dalziel and a colleague went and determined where in South America the island came from. More than 40 years later, he's still working out the tectonic process that pulled them apart.

Dalziel estimates he has made about 40 trips to the frozen continent, which he said makes him an OAE, or Old Antarctic Explorer. He reckons only one or two other scientists have been there as often. He has been invited to participate in numerous scientific expeditions to Antarctica in part because of his almost encyclopedic knowledge of the geography and geology, as well as how to navigate the bureaucracy of the National Science Foundation's Office of Polar Programs, which handles funding and logistics for Antarctic researchers. One main thrust of his own research has focused on what other landmasses were once joined to Antarctica in the ancient past.

Before the Before

Most of us under 50 learned in high school that the continents we see scattered across the planet today were once clumped together in a supercontinent that formed around 300 million years ago called Pangaea. Yet Earth is well over 4 billion years old. What was Earth like before Pangaea? It's a question geologists have pondered since at least the 1930s.

On a field trip to the Transantarctic Mountains in 1987, Dalziel saw rock layers and fossils that seemed strikingly like those of western North America. Previously discovered geological evidence also suggested that sometime before Pangaea, the western margin of East Antarctica had been attached to some other continent and that they then rifted apart. The western margin of North America told the same geologic story. He began to wonder if the two continents were broken from the same loaf.

Leading an Antarctic tour two years later, he shared the insight with Eldridge Moores, a geologist from the University of California at Davis. In 1991, based on Dalziel's insight and similarities in internal structures discovered by other researchers that suggested strata in southwest Canada had counterparts in southeastern Australia, Moores proposed that the Southwest U.S. was once joined with East Antarctica and Australia within a pre-Pangaea supercontinent called Rodinia. It became known as the SWEAT (Southwest U.S. - East Antarctica) hypothesis.

Using PLATES, a software package developed at UT Austin to position tectonic plates on the globe and reconstruct how they moved over time, Dalziel and Lisa Gahagan, manager of the PLATES project, confirmed that the scale and general shape of the two old rifted margins were compatible. Dalziel became one of SWEAT's strongest supporters and has spent the last two decades developing and promoting the idea. He has developed reconstructions showing how, in his view, North America danced its way like a clumsy ballerina from Rodinia to Pangaea, occasionally smashing into a pair of joined-at-the-hip dancers, South America and Africa.

In the time between Rodinia and Pangaea, there were deep ice ages, vast mountain chains formed, and the first multicellular life appeared. Understanding how landmasses and seas were arranged during that time could shed light on the links between climate, environment, tectonics, and life.

The SWEAT hypothesis immediately met with resistance. Competing hypotheses were put forward that put other plates up next to western North America in place of East Antarctica, such as Siberia or South China.

"When we first came out with this idea, I went to a conference and people told me, 'We'll start paying attention if you find two things in Antarctica'," said Dalziel.

One was a type of granite found in a 1.4 billion year old belt of rocks stretching from Newfoundland to California. The other was a type of rock found in a band from Upper Michigan down through the subsurface into the Franklin Mountains of West Texas, in an ancient igneous province called the Kewenawan Province, from

Simplified reconstruction at 1000 million years ago.

Simplified reconstruction at 545 million years ago.

Left: A simplified reconstruction of Rodinia at 1000 million years ago. There is considerable uncertainty about the locations of the pieces making up modern South America (SAM) except for its present-day Pacific margin. Its complete outline is included merely for orientation. AUS = Australia; BAL = Baltica; C = Cuyania terrane(Precordillera) of NW Argentina; CL = Coats Land crustal block of present day East Antarctica; EAT = East Antarctica; G = Grunehogna crustal block of present day East Antarctica; K = Kalahari craton of present day Africa; LAR = Laurentia craton of present day North America. Grey areas represent Grenvillian orogens. Right: A simplified reconstruction of Pannotia (newly assembled Gondwanaland plus Laurentia) at 545 million years ago. Illustrations: PLATES Project.

about 1.1 billion years ago. If SWEAT was right, some of these rocks should have been left behind in Antarctica.

Full Circle

In 2008, John Goodge, a geologist at the University of Minnesota Duluth, announced the discovery of a piece of 1.4 billion year old granite in Antarctica with the same chemical, textural, mineral and isotopic characteristics as a unique belt in North America. More recently, Stacy Loewy, a former graduate student who worked with Dalziel, has found that 1.1 billion year old igneous rocks from a part of East Antarctica called Coats Land have identical lead isotope ratios to rocks of the same type and age in the North American Keweenawan Province. That work was recently published in the journal *Geology*.

"So it looks like Coats Land is a little piece of ancestral North America that came off west of the Grenville Front and is most closely related to the Red Bluff Granite sequence of West Texas," said Dalziel. "It's a little piece of real estate that is saying, 'North America was here.'"

The irony of finding a bit of Texas in Antarctica is not lost on Dalziel, who left Lamont-Doherty Earth Observatory and Columbia University—after serving as professor, departmental chair, and senior research scientist for several years—to come to the Institute for Geophysics in 1985.

"When I came to Texas, I never expected to look at a Texas rock in anger," he said. "I was hired as somebody who knew a lot about the southern oceans and continents and it turned out that Texas is really important in this story."

Three of the places most important in his life—Scotland, Texas, and Antarctica—rent asunder by tectonic forces and cast to the winds, are forever united in his digital reconstructions of the ancient world of Rodinia.

Dalziel said like many British kids, he grew up on a constant diet of things Antarctic. He was riveted by heroic tales of Ernest Shackleton's and Robert Falcon Scott's attempts to reach the South Pole.

"A hundred years earlier, I could happily have been an explorer," said Dalziel. "Now the only really worthwhile exploration is scientific exploration." ✷

—*Marc Airhart*

SCIENTISTS

Top of His Game

Ian Dalziel has been recognized as one of the leading forces in the field of plate tectonics through numerous awards and honors including: Honorary Fellow (Geological Society of London), the Murchison Medal (Geological Society of London), the Clough Medal (Geological Society of Edinburgh), Fellow (Royal Society of Edinburgh), the Bownocker Medal (Ohio State University), and a John S. Guggenheim Memorial Fellowship (Swiss Federal Institute). He has also been recognized within the university for the impact of his research and service through the University Cooperative Society's Career Excellence Award and the Jackson School's Joseph C. Walter Jr. Excellence Award, its highest honor.

More Antarctic Mysteries

Ian Dalziel continues to refine his reconstructions of Earth before Pangaea. But he's also involved in many other research projects designed to answer a host of other questions, such as:

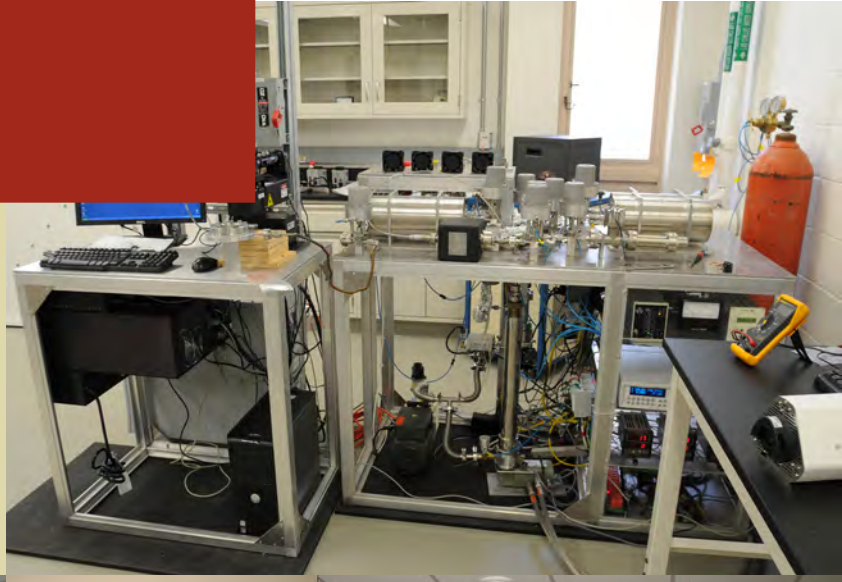
How fast is Antarctica losing ice? Scientists use data from the GRACE satellites to measure change in ice mass, but they first have to subtract out the gravitational effects of post glacial rebound, a slow rise in the bedrock resulting form 20,000 years of thinning and retreating ice. With the POLENET project (and its predecessor WAGN), Dalziel and colleagues at Ohio State University and elsewhere have been bolting metal plates to bits of exposed bedrock, called nunataks, across the frozen continent. GPS measurements at these sites over many years are providing the first direct measurements of vertical motion of the bedrock. Early results suggest Antarctica is not losing ice as fast as some recent estimates. This work will help scientists make more accurate projections of future sea level rise.

Are parts of Antarctica moving with respect to each other? If you add up the movement of all the tectonic plates around the world (measured with GPS), making a complete circuit of the globe, they just don't zero out. Some people have proposed that an internal rift within Antarctica and movement of different pieces of the continent could help balance the ledger. Results from POLENET might help resolve the discrepancies.

When did the Scotia Sea open up? Scientists have proposed that the formation of Antarctica's ice sheets was driven by a fast moving current of water encircling the continent and thermally insulating it, called the Antarctic Circumpolar Current. Both the current and the ice sheets formed around 30 million years ago. If the hypothesis is correct, geological barriers to the current would have to have been removed by that time. Dalziel and colleague Lawrence Lawver are investigating some magnetic anomalies in the Central Scotia Sea that complicate that tidy story.

RENOVATIONS

Multiple renovations were either begun or completed on campus this summer. Clockwise from top right: Professor Daniel Stockli's Helium Spectrometry Lab in the Jackson Geological Sciences Building; the new High Temperature Stable Isotope Lab in the Jackson Geological Sciences Building; artist's rendering of the new student center in the geology building, followed by two scenes from the renovations in progress to create the student center; the school's new microscope teaching facility in E.P. Schoch which allows projection of the image from any microscope for teaching purposes.

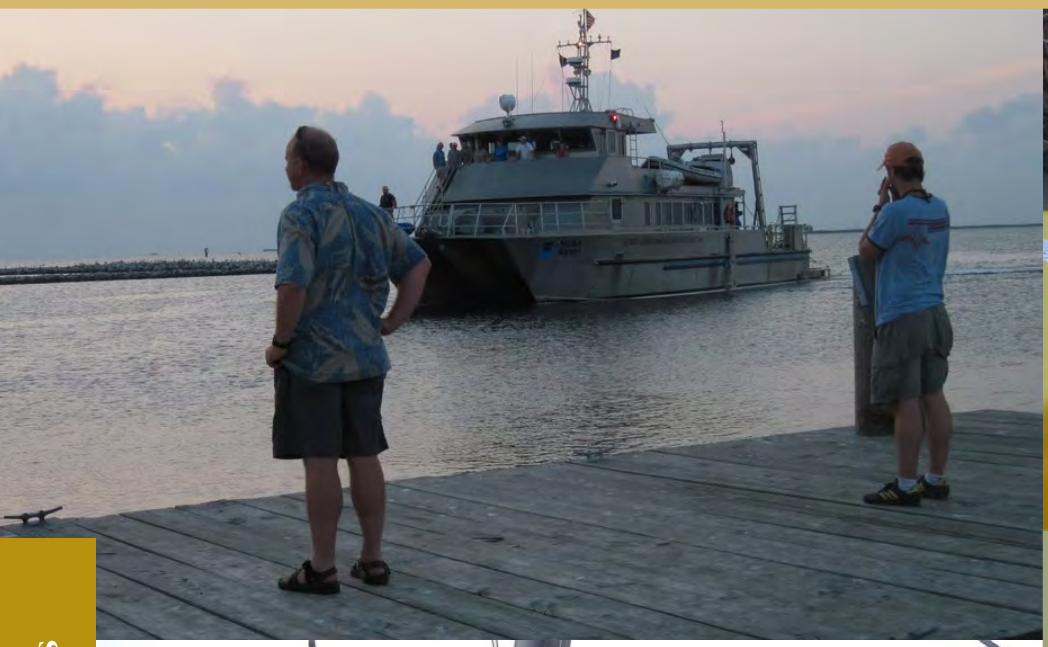


SUMMER FIELD CAMPS

Scenes from the Geo 660 Summer Field Course

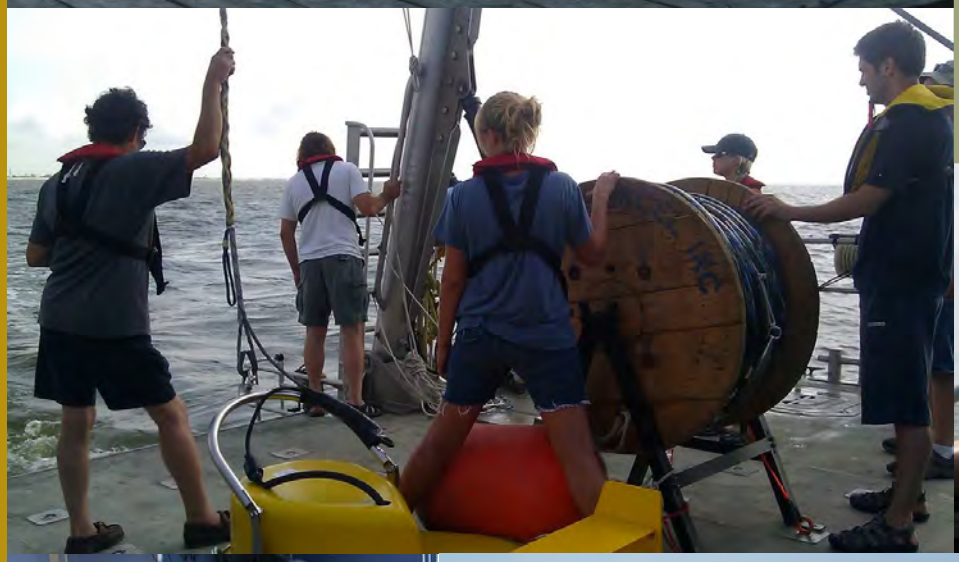
Photos courtesy Mark Helper and Tip Meckel.

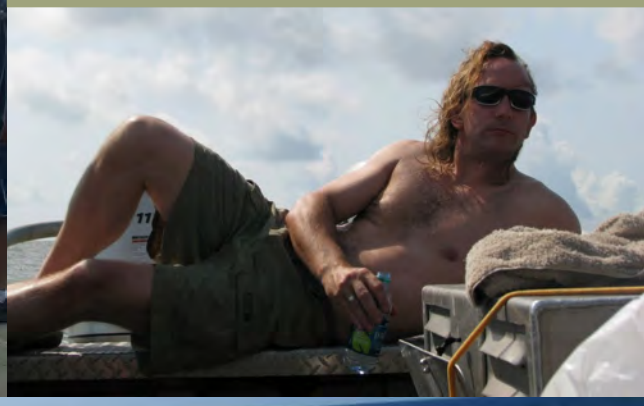
SUMMER FIELD CAMPS



Scenes from the Marine Geosciences & Geophysics Field Course

Photos courtesy Marci Davis and Sean Gulick.





SUMMER FIELD CAMPS

Head of the Class

Texas Team Wins 2011 Imperial Barrel Award Competition

By Marc Airhart

Each spring, Chris Zahm teaches the course "Petroleum Basin Evaluation." The entire class votes to select the five best candidates from among their ranks to participate in the Imperial Barrel Award (IBA) Competition, the world's largest and most prestigious contest in petroleum geosciences, hosted annually by the American Association of Petroleum Geologists (AAPG).

When students start the class, they have little to no experience working with well logs and geophysical data.

"I find the teaching experience to be very gratifying because I get to see the students go through an important phase change in their learning—evolving from a student of geology to one that comprehends the impact of their study to the world economic stage," said Zahm, a research associate at the Jackson School who also advises the student-team selected to go to IBA.

This year, the team consisted of graduate students Ashley Bens, Michael Fairbanks, Justin Fitch, Erin Miller, and Ben Siks.

Starting in regional competitions last March, 87 university teams competed for the IBA. In the eight weeks prior to their local competition, teams analyzed a dataset (geology, geophysics, land, economics, production infrastructure, and other relevant materials) and then used it to seek a solution to an energy geoscience problem.

Each team delivered their results in a 25 minute presentation to a panel of industry experts. Students had the chance to use industry technology on a real dataset, receive feedback from a professionalpanel, impress potential employers in the audience, and potentially win cash awards for their schools. The panel selected the winning team based on the technical quality, clarity, and originality of its presentation.

In March, the Jackson School team took first prize in the Gulf Coast region, earning a $3,000 prize for the UT-AAPG Student Chapter and a chance to represent the region the following month in the global contest, squaring off against the best teams from the remaining 11 national and international regions.

With one additional week to prepare, the students traveled to Houston to make a 25 minute presentation to the final panel of judges, followed by a 15 minute question and answer session.

The winners were announced at an emotional presentation during the AAPG's annual meeting. The crowd of students,

Opposite page: The IBA Gulf Coast region winning team: Chris Zahm (faculty advisor), Michael Fairbanks, Erin Miller, Justin Fitch, Ashley Bens, and Ben Siks. Photo by Jim Sigmon. This page, clockwise from top right: Alumni, students, faculty and friends celebrate the IBA victory at the 2011 AAPG annual meeting in Houston; IBA judges review the teams; the winning team and advisor Chris Zahm (left) hoist their $20,000 championship check.

advisors, alumni, and others waited patiently as winners were announced in reverse order. When the next to last winners were announced, a sizable faction in the back of the room erupted into a lively rendition of "The Eyes of Texas," rhythmically underscored with hook 'em horns. The Jackson School team won $20,000 for their AAPG student chapter.

The University of Southampton from the United Kingdom took second place and Sultan Qaboos University from Oman took third.

"I followed up with the judging panel after the competition was over and determined that the first and second place team presentations were of similar quality, but the Q and A portion strongly favored the UT Austin team," said Zahm.

Back home in Austin, the the main tower was lit orange in the student's honor, the first time in recent memory for geoscience students.

"From an employability perspective, the five students who won went from strong contenders to the top of the class on every petroleum recruiter's list," said Zahm. "This is the top line of their resume."

AAPG started the Imperial Barrel Award program in 2007, based on a similar competition at Imperial College, to give students an opportunity to experience the team-oriented creative process and evolving technology of the energy industry.

Zahm, who worked at ConocoPhillips on an exploration portfolio analysis team doing essentially the same thing as these students before coming to the university, has taught the class for three years. In 2009 and 2010, his teams won second place in the regional round of the IBA competition.

"I'm so proud of the students and their adviser," said Sharon Mosher, dean of the Jackson School. "Witnessing what these students have just accomplished, the future looks very bright." ✷

Where Are They Now?

It might take these five students a while to top their achievement this past spring. They certainly aren't resting on their laurels. Ashley Bens and Ben Siks married last July and started working as production geologists for BP Exploration Alaska, Inc.

As of September, Michael Fairbanks was finishing his master's degree and had accepted a position with Apache Corporation in Midland starting next May. Last summer he interned with Apache in Houston. "My IBA experience directly prepared me for the internship where I was faced with similar problems," said Fairbanks.

Justin Fitch was finishing his master's degree and seeking exploration work. Last summer, he attended a week-long petroleum basin analysis field course in the Bighorn Basin of Wyoming and Montana sponsored by GSA and led by ExxonMobil geologists.

Erin Miller was finishing her master's degree, seeking employment, and training for a 4,000 mile bike ride from Austin to Anchorage next year with Texas 4000, a charity dedicated to fighting cancer.

Ashley (Bens) Siks said both the M.S. program and the IBA program were integral to her and her husband's success in finding work together doing what they love.

"Not only did the IBA program through UT provide us with exposure to the petroleum industry, but it also gave us the opportunity to network with employers and representatives of a number of major oil companies," she said.

"In retrospect, I am really thankful for the opportunities that the Jackson School provided me, from my advisor Ron Steel, to the array of geoscience experts who make up the faculty, the financial resources from which to do good fieldwork, and so on. Thanks!"

Scratching the Surface

Hydrogeologists Study Human Impacts on Pacific Island Reef

By Marc Airhart

Do you ever dream of taking a few days off and getting away from it all? Burying your toes in some warm sand and just staring out at the ocean? Rarotonga, one of the Cook Islands in the South Pacific, is about as far as you can get.

"With its jagged peaks and deep valleys, fertile slopes of red earth and sparkling aquamarine lagoon, [Rarotonga] is the classic 19th century European ideal of paradise," proclaims a Cook Islands booster website. It goes on to describe an idyllic scene with coconut palms, the roar of the waves, and the beat of the drum dance.

Sounds lovely right? But head to the shore with a careful eye and another reality intrudes. Sadly, the part they don't mention on websites and in slick brochures is that the coral reefs are largely dead.

"Tourists go there and see nice beautiful white sand and turquoise water," said Bayani Cardenas, associate professor in the Jackson School of Geosciences. "It's not supposed to look like that. Some parts are supposed to be sharp, rocky reefs with colorful fishes."

Cardenas should know: he grew up in the Philippines. Reefs there have been badly degraded in part due to overfishing and too many commercial fish pens. But he suspected people could be impacting the reefs in more indirect ways.

A study he and his colleagues published three years ago showed that a significant amount of fresh groundwater beneath Santiago Island was flowing offshore and seeping from the sediments and reef rocks into the sea, most likely through geologic

Opposite page: From above, Muri Lagoon on the island of Rarotonga looks like paradise, but look closer and it's clear the reef is out of balance.
This page: Cardenas and his team laid out an instrument transect and parallel submersible ER cables.

faults. Several farmers live on the island. Although Cardenas didn't trace the sources, he suspects sewage and fertilizer runoff transported in the groundwater is affecting the reef. The added nutrients could feed algal blooms, deplete oxygen from the water, and kill coral and fish.

Researchers from Southern Cross University in Australia saw Cardenas' work and invited him to join a study on Rarotonga. They already planned to measure salinity and nutrients in the water over and within the reef to better understand why it had become degraded. Cardenas would use his geophysical tools and hydrogeologic background to help determine where freshwater and nutrients were coming from. It wasn't clear if the freshwater was flowing overland or was taking a more complicated subsurface path.

Cardenas and two doctoral students flew to Rarotonga last February. The leading hypothesis, the one they hoped to test, was that raw sewage from the population of 16,000 and many thousands of tourists each year, as well as from hog farms, is carried in shallow groundwater down the steep volcanic topography to the coast, emerging from the floor of the lagoon through sediments and cracks in the reef itself, much as in the Philippines.

Kevin Befus had been at UT Austin for a few months and was casting about for a Ph.D. project when Cardenas invited him to participate in the project. The trip was so successful and the data so plentiful, he decided to make it the focus of his Ph.D. Now he's analyzing the data to create a hydrologic model of the island, and he's planning future work.

Cardenas, Befus, and doctoral student Travis Swanson pedaled an experimental catamaran around the lagoon off the southeast coast of the island towing electrical resistivity (ER) equipment, which they used to map areas below the seafloor with freshwater, seawater, or some mixture. They collected corresponding ER data below the land surface. They also measured water temperature in wells near the coast at various times as tides came and went to get a sense for how the movement of freshwater ebbed and flowed in response to the movement of seawater.

They found fresh groundwater below the land was indeed flowing out and seeping up through the reef. In fact, much to every-

one's surprise, this seepage was detected as far away as the edge of the reef, half a kilometer from shore.

"Before this work, the Australians thought the freshwater was coming out close to shore," said Befus.

Cardenas and Befus propose this unhealthy brew is a result of an unfortunate blend of natural factors—including steep island topography that gives groundwater the gravitational oomph to move far out onto the reef and the presence of fractures that act as conduits—and human factors—such as the development of pig farms catering to the tourism industry and the lack of any real treatment for human or animal waste.

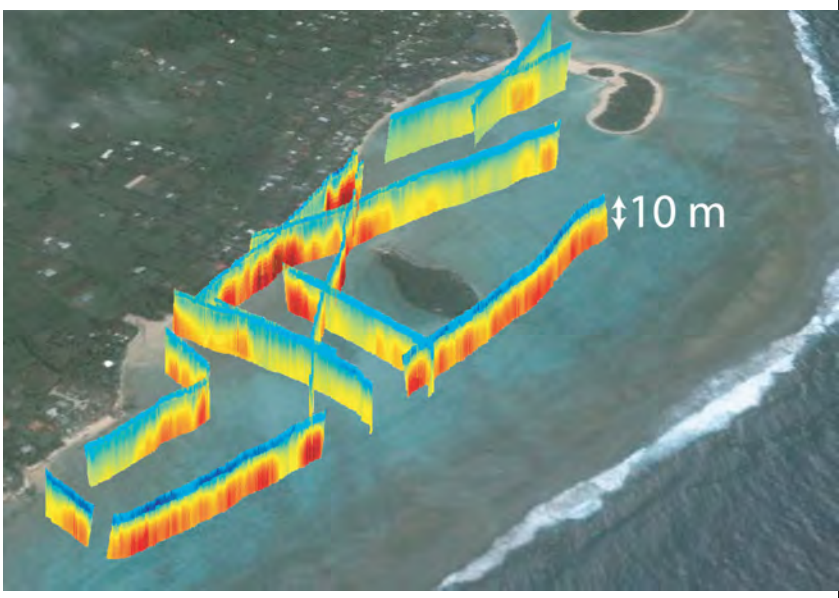
"They are in the middle of nowhere. They rely entirely on tourism," said Cardenas. "It's their main industry. Their problem now is they just have domestic septic systems. All their waste goes in their backyards and then some gets into the rivers and aquifers."

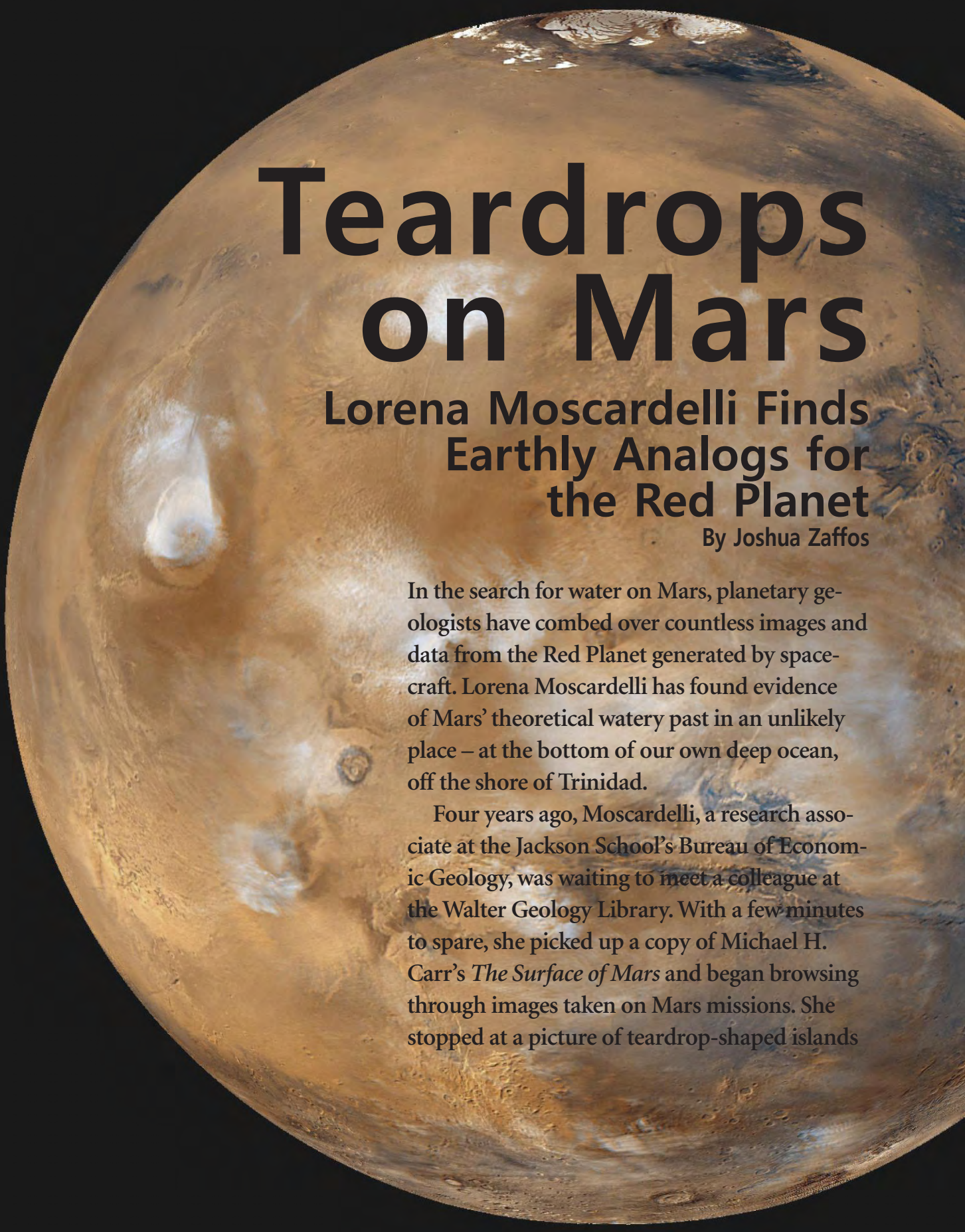
Befus would like to extend the offshore component of the study to the entire island (this study focused on just 2 out of about 30 kilometers of coastline). That would allow him to build a complete hydrologic model for the entire island accounting for every drop that comes and goes. With such a model, he could provide the local community with guidance on the areas of the island that might be the largest contributors to submarine groundwater discharge, the term hydrogeologists use for this kind of flow. That information could help islanders decide where to build water treatment facilities or where to restrict certain kinds of land use.

Befus, who grew up in Latin America, first got interested in water during an undergraduate hydrogeology course. The professor, James Clark, was focused on international water development. Clark, who became a mentor to Befus, would go to places like Tanzania or Chad and use geophysical instruments to help locals find the best places to drill for water. Befus was inspired to volunteer with a student-led project building gravity fed water systems in Honduras. Now, as a doctoral student at UT Austin, he talks to his fellow students about participating in similar projects.

"We are geologists," he said. "We have a certain skill set that we can bring to these communities. So I'm trying to get people excited about it." ✷

Clockwise from top left: Kevin Befus (left) and Bayani Cardenas install piezometers and thermistors in Muri Lagoon to look for signs of groundwater flow; reds and oranges in electrical resistivity data from Muri Lagoon indicate possible presence of fresh groundwater and nutrients, likely a result of sewage from the island's human population and pig farms; the team prepares to conduct a boat-towed ER survey of Muri Lagoon from an experimental, pedal powered catamaran; Kevin Befus shows school pride.





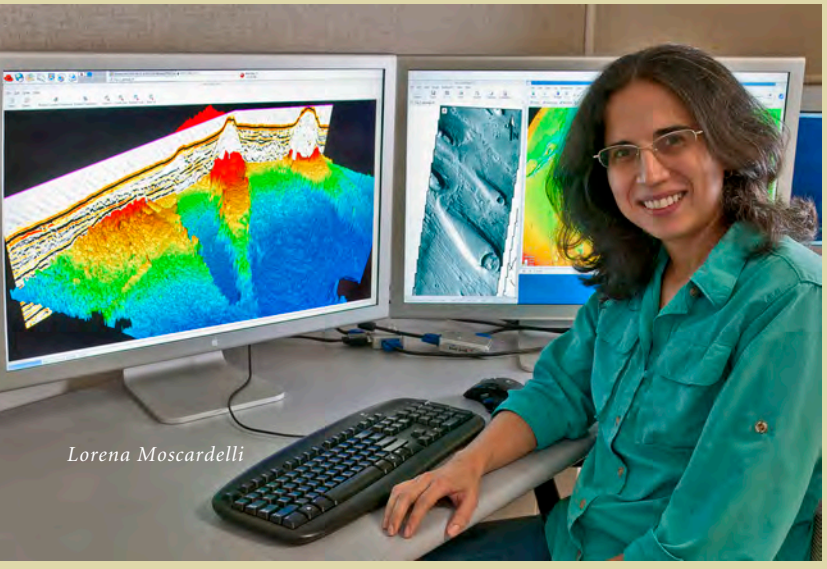
Teardrops on Mars

Lorena Moscardelli Finds Earthly Analogs for the Red Planet

By Joshua Zaffos

In the search for water on Mars, planetary geologists have combed over countless images and data from the Red Planet generated by spacecraft. Lorena Moscardelli has found evidence of Mars' theoretical watery past in an unlikely place – at the bottom of our own deep ocean, off the shore of Trinidad.

Four years ago, Moscardelli, a research associate at the Jackson School's Bureau of Economic Geology, was waiting to meet a colleague at the Walter Geology Library. With a few minutes to spare, she picked up a copy of Michael H. Carr's *The Surface of Mars* and began browsing through images taken on Mars missions. She stopped at a picture of teardrop-shaped islands



Lorena Moscardelli

set in a large basin amid the planet's northern plains, unexpectedly recognizing the landforms.

"It was kind of an accident," Moscardelli says. "I was looking through this book and said, 'Wow, I have seen this before,' and I made the connection that it looks like what I saw in my study area in Trinidad."

Moscardelli studies underwater landslides and other mass transport systems in the deep oceans, concentrating on an area off the eastern shore of Trinidad near the northeastern coast of South America. The submarine disturbances occur when the outer continental shelf massively fails, which sometimes sets off catastrophic tsunamis. The collapses can also leave behind landforms on the ocean floor called erosional shadow remnants, which appear as triangular-shaped mountains preserved from erosion because they lie in the shadow behind seafloor mud volcanoes.

That fateful day in the library, Moscardelli spotted a compelling resemblance between the Martian teardrop-shaped islands and the triangular remnants from the deep seafloor near eastern Trinidad. The findings, published this past July in the journal *Geology*, note the similarities between the two cases and lay out a new analog to strengthen the claims that water once flowed—and even filled an ocean—on Mars.

"It's the first time a deep-water feature has been linked to these teardrop-shaped islands on Mars," Moscardelli says.

Scientists have speculated that a sea once existed on Mars since images started coming back from the Viking Orbiter in the late 1980s. The images revealed giant flood (or outflow) channels within the Chryse Planitia region of the planet, suggesting water movement through the basin. Debate, however, over the forces that created the features and their actual origins remains hotly contested. The analogy presented by Moscardelli and co-author Lesli Wood, a colleague at the Bureau of Economic Geology, has given planetary scientists something new to discuss.

Working in ocean depths of more than 1,000 meters, Moscardelli uses seismic data to better understand the causes and consequences of submarine landslides and mass wasting events.

"What happens is you have these catastrophic collapses of the shelf break area where a change in slope happens, so all these materials fail," Moscardelli says. "We have mud volcanoes and they act as obstacles, like small mounds. With the erosional shadow remnants, all these sediments that fail are just going around these objects on the seafloor with the relief protecting the sediment behind it. That's how those sediments get preserved behind the mud volcano and how you get the triangular shape."

Three-dimensional seismic reflectivity images, gathered during oil and gas exploration, have recently provided a better picture of these systems and landforms than ever before. The more detailed look at the deep-sea floor and the impacts of the underwater landslides also brought Moscardelli back to her chance discovery in the library.

After having contemplated the connection for several years, Moscardelli ran with her hunch. She learned more about Mars and its geology, studying newer, thermal emission imagery from the Mars Odyssey spacecraft, which shows more than 40 teardrop-shaped islands downstream of the outflow channels. She compared the images with the high-quality 3-D maps of the deep ocean floor near Trinidad, and soon confirmed that she had uncovered a new link between the comet-shaped remnants from the ocean floor and the teardrop features on Mars. Measurements of the geometric dimensions of features show them to be "strikingly similar," as Moscardelli and Wood write in *Geology*.

The resemblance suggests that a substantial deep-sea landslide carved up the Chryse Planitia region of Mars and helps to fortify arguments that an ocean once covered part of the planet. Flume experiments, where scientists can unleash test floods, also delivered similar triangular formations.

"There's a strong geometric analogy," Moscardelli says.

Of course, contributing to the pool of research on the presence of water—and, potentially, life—on Mars means jumping into a divisive scientific arena. But Moscardelli says reviews of and reactions to the paper have been "really positive." One reviewer even encouraged her to be more direct with her conclusions that the teardrop-shaped islands originated in a submarine environment.

"To make the assumption that these features on Mars were actually formed underwater, you have to look at different lines of evidence," Moscardelli says. "Here, on Earth, you talk about something, you make your assumptions and hypotheses and, at the end of the day, you go there and look for rocks or something you can touch and send to the lab. Then you feel comfortable about saying this theory or hypothesis was right or wrong.

"On Mars, obviously for logistical reasons, it doesn't work the same way, so the space to make multiple hypotheses is wider. So that's why I think it's important to keep an open mind."

The findings offer "an interesting, new morphological analog and an innovative, new hypothesis for this work," says Devon Burr, a University of Tennessee planetary scientist, who also wrote a Research Focus article on the topic in the same issue of *Geology*.

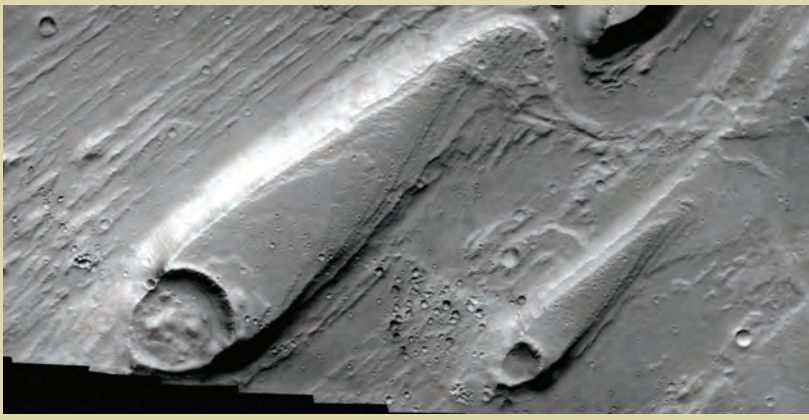
Burr points out that the lower gravity of Mars could make islands eroded by air resemble Earth's water-carved islands, however, she acknowledges the Jackson School researchers have introduced intriguing evidence that a submarine, mass-wasting event may have formed the Martian islands.

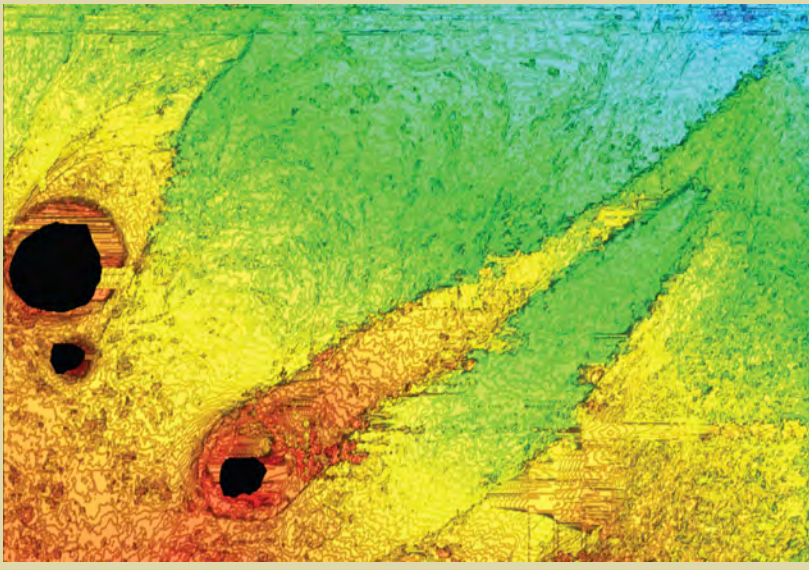
The connection could also have implications for other worlds, such as Saturn's largest moon, Titan, which has its own similar, streamlined landforms and is the only body in the solar system, other than Earth, known to have surface bodies of liquid.

"It opens up and contributes to our thinking in the Mars community," Burr adds.

Following up on the research, Moscardelli has begun attending planetary and lunar geology conferences and she's been surprised to learn about more analogs and connections. Other polygonal features that have been reported on Mars and interpreted to be thermal contraction cracks resemble deep-sea landforms in the Gulf of Mexico and offshore of Norway that are linked to underwater landslides or similar events. Moscardelli hopes to further explore how these comparisons hold up, while also continuing her focus on mass wasting, deep-water events and their impacts, including tsunamis.

"I'm going to keep pursuing these things," Moscardelli says. "It's relatively new for me, and it's pretty amazing, so I'll definitely keep reading and trying to make a contribution. If you ask me personally, I do believe in an ocean on Mars, not only because of the teardrop-shaped islands but because of other lines of evidence that I think are consistent. But everyone has to recognize this is still an open question and we're still working on it." ✶





Right, above: A camera onboard the Mars Odyssey spacecraft took this image of teardrop-shaped islands at the downstream end of an outflow channel on the northern plains of Mars. Image: NASA/THEMIS. Below: Structural map defining the erosional base of a Pleistocene submarine landslide in eastern offshore Trinidad. Black circles indicate the location of mud volcanoes, triangular geomorphological features behind the mud volcanoes are termed erosional shadow remnants (ESRs). Seismic data provided by ExxonMobil.

From Venezuela to Mars, by Way of Texas

A dataset lured Lorena Moscardelli to Texas.

Originally from Venezuela, Moscardelli received her bachelor's degree in geology from the Universidad Central de Venezuela in 2000 before going to work for the national petroleum company. While working offshore in the Orinoco River Delta, she crossed paths with Lesli Wood of the Jackson School's Bureau of Economic Geology. Wood mentioned she had an extensive collection of three-dimensional seismic data spanning 10,000 square kilometers of the eastern offshore area of Trinidad ready for a doctoral student to explore. Moscardelli, already interested in the mass movement and stirrings that occur on the ocean floor, took the bait and soon found herself in Austin.

Moscardelli completed her Ph.D. in 2007, concentrating on deep-sea mass transport systems and submarine landslides that happen when a section of the continental shelf collapses. Causes may include weak geological layering, high sedimentation rates, and earthquakes. She credits the Jackson School's resources for enabling her to manipulate such a large dataset. Some of the same data, showing triangular erosional remnants left behind after an underwater landslide, provided her with an analog to theorize that similar looking islands on Mars also formed in an ocean.

"The main objective has been to try and understand how these regional extensive submarine landslides operate—what are the triggering mechanisms, what is the size, the thickness, the internal character of these units," Moscardelli says. "Once we do that, we try to establish what's the relevance."

Perhaps most vital is recognizing how, when, where, and why submarine landslides cause tsunamis, which can occur through the disturbance of the seafloor and the water column. One deep-water landslide off the shore of Papua New Guinea in July 1998 generated a tsunami with 15-meter-high waves that struck the island, killing 2,200 people.

Within the growing community of scientists homing in on the subject, Moscardelli is now putting together a quantitative database of underwater landslides around the world. By collecting information on the area, thickness, length and width, morphology, and rock types of submarine landslides, Moscardelli hopes to uncover how the different factors may affect or interact with one another.

"If these relations exist, then you can define functions and you can predict one parameter based on another," Moscardelli says.

In addition to the safety benefits related to tsunami impacts, energy and telecommunications companies have taken an interest in the research. By identifying zones of the continental shelf that are vulnerable to collapse, industry can avoid placing cables and pipelines in areas prone to underwater disturbances. The sites where landslides occur can also represent places where hydrocarbons will be sealed in lower layers beneath the shifted units of sediment. And now, thanks to Moscardelli, studies of these zones have implications for planetary geology, too.

A drilling rig explores for natural gas in the Arkoma Woodford Shale play in southeast Oklahoma. Image courtesy of Devon.

Building the Bridge

With Leadership from the Bureau of Economic Geology

UT Austin Makes Big Push in Unconventional Oil & Gas

by J.B. Bird

The growing importance of unconventional oil and gas is old news to most geologists, but in many ways the world is just now waking up to the vital role unconventional hydrocarbons will play in our energy future.

With significant research being done on unconventionals throughout the past decade, researchers at the Bureau of Economic Geology have been well ahead of the curve. Over the past two years, the Bureau's foresight has paid off in droves, with the organization helping lead the university into a number of collaborative research projects on unconventionals. Since the Spring of 2011 alone, the university has announced two new partnerships with industry (Shell and Statoil) that will deal with unconventionals and a Bureau-led study assessing the extent of unconventional reserves. These projects complement existing Bureau collaborations with major oil companies and the robust growth of its Mudrocks Systems Research Laboratory.

Fastest-Growing Source

In April the university received a $1.5 million grant from the Sloan Foundation to conduct the first accurate, comprehensive assessment of the country's fastest growing major source of energy, natural gas from shale formations, or shale gas, likely to be one of the country's key fuels over the next 50 years.

Though only a minor source of fuel ten years ago, shale gas now accounts for almost half of all U.S. natural gas production thanks to technological breakthroughs and the discovery of five major fields. Despite the importance of the resource, estimates of its U.S. reserves fluctuate wildly from as low as 420 trillion cubic feet (tcf), or about 20 years' supply at current consumption levels, to 870 tcf, or about 44 years' supply.

The new study will rely on publicly available production data sets, geologic expertise, and energy economics to provide a more accurate prediction of the amount of shale gas in place in the U.S., while offering policymakers a roadmap for the environmental and economic regulation needed to develop the resource.

"Shale gas could extend natural gas production in the U.S. another 50 to 100 years," says Scott Tinker, principal investigator on the grant and director of the Bureau of Economic Geology.

Tinker notes natural gas' environmental costs include increased traffic and noise from its development, water and land use, and greenhouse gas emissions, though the emissions picture is mixed, since gas has lower emissions than equivalent energy from coal or oil, which industrialized countries will continue to use in coming decades.

On the positive side, he says, natural gas is a versatile fuel, available for transportation, heating, and electricity generation, and it can enhance U.S. energy security, since it is available, affordable and contributes (as a domestic resource) to the U.S. economy.

"And a strong economy helps us have a strong environment," says Tinker.

The team that will contribute to the research includes Tad Patzek, chair of the Department of Petroleum and Geosystems Engineering at the Cockrell School of Engineering; William Fisher, former Assistant U.S. Secretary of Energy and Minerals (1976-77) and inaugural dean of the Jackson School (2005-2006) where he is the Leonidas T. Barrow Centennial Chair in Mineral Resources; researchers from the Bureau of Economic Geology's shale mud rocks

group, environmental research team, and energy economic team, and economist Ken Medlock from the Baker Institute for Public Policy at Rice University.

Big Oil

In September, Shell signed a five-year agreement with the university to invest $7.5 million to address short- and long-term challenges in unconventional oil and gas exploration and production.

"This agreement marks an important milestone in Shell's commitment to continually research and develop innovative technology that will help to meet global demands by bringing more energy resources to market," said Marvin Odum, presiden of Shell Oil Company. "We chose to collaborate with UT Austin because it brings together an extraordinary amount of talent from both organizations that will push the technological envelope in the field of developing even the most challenging hydrocarbons safely and responsibly."

The Bureau is managing the new Shell-UT Program on Unconventional Resources with participation across the campus, including geoscience, engineering, economics, business, environmental and regulatory affairs.

"The pursuit of unconventional energy resources is a complex, integrated problem that requires uniting the scientific and engineering efforts below ground with above-ground efforts in water, regulation, and public awareness," said William Powers, president of the university. "As a major research university and leader in energy, we've got the integrated expertise to help solve it."

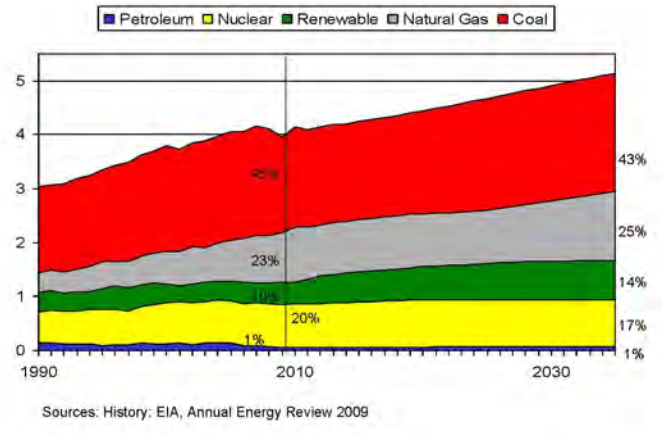
In addition to science and engineering, the Shell-UT agreement will try to integrate research to address environmental and public policy issues that could facilitate safer and wider adoption of onshore US energy resources.

The agreement will also support students at the university, significantly enhancing the employability of those working on Shell-UT projects in the Jackson School of Geosciences, Department of Petroleum & Geosystems Engineering, and other departments. Just a week after announcing the Shell deal, the university signed a $5 million research agreement with Statoil. It's the largest such agreement the company has signed outside its home country of Norway. Unconventionals are just one of four areas of focus for the Statoil collaboration (others being earth models, salt tectonics, and drainage of deep marine reservoirs), but the agreement further solidifies the university's growing reputation for work on unconventional hydrocarbons.

Mudrocks

Research on unconventional resources takes place in all three major units of the Jackson School and in the Center for International Energy & Environmental Policy. For the last two years, however, much of the work has found a new home in the Bureau's new industrial associates program, the Mudrocks System Research Laboratory (MSRL).

Started in just 2009, the MSRL already works with 29 companies ranging in size from small independents to BP and Chevron



Firms are attracted to the MSRL, says Stephen Ruppel, a senior research scientist at the Bureau, "because we do one of the things the Bureau does best: Look at the rocks."

Researchers at MSRL integrate a variety of geologic disciplines, such as sedimentology, stratigraphy, organic chemistry, and inorganic chemistry (which can indicate the original oceanographic setting of sediment deposition). Two more areas are pore structure and, on the engineering side, how the combination of pores and grains affects fluid flow.

"And we're adding disciplines, like rock physics, which allows us to understand compressive strength," says Ruppel. "You don't find this combination anywhere else, at least not outside the biggest companies."

Driven by company interests, the MSRL is becoming increasingly involved in international studies, looking at the outlook for unconventionals in Australia and Europe. Domestic locations range from Montana to Illinois, but Texas is the major focus because, as Ruppel explains, "there's a huge amount of activity and data in Texas."

While the Barnett is the most famous unconventional formation in Texas, activity has also begun to explode in the Permian Basin. The new interest in the Permian is a spin-off of a confluence of geoscience, technology, and economics that first took off in the Bakken formation in Montana and North Dakota. Now the country's most productive oil reservoir, the Bakken formation is very different from the Barnett. Instead, it comprises a sandwich of "low permeability rocks and surrounding shale beds", explains Ruppel, and produces mostly oil, not gas. For many years, technology and low oil prices held back production in the Bakken. But by applying the same key technologies used in shale gas production—horizontal drilling and hydraulic fracturing—companies have found an effective way to extract the oil. With rising oil prices, the Bakken took off.

The new economic and technological realities "opened up a total explosion in re-development," says Ruppel. "That's a huge driver right now of renewed interest in the Permian Basin."

The research coming out of the MSRL is great for its collaborators and the country—and also for students. More than 20 are currently working with the lab. With the positive outlook for unconventionals, they should find plenty of work for years to come. ✷

Across University, Faculty Bring Science and Policy to Hydraulic Fracturing Debate

While hydraulic fracturing has been used since the 1950s, debate about it has escalated in recent years. Documentaries like "Gasland" have raised public fears, but many familiar with the process consider media reports on the subject to be excessively alarmist. To keep science front and center in debates over fracturing, experts across UT Austin, primarily in the Jackson School and the Cockrell School of Engineering, are offering innovative research to improve the safety and efficiency of hydraulic fracturing, identify issues that need to be corrected, and untangle misperceptions of a process expected to be a major part of energy exploration for years to come.

There's no debate hydraulic fracturing has helped the nation's domestic energy production significantly. According to the U.S. Energy Information Administration, shale gas, tight gas, and coalbed methane accounted for 50 percent of U.S. gas production in 2009 and are expected to account for 75 percent by 2035. Shale gas, the resource most associated with hydraulic fracturing, accounts for as much or more than half of that unconventional production.

As Scott Tinker, director of the Bureau of Economic Geology, pointed out when announcing a new study of shale gas reserves, "Shale gas could extend natural gas production in the U.S. another 50 to 100 years and have a similar global impact, if developed."

But some say this energy gain is not without serious costs, and concerns about environmental impacts have spurred France, the state of New Jersey and—up until recently—New York, to ban the practice altogether. Among the myriad of concerns expressed is that the process contaminates groundwater, causes earthquakes, and leaks chemicals like methane and benzene into the air.

To date, oil and gas regulators and other experts in groundwater protection have found little evidence of a direct link between hydraulic fracturing and groundwater contamination, but no comprehensive study of the technology has been conducted.

Danny Reible, a professor in the Civil, Architectural and Environmental Engineering Department at the Cockrell School, who recently lent his groundwater expertise to the Environmental Protection Agency for a hydraulic fracturing study, said contamination could occur as a result of poor well design and construction, or bad waste management at the surface level. But these challenges, although real, are related to surface operations, not the hydraulic fracturing process itself.

Because gas, salt, and sand stick to water during the extraction process it comes out murky and salty, making it difficult to reuse. Most commonly in the Marcellus Shale, which spans the northeastern U.S. and is ground zero for the fracturing controversy, water leftover from fracturing is treated at the surface, often in ill-prepared publicly owned treatment works instead of recycled or disposed of underground with injection wells as it is in much of the U.S.

In order to reduce the risks of fracturing and to alleviate concerns about the process, Reible says two things must happen: first, well operators must strictly adhere to industry best practices and, secondly, a concerted effort must be made to reuse or reinject water at more wells or improve surface treatment.

Mukul Sharma, a professor in the Petroleum and Geosystems Engineering Department at the Cockrell School, has researched hydraulic fracturing for 25 years, but he's never seen as much attention focused on the issue as there is now. That's why this summer he hosted a question-and-answer session about hydraulic fracturing open to students, faculty, and members of the media. The goal was to provide a better understanding of the concerns, both real and perceived, about hydraulic fracturing.

Scott Tinker, center, at the Energy Institute's shale gas forum.

"I think we need to be doing more of this high-level discussion," he said. "If not, documentaries come out and the public is misinformed."

One by one, Sharma addressed a range of statements about fracturing: The process causes earthquakes. (Yes, Sharma said, but the magnitude is smaller than an earthquake that occurs when a truck drives down a road, rarely producing any damage to buildings on the surface.) The process is water-intensive. (Sharma said municipal water-use in the area of the Barnett Shale is 323 billion gallons. Water used for fracturing in the same area is only about 2.7 million gallons per well, or about 38 billion gallons for 14,000 total wells drilled.)

But experts agree more research is needed to either substantiate or refute allegations fracing harms the environment. No comprehensive study has been conducted, though entities such as Congress, the EPA and DOE, among others, have initiated studies.

The groups will be joined by the Energy Institute at The University of Texas at Austin, which announced this summer it will lead a comprehensive review of the science, policy, and environmental issues surrounding fracturing. The project will combine an independent assessment of alleged groundwater contamination, air emissions, and seismic events attributed to fracturing with a detailed analysis of the scope and effectiveness of laws and regulations related to the process.

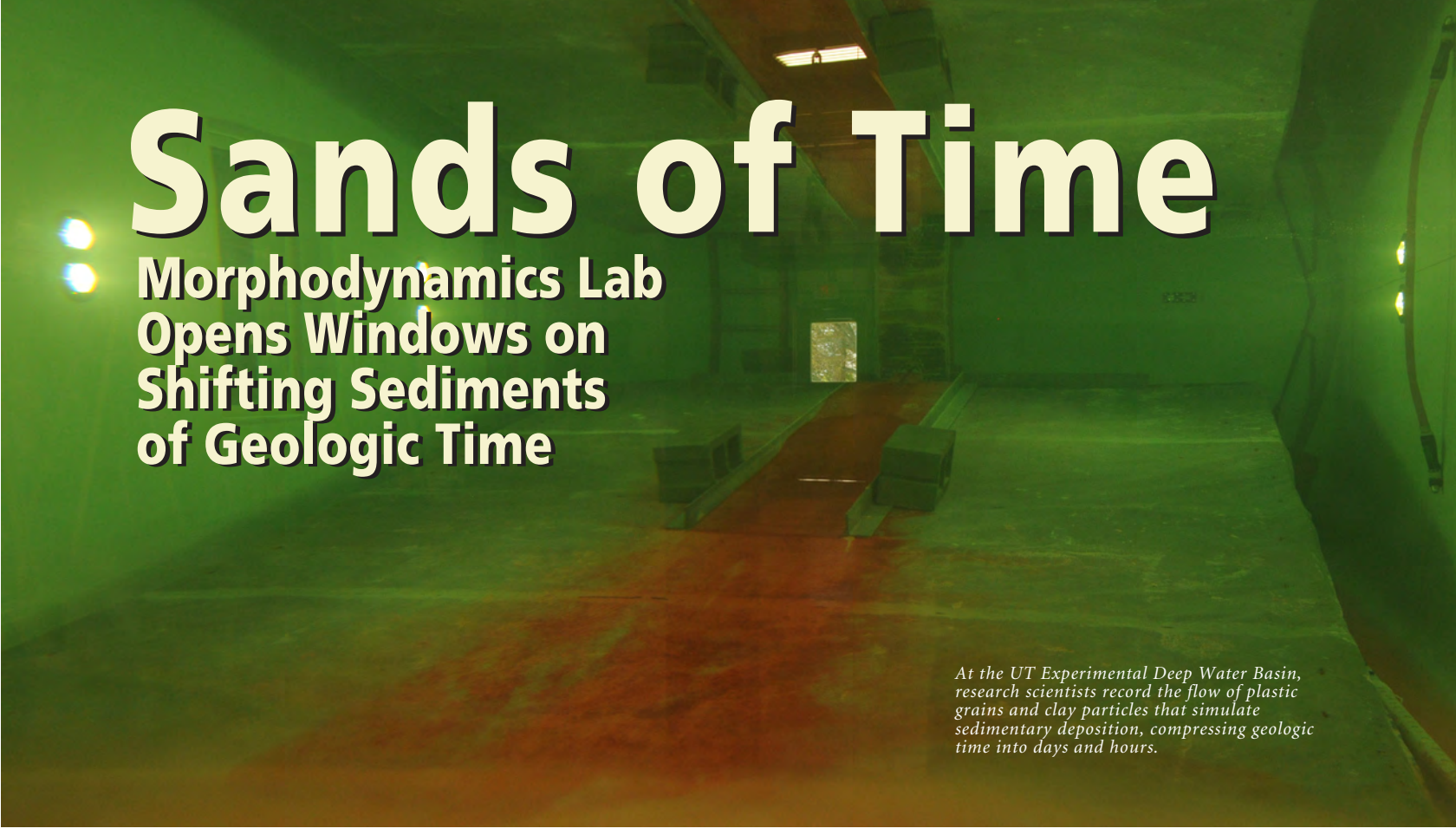
"We're trying to take inventory of as many claims as possible attributed to shale gas development and then run them down. Which have been investigated, and what happened? Was it a casing failure or was it fracturing itself?" said Chip Groat, professor in the Jackson School and associate director of the Energy Institute. "For people to say there are no effects of shale gas development is incorrect, but we want to see what really caused these things and not have the old knee-jerk reaction that says, 'Oh its fracing.'"

Groat said the goal is to promote a fact-based approach to regulatory policies for shale gas development. The study will include faculty and research scientists from the university's Bureau of Economic Geology, Cockrell School, LBJ School of Public Affairs, School of Law, Center for International Energy and Environmental Policy, and College of Communication.

Talk to any university expert about hydraulic fracturing, and no one can say with certainty what's in store for its future.

"I think if anyone tells you right now that they know where this is going, you know you know they have not been around the oil and gas business very long," Tinker said.

—Edited from an article by Melissa Mixon.



Sands of Time

Morphodynamics Lab Opens Windows on Shifting Sediments of Geologic Time

At the UT Experimental Deep Water Basin, research scientists record the flow of plastic grains and clay particles that simulate sedimentary deposition, compressing geologic time into days and hours.

In the last five years, the Jackson School's Morphodynamics Lab, housed in a large warehouse on the J.J. Pickle Research Campus, has added new facilities, faculty and researchers to become a major research center. Scientists in the lab now use physical models to study groundwater flow, delta evolution, turbidity currents, flash floods and ice sheet dynamics.

Rivers Under the Sea

Pick your favorite river that flows to the sea, say the Mississippi or the Amazon. Now go to the mouth of that river and dive below the waves and you'll notice a curious thing: the river keeps on going, skirting the bottom of the ocean. You can tell it from the surrounding water by all the sediment it's carrying. All the sand, dirt, rocks, and organic matter it's dragging along makes it denser than the surrounding sea water, so it sinks to the bottom and snakes along scouring channels, tributaries and canyons like a river on land. It looks a bit like an avalanche of snow tumbling down a mountainside. This is called a turbidity current. You can also find them on smaller scales in lakes and in reservoirs behind dams.

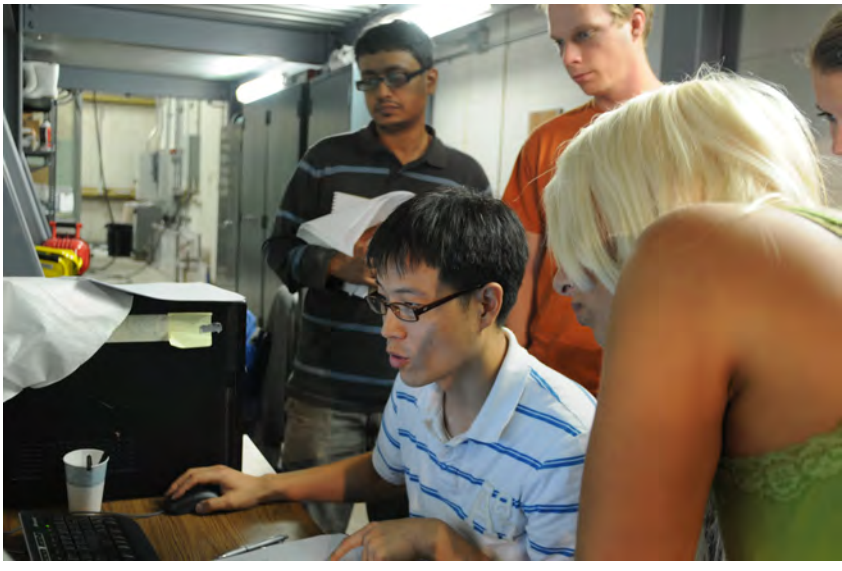
Scientists want to understand the fundamental forces at work in turbidity currents—what dictates their flow paths, what keeps them going over miles and miles of sea floor, how they reshape the seascape, and how the ancient channels they leave behind reflect past climate and flow rates. Oil and gas companies are also interested in better understanding them because the currents deposit organic matter that over geologic time gets buried, compressed and transformed into hydrocarbons.

Researchers have had a difficult time trying to recreate some aspects of these currents in the lab. David Mohrig and Jim Buttles, researchers at the Jackson School of Geosciences, know as well as anyone. They spent several years attempting it with large water tanks at their former academic home, the Massachusetts Institute of Technology (MIT). They would pour a layer of sediment in the bottom of a tank to mimic a sloping sea floor and add a layer of water to mimic the sea. Then at the shallow end, they would inject water containing sediment, which would form a turbidity current. They would then sit back and let it intermittently flow over the sediment bed for several days or even weeks. The trouble was, the currents wouldn't cut channels in the sediment. The best they could do was first make artificial channels in the sediment and then watch how they evolved.

Mohrig, now a professor in the Jackson School, came to Austin in 2006. Buttles, now a research engineer and scientist associate in the school, followed in 2007. Together, they've built a new, larger tank. Housed in a warehouse on the J.J. Pickle Research Campus, it's about the size of a regular back yard swimming pool with concrete walls one foot thick and an observation deck. They call it the UT Experimental Deep Water Basin (UTDW).

The bottom of the tank features a ramp tilted up 10 degrees to simulate a continental slope, the place where a continent meets the deep seafloor. A typical continental slope would have a slope of about 4 degrees, but to get the physics right on a much smaller scale, a computer model of the system indicated that a steeper slope would be required. The sediment that forms the "sea floor" in the tank is a mix of plastic grains and clay particles that together have the right particle size, cohesiveness and density to mimic real sediments.

The researchers have an array of instruments to measure what's happening as an experiment unfolds. Rows of digital cameras mounted above the tank and along the sides capture panoramic snapshots from multiple angles simultaneously. A laser altimeter



Clockwise from top left: Research scientists and graduate students at the Morphodynamics Laboratory watch sediments flow in the UT Experimental Deep Water Basin—David Mohrig and Jim Buttles are the last two on the right; graduate students observe the formation of a simulated delta in the UT Experimental Delta Basin, also in the Morph Lab; Wonsuck Kim and students watch a simulation in progress.

scans back and forth over the tank measuring the topography of the sediment surface to within 100 microns vertically. An acoustic Doppler velocimeter inserted into the water measures the flow velocity and direction at specific points. An acoustic Doppler profiler measures discrete flow at many points within a column of water, providing a vertical profile. And an array of aluminum siphons sample water and sediment at specific depths and X,Y coordinates. The samples can be tested for fluid density, particle size and other characteristics.

But the observations don't end when the currents stop flowing. At the end of an experiment, the researchers can drain the water and do a couple of other interesting investigations with the sediment. They extract "cold cores" by chilling a metal tube with liquid nitrogen, sticking it into the sediment and pulling it out. The core is a frozen ring of water and sediment that sticks to the outside of the tube. That hollow ring can be pulled off, sliced and analyzed to evaluate the stratigraphy of sediments at that spot. Researchers can also slice through the layers of sediment on the tank floor along one axis and evaluate the stratigraphy of the cross section.

In 2009, the team ran an experiment for several days and began to see something that neither they nor anyone else in their field had ever observed before: their sediment-laden turbidity current formed channels in the existing sediment. It was a big step closer to creating a true submarine landscape in the lab.

"When we saw that our jaws dropped," said Buttles.

This early success makes them confident that their tank is doing a reasonable job of modeling some aspects of real turbidity currents and ultimately, seascape evolution.

So why were they more successful with the new tank?

It comes down to size. The new tank is basically a larger version of their MIT system. The increased depth allows the researchers to create a relatively steep sloping platform and the larger holding capacity means they can run experiments longer.

The steep sloping platform introduces a greater driving force due to gravity for the turbidity currents (relative to the MIT setup), "which translates into a greater potential to erode and transport our sediment. Sediment bed changes may evolve at a slow rate and can be quite subtle, the longer runtime allows the evolution to proceed under constant experiment conditions."

For Mohrig and Buttles, this means they finally have a chance to answer some of the fundamental questions about turbidity currents that have stymied scientists for decades. ✷

Kim Completes Delta Basin

Wonsuck Kim, assistant professor in the Jackson School, recently finished building the UT Experimental Delta Basin (UTED), another major component of the Morphodynamics Lab. It is designed to physically model morphodynamic and stratigraphic evolution of a fluviodeltaic system.

The UTED Basin is one of only three flumes in the world with a computer-controlled basement motion, which can mimic a range of subsidence patterns, including fore-hinge (passive margin), back-hinge (foreland basin), and lateral tilting. Researchers can also vary sediment supply and sea level during an experiment. By changing those three parameters, Kim and his colleagues can try to recreate morphologies they see in the real world. That gives them clues as to the conditions in the past that led to those morphologies.

The flume is 4 meters wide, 5 meters long, and 1.5 meters tall.

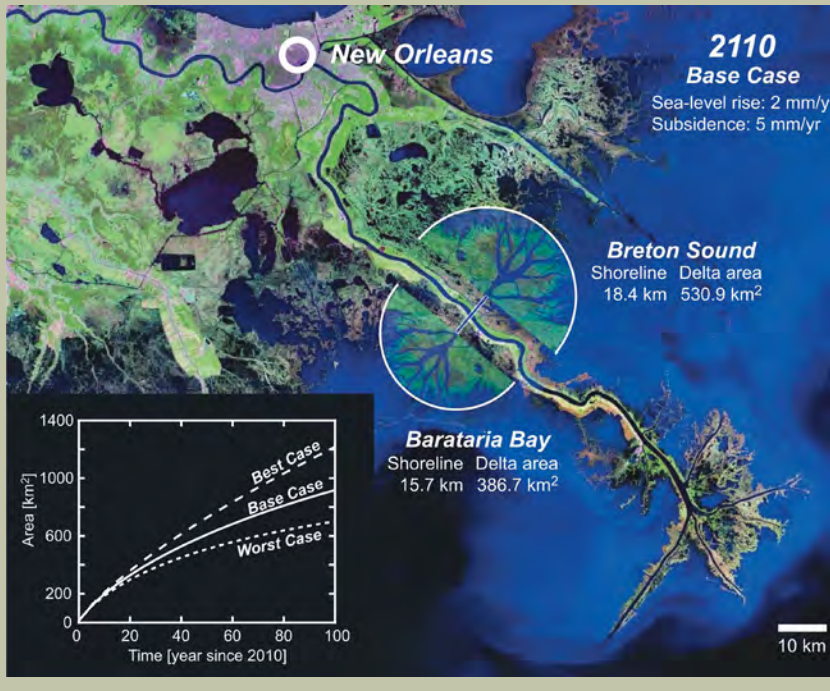
Some Recent Projects in Morphodynamics & Quantitative Stratigraphy

Mass-balance control on the interaction of axial and transverse channel systems
Presents a geometric, sediment mass-balance model for the interaction of axial and transverse alluvial systems in a subsiding basin. Comparing modeling results with field cases demonstrates that transverse sediment fluxes could slow the axial-channel migration or even reverse the movement against the tectonic forcing.

Steering of experimental channels by lateral basin tilting
A major issue in tectonics and sedimentation is the role of cross-stream tectonic tilting in steering channels. The general idea is that channels will be attracted to lateral maxima in subsidence rate. A physical experiment performed in 1999 at the St. Anthony Falls Laboratory was in conflict with the idea and showed that fluvial channels and resulting stratigraphy can be insensitive to even relatively strong lateral variation in subsidence. Scientists in the Morphodynamics Lab tested a hypothesis developed from the earlier experiment: Tectonic tilting steers channels only when the ratio of the time scales describing lateral channel mobility to tectonic deformation is sufficiently small.

Is it Feasible to Build New Land in the Mississippi River Delta?
What if the Mississippi River levees were cut below New Orleans? What if much of the water and sediment were allowed to flow out and build new deltas? Could deltaic land loss be reversed and even restored? Using a conservative sediment supply rate and a range of rates of sea level rise and subsidence, a physically based model of deltaic river sedimentation [Kim et al., 2009] predicts that approximately 700 to 1200 square kilometers of new land (exposed surface and in-channel freshwater habitat) could be built over a century.

Delta progradation driven by an advancing sediment source: Coupled theory and experiment describing the evolution of elongated deltas
The research is motivated by the operation of the tailings pond of a mine in which a delta forms. The mine operators must frequently move the outfalls of their slurry pipelines downstream to avoid their burial under sediment as the delta aggrades. This downstream migration results in a characteristic delta configuration. Under the right conditions, as the tailings delta progrades downstream, it does not have time to fill all the available space in the lateral direction, thus leaving unfilled open water on either side. The result is the formation of an elongated delta. Scientists use both experiments and numerical modeling to obtain a partial explanation of natural elongated deltas.



View of the delta of the lower Mississippi River below New Orleans, schematizing predictions of the new land (delta surface) that could be built over 100 years starting from 2010. Two diversions are considered: Barataria Bay and Breton Sound. The calculation is based on a "base case" scenario: a subsidence rate of 5 millimeters per year and sea level rise rate of 2 millimeters per year. The inset shows results for a "best case," subsidence of 1 millimeter per year and sea level rise of 0 millimeters per year, and a "worst case," with corresponding values of 10 and 4 millimeters per year. For the sake of clarity, land losses in the part of the deltaic wetlands not subject to diversion are not estimated or shown. Image courtesy of NASA World Wind. Published in the Oct. 20, 2009 edition of EOS.

Other Researchers Working in the Morphodynamics Lab

Ginny Catania, assistant professor in the Jackson School, built the Ice Dynamics Model to study the behavior of ice sheets and glaciers.

Bayani Cardenas, associate professor in the Jackson School, built the Narrow Temperature-controlled Open Channel Flume to study how fluids (and other entities they transport such as chemicals and heat) move across and within groundwater and surface water reservoirs.

Joel Johnson, assistant professor in the Jackson School, recently remodeled an existing 40 meter flume to study the hydraulics and sediment transport of flash floods and tsunamis.

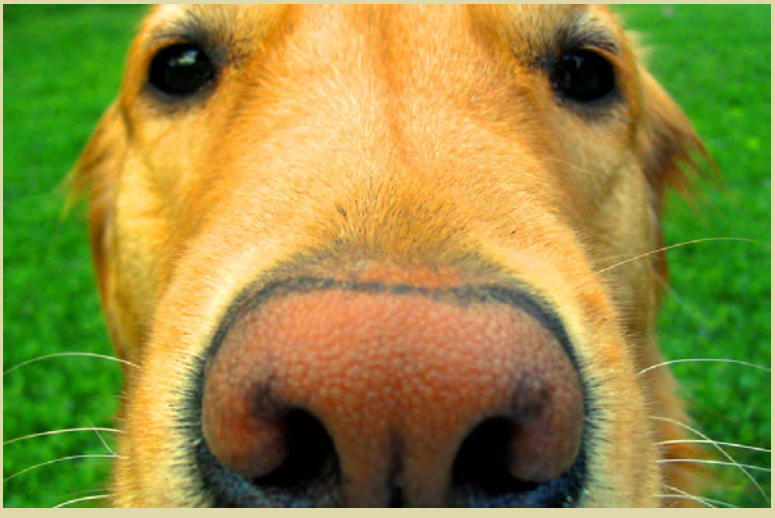
Super Sniffers

Mammals First Evolved Big Brains for Better Sense of Smell

BY MARC AIRHART

Among living animals, mammals have the largest brains relative to their body size. This holds true for big mammals like whales—for medium sized ones like you and me, for dogs and cats—and for small ones like mice. Even the earliest mammals had big brains. For years, scientists have wondered why.

"We know they weren't doing calculus," said Tim Rowe, professor in the Jackson School and director of the university's Vertebrate Paleontology Laboratory. "So what were they doing with those bigger brains? How did big brain size evolve? And what were the driving mechanisms?"



Dogs retained a strong sense of smell from their mammalian forebears, while humans traded some of that ability for keener vision and hearing. Photo Credit: Salem Eames.

Scientists have proposed many explanations, but because fossil skulls of early mammals are extremely rare, they have been reluctant to cut them open for closer study, thus destroying the fossils. Scientists have mostly relied on comparative studies of living mammals.

"We studied the outside features of these fossils for years," said Rowe. "But until now, studying the brains meant destroying the fossils. With CT technology, we can have our cake and eat it, too."

Rowe and colleagues CT-scanned the skulls of more than two dozen early fossil mammals and more than 200 living mammal species over the last decade and compared them to understand how large brains evolved. The soft tissue of brains aren't preserved well in fossil skulls, but endocasts, imprints of the brain on the inner surface of the skull, are.

This study was the first to use CT technology to reconstruct the brains of two of the earliest known mammals, *Morganucodon* and *Hadrocodium*, both from the Jurassic fossil beds of China. The 3D scans revealed that even these tiny, 190-million-year-old animals had developed brains larger than expected for specimens of their period, particularly in the brain area for smell. Specifically, the olfactory bulb, a dual-lobed structure at the front of the brain that processes smells, was enlarged compared to that of their reptile forebears.

"We were surprised to find that as proto-mammals evolved into mammals, the first parts of the brain to expand were those related to the sense of smell," said Rowe. "Compared to their more primitive ancestors, these first mammals were super smellers."

Rowe thinks an enhanced sense of smell would have given mammals a much needed evolutionary advantage over reptiles. This was during the age of the dinosaurs after all. There would have been a lot of pressure on tasty little critters to lay low during the daytime when dinosaurs were active. At night, a strong sense of smell would be more useful than sight.

"Once the dinosaurs had bedded down for the night, that's when the mammals came out and started sniffing around for insects, insect larvae and other things that lived in the soil, like worms," Rowe speculated in an interview with NPR.

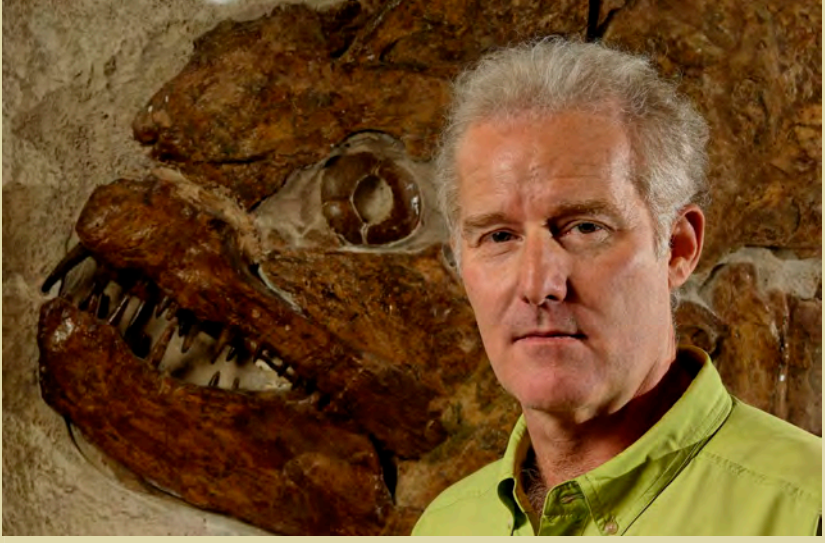
Rowe and his colleagues at the Carnegie Museum of Natural History (CMNH) and St. Mary's University in San Antonio published their research in the journal *Science*.

Thomas Macrini, assistant professor of biological sciences at St. Mary's, conducted much of the research for his doctoral dissertation at The University of Texas at Austin, in which he scanned the heads of numerous fossil and living species to visualize the size and shape of their brains.

"This is the most comprehensive study yet undertaken using computed tomography to study the evolution of the mammalian skull," said Macrini. "And it is exciting to see these new insights emerging from years of intense labor."

Zhe-Xi Luo, curator and associate director for research and collections at CMNH, was involved in the discovery and research on the fossils for this study. When he first described the paper clip-sized mammal *Hadrocodium* ten years ago, he named it for its relatively large cranium despite its appearance so early in the mammalian lineage ("hadro" means "fullness" in Latin and "codium" means "head").

"I have spent years studying these fossils, but until they were



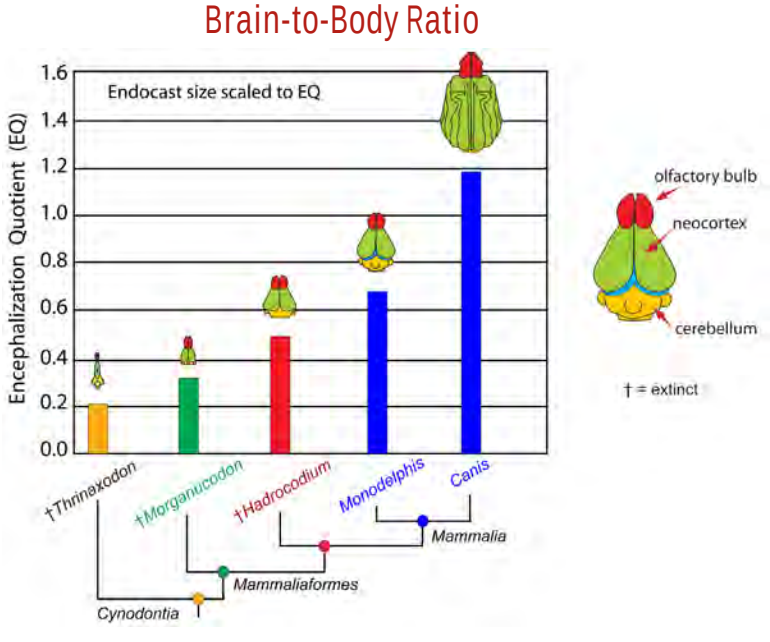
scanned it was impossible to see the internal details," said Luo. "I was absolutely thrilled to see what the brains of our 190-million-year old relatives were like."

According to the study, other factors leading to larger brains in early mammals included greater tactile sensitivity and enhanced motor coordination. Fossils of some of the earliest mammals, such as *Hadrocodium*, bore full coats of fur, explaining the need for enhanced tactile sensitivity.

The CT scans were made at the university's High-Resolution X-ray Computed Tomography Facility, which is supported by the National Science Foundation for researchers around the world. The scans, including interactive 3D fly-throughs, are archived online and available to the public along with nearly 1,000 other specimens on the DigiMorph Web site (www.digimorph.org). ✷

Top left, Tim Rowe: "Until now, studying the brains meant destroying the fossils," said Rowe. "With CT technology, we can have our cake and eat it, too." Top right: CT scans of the brains of modern short-tailed opossum (upper left of figure) and Hadrocodium *(bottom right). The brains are pink and olfactory bulbs, at front of brain, are reddish pink. Credit: Matt Colbert, The University of Texas at Austin.*

We're Not All Super Sniffers



As mammals evolved out of reptiles, the ratio of their brain size to body size (encephalization quotient) increased. In the earliest mammals, such as Hadrocodium *and* Morganucodon*, it was the olfactory bulb that increased the most.*

Anyone who lives with a dog knows not all mammals have equally strong senses of smell. The earliest mammals originated around 200 million years ago. They had robust senses of smell. But since then, some mammals, such as lemurs, have retained that strong sense while others, such as whales, have lost it entirely. Most, such as us humans, are somewhere in between. Rowe says a good analogy for the mammalian brain is a computer.

"You can optimize a computer for anything," said Rowe. "Even with the most powerful computers, you might optimize them for video or audio or 3D graphics. No one computer is optimized for everything you might want to do. It's like that with mammals. When you make one sense better, it's usually at the expense of something else."

Rowe noted that we humans sacrificed some of our sense of smell for better vision and hearing. Bats traded some of their sense of smell for echolocation; whales for better hearing; and birds for better vision.

"The olfactory system is the single largest set of genes in our genome," said Rowe. "Like all mammals, we have about 1,000 genes for smelling. But in our case, fewer than half are turned on."

Symposium Pays Tribute to William Muehlberger

Note: We put this article together before Willaim Muehlberger passed away this summer and felt it was a fitting tribute to include in this issue. For an obituary of Prof. Muehlberger, see our Memorials section.

What do you give the geologist who has everything? If it's professor emeritus Bill Muehlberger, bringing together over 120 colleagues, friends, and former students for a three day research symposium and celebration would be a good start.

Longtime compatriots Patricia Dickerson, a research fellow working in the Walter Geology Library, and Mark Cloos, professor and Getty Oil Company Centennial Chair in Geological Sciences, organized "From the Earth to the Moon: A Research Symposium honoring the scientific contributions of William R. Muehlberger" in Austin in August 2010. Some of the most touching as well as humorous moments of the weekend came during the opening reception when Bill's friends and family shared their favorite "Muehlberger Moments" with the audience. Notable photos spanning several decades were also shown throughout the evening. The praise, respect and appreciation continued the rest of the weekend as speaker after speaker began their presentation with a personal note of how he had challenged and inspired them.

As much as they came to honor the man, the attendees also came to share the fruits of their research in fields as diverse as North American tectonics, Central American and Caribbean geology, nuclear waste storage in Japan, natural resources, lunar geology and human exploration of space. Speakers and attendees included two Apollo astronauts (Charles Duke and Harrison "Jack" Schmitt), three presidents of the Geological Society of America, three university deans, and representatives of state and federal government agencies, universities, petroleum and mining companies, and consulting firms.

Dickerson and Duane Ross, head of astronaut selection and training at NASA, presented Bill with a commemorative plaque bearing rock samples flown for him on space shuttle Atlantis to the International Space Station and back on mission STS 132. The two rocks—one, Precambrian Llanite from the Llano Uplift, and the other a liesegang banded granite from Big Bend National Park—represent prime research locales from both his early and most recent work.

Bringing the event to a close, Dean Sharon Mosher presented the esteemed professor a plaque commemorating the creation of the William R. Muehlberger Graduate Fellowship in Structural Geology/Tectonics. The fellowship was designed to support "a graduate student possessing the greatest breadth and depth of geologic knowledge and who is focused on a research project aimed at resolving an important structural geology or tectonic problem." Within a few short months of establishing the fellowship, donors contributed the full $250,000 needed to fully fund the endowment. The first recipient was John S. Singleton, a doctoral student.

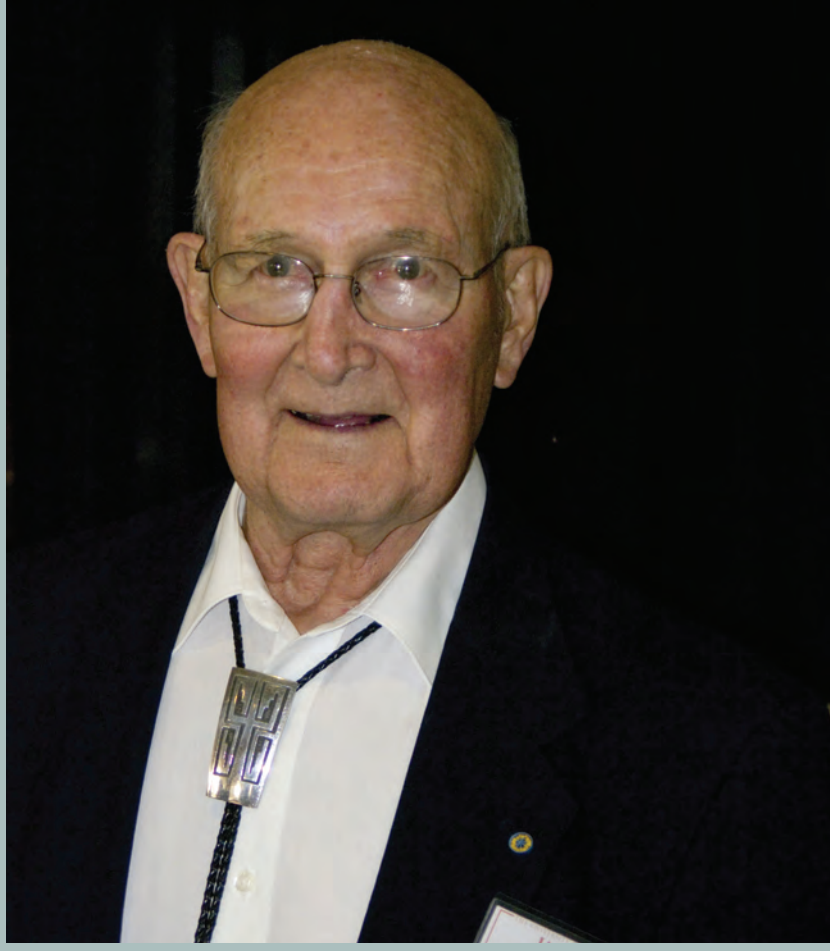
To obtain a copy of the symposium abstract volume, contact the Newsletter editor (communications@jsg.utexas.edu). ✷

A Giant in Geology

Bill Muehlberger's shadow looms large in the field of geology. He published the Basement Rock Map of the United States with the USGS in 1968. He published the definitive Tectonic Map of North America, for which he received the 1998 Best Paper Award from the Structure/Tectonics Division of the Geological Society of America. He has conducted field investigations all over the world. He helped train nearly every class of astronaut from Apollo through Skylab and on to recent shuttle crews. He was principal investigator for Apollo 16 and 17, the two missions in which astronauts carried out significant geological research.

He began teaching geology at the University of Texas in 1954. During his tenure as professor and chairman of the Department of Geological Sciences, he supervised 61 master's and 26 doctoral students. His students worked on problems in tectonics, structural geology and petrology in Texas, New Mexico, Colorado, the southern mid-continent basement, Vermont, the Canadian Rockies, the Gulf of Mexico, Mexico, Guatemala, Honduras, Turkey, and the Moon. He and his students made the first geological maps of Honduras, as well as parts of Guatemala and Mexico.

For his work over the years, he has received the Medal for Exceptional Scientific Achievement and the Public Service Medal from NASA, as well as the Houston Oil and Minerals Corporation Faculty Excellence Award. In 2009, he was inducted into the Jackson School's Hall of Distinction. At the time of his death he was professor emeritus in the Jackson School.



A Second Look

Sizing Up the Potential for Geothermal Energy in Texas

by Marc Airhart

As two recent articles in *AAPG Explorer* have noted, research into geothermal energy has been on the upswing over the past several years. New projects have ranged from coproduction of power at existing oil and gas sites (Hilcorp Energy and Denbury Resources) to larger-scale efforts focused on dedicated electricity-generation from geothermal sources (Louisiana Geothermal in the Gulf Coast and Pioneer Natural Resources in Colorado). The U.S. Department of Energy (DOE) is in the midst of awarding $360 million in federal stimulus grants for research in this area.

Traditionally, geothermal energy has been associated with regions of intense volcanic or hydrothermal activity, like Iceland, which generates more than half of its primary energy from geothermal sources. For decades, however, scientists have wondered if the less volatile subsurface in areas such as Texas could provide economically viable locations for geothermal power.

Bruce Cutright, a research associate at the Bureau of Economic Geology, and colleagues are helping answer that question through several current research projects funded by the DOE. They are drawing together data from a broad range of sources on the geothermal resources in the state for a national, publically accessible

Three geothermal plants in operation, left to right: Raft River Geothermal Project in southern Idaho, image courtesy USA Geothermal Inc.; the U.S. Department of Energy's Rocky Mountain Oil Field Test Center in Casper, Wyoming, demonstrating the geothermal co-production concept for years; geothermal drilling rig at Calpine's "the Geysers," the country's largest geothermal complex along the Sonoma and Lake County border in California.

geothermal database. Another project will combine a real world test of geothermal energy production with carbon sequestration, another area of active research at the Bureau.

Geothermal 2.0

Three decades ago, the Bureau conducted groundbreaking work on geothermal resources in Texas from deep, hot sediments. Researchers included Don Bebout, Robert Loucks, currently a senior research scientist at the Bureau, and others. Ultimately, the economics weren't favorable for geothermal in the state. Geothermal development did continue in other states like Nevada, but it was slow.

Now, along with four graduate students, Cutright has revived the Bureau's efforts in this area. He is participating in three DOE grants for geothermal research totaling about $2 million, with partners at Southern Methodist University, the Arizona Geological Survey, Lawrence Berkeley National Laboratories, and Denbury Resources.

With the first two grants, Cutright and colleagues are collecting data from scientific publications, universities, and industry on the geothermal resources of Texas for the National Geothermal Data System, a web-based collection of data relevant to geothermal exploration and development. Data from earlier petroleum exploration and production activities include bottom-hole temperatures and other critical reservoir properties such as pressure, porosity, permeability, formation thickness, and fluid chemistry. One of the more time-intensive aspects of the project involves scanning old legacy data and documents from before the computer age and making them available as PDFs. The researchers, who are about half way through the pair of three year grants, are also analyzing data and identifying prospects for industry.

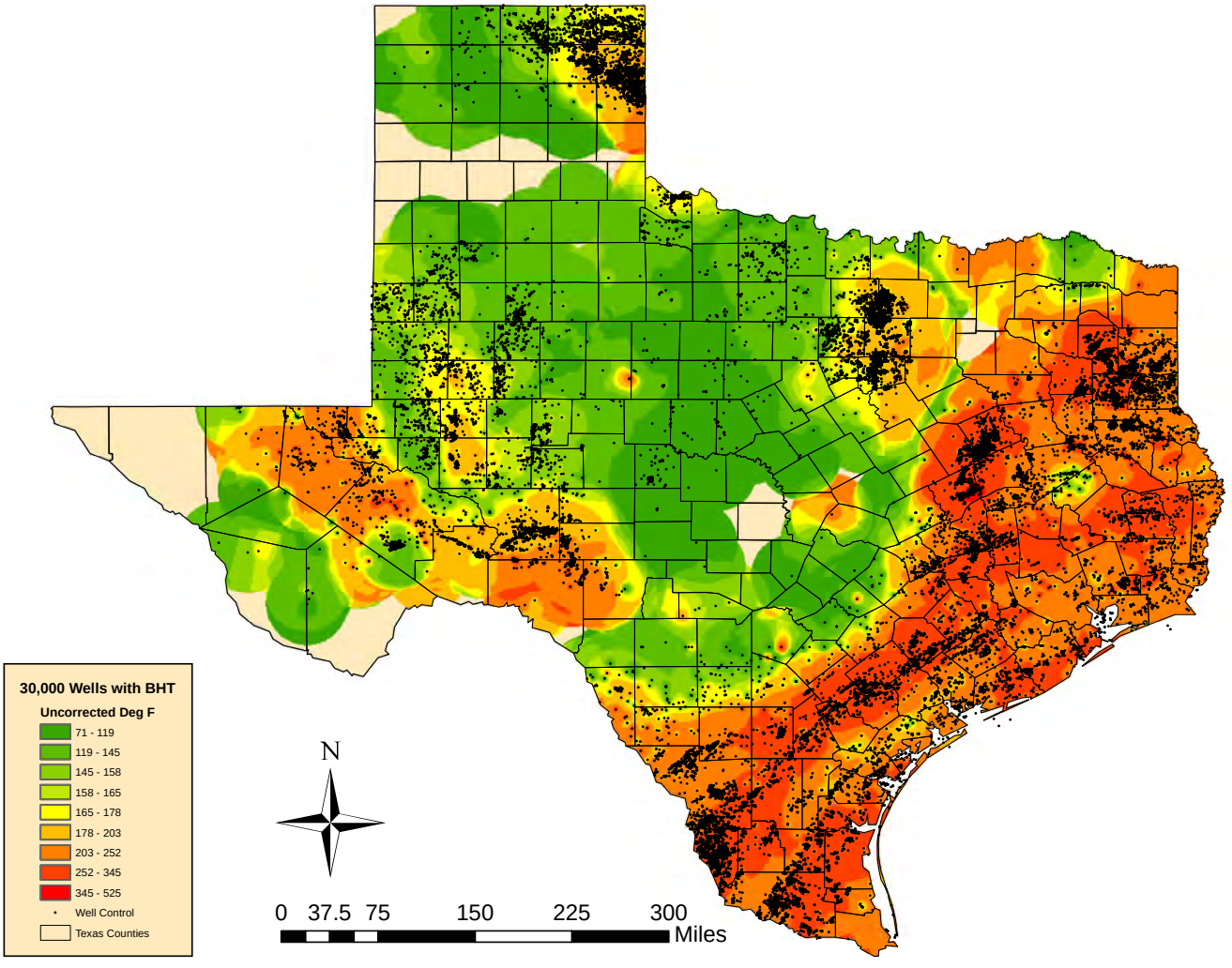
So far, they have identified three prospective areas in Texas that hadn't been considered promising for geothermal—in Crocket County (West Texas), in Robertson County (East Texas) and, particularly surprising, in the Anadarko Basin (North Texas).

"It was always considered a cold, old basin," Cutright says, "but there are some hot spots that might be worth looking at."

The third grant, awarded this past summer, supports research on combining geothermal energy production with carbon sequestration. By switching to carbon dioxide (CO_2) to mine or transport heat, the demand for water and the emission of CO_2 from conventional power plants could be reduced. The tests will be conducted at Cranfield field in Mississippi, the site of recent work by the Bureau's Gulf Coast Carbon Center.

Texas: Geothermal Hotspot?

Most geothermal resources developed to date have been in places where nature has already done much of the work, such as The Geysers in northern California. Coming online in 1960 as the first geothermal electric power plant in the U.S., The Geysers currently provides enough electricity to power about 750,000 homes. At such sites, the resource (hot, fluid-filled rock) and the plumbing (highly permeable, pressurized system with a path to the surface) are already in place. Best of all, the location of the resource is known: Where there's steam, there's heat. Exploration costs are thus very low. Unfortunately, these shovel-ready hydrothermal systems



This temperature gradient map, based on bottom hole temperatures from 30,000 existing wells in Texas, shows large regions with geothermal potential. The reported temperatures are typically lower than the true temperature of surrounding material because they are taken shortly after drilling fluid has stopped circulating in the borehole. Future maps will correct these temperatures upward accordingly. Data: IGOR Database and Texas Railroad Commission. Map: Colgan Smith, Adam Stater and Andrew Setchko.

only exist in isolated areas around the world, with most activity so far in places like Iceland, Indonesia and the Philippines.

As he surveys resources in Texas, Cutright sees potential for geothermal energy production around an entirely different model that has many of the same benefits of conventional hydrothermal resources. In this scenario, oil and gas companies would coproduce geothermal energy from the same wells as oil and gas. Because the wells are already drilled, there is a path to the surface and no need for additional drilling.

So far in his research for the national database, Cutright has identified more than 17,000 wells in Texas with bottom-hole temperatures above 100 degrees Celsius, an operational threshold for some modern geothermal power plants. Not all of these wells will have the right reservoir properties for geothermal energy production, but it does suggest a potential resource base worth researching.

"The easiest places for development of this are Texas and Oklahoma with their long histories of petroleum development," Cutright says, "because it's the petroleum provinces that I think will be the first areas to capitalize on these deep hot sediments."

Universal GeoPower, a renewable power company, has announced plans to test the coproduction concept in Texas. The company is developing a geothermal hydrocarbon coproduction demonstration project at two previously abandoned Wilcox tight gas sand wells in Goliad County. The company received a $1.5 million stimulus grant to "demonstrate the feasibility and economic viability of geothermal electricity production from oil/gas coproduced water."

According to Cutright, even without Texas' natural advantages for coproduction, a trio of technological advances has dramatically reduced the cost and greatly expanded the potential geographic range of geothermal energy across the country.

First, improvements in drilling technology and horizontal drilling have lowered the cost of drilling wells—and the size of their surface footprints—by allowing drillers to drill several wells in different directions from one small well pad. Second, hydraulic fracturing has increased the permeability of shale formations, allowing producers to create what experts in the field call Engineered Geothermal Systems. And third, development of power generators, called binary-cycle heat exchange systems, efficient enough to

make economical power with a heat source as low as 100 degrees Celsius (much lower than deemed necessary in the 1970s), now allow producers to develop geothermal resources in broad geographic areas, not only in narrowly concentrated spots like The Geysers.

Challenges

According to recent studies by the DOE, the U.S. Energy Information Administration and Lazard Capital Markets, geothermal energy costs about 10 cents per kilowatt hour to produce at the national level. That estimate includes upfront capital investments such as the cost of drilling production and injection wells, some of which don't apply to the coproduction model. This cost estimate makes geothermal cheaper than solar and nuclear, and comparable to wind, but more expensive than conventional coal and combined cycle natural gas. Cutright notes state and federal tax incentives would further reduce the cost of geothermal energy.


Bruce Cutright

According to the International Energy Administration, geothermal energy accounts for only 0.3 percent of global electricity production. If it's so great, why aren't we doing more of it?

Deloitte, a financial services company, put that very question to experts in the energy industry for a DOE funded study published in 2008.

The respondents said, among other things, they didn't have reliable resource information, the resources were too far from population centers and transmission infrastructure, risk sharing mechanisms were insufficient in the early stages of development, and policy approaches lacked continuity and clarity.

As a direct result of the Deloitte study, the DOE is addressing the first concern, a lack of reliable resource information, by investing $20 million to build the geothermal database that Cutright is contributing to.

Cutright says the second concern, limited access to infrastructure, is based on an outmoded understanding of the resource. Improvements in technology in the last three decades could greatly increase geographic locations hosting economically viable geothermal resources.

Still, he acknowledges energy companies have been slow to invest in geothermal in the U.S. He says more working examples will help assess the technical and economic viability.

At least one coproduction project is operating in the U.S.—at the DOE's Rocky Mountain Oil Field Test Center in Casper, Wyoming. An article in the AAPG Explorer last year noted plans by Houston-based Hilcorp Energy to produce 50 to 100 kilowatts of power from hot water at producing wells in south Louisiana to help offset operating expenses in the field. Gulf Coast Green Energy is also developing coproduction projects at producing oil and gas fields in Louisiana and Mississippi, one of which is in partnership with Denbury Resources and supported by a $1.6 million stimulus grant.

The Bureau's upcoming test at Cranfield field, combining coproduction of hydrocarbons and geothermal energy with carbon sequestration, along with the national geothermal database, will add to a growing body of information that will help energy producers decide whether the second time's a charm for geothermal energy in Texas. ✷

Last Time Around

In Texas and the U.S., the last major surge of interest in geothermal energy came in the mid-1970s, on the heels of the OPEC energy embargo. The technology attracted attention for understandable reasons: It emitted no toxic pollutants or radioactive waste. Unlike wind and solar energy, it was available around the clock. And best of all it was a 100% bona fide homegrown U.S. resource.

The newly formed Department of Energy (DOE) sponsored a broad range of research aimed at reducing the country's dependence on foreign oil. That included a significant grant to the Bureau to survey the potential for energy production from so-called geopressured geothermal reservoirs along the Texas Gulf Coast. From 1974 to 1985, the Bureau expended $6.9 million (about $18 million in today's dollars) on geothermal research in Texas.

But by the mid-1980s, geothermal was down on its luck. In Texas, the water in geopressured geothermal reservoirs wasn't hot enough to flash to steam at the surface, which was needed to turn turbines and generate electricity. Other features that were supposed to be economic bonuses—capturing and selling dissolved methane and using the condensed steam for crop irrigation or drinking water—evaporated too. The methane was too diffuse and the water was saltier than people assumed.

Finally, when the price of oil and gas collapsed, the DOE cut funding for alternative energy research. Bill Fisher, director of the Bureau at that time, points out that the Bureau operated, as it still does, largely on soft money.

"We had to go where the interest was," says Fisher, professor and Leonidas T. Barrow Centennial Chair in Mineral Resources in the Jackson School, and by the 1980s there was little for funding geothermal research.

That all changed with the American Recovery and Reinvestment Act of 2009, which included $360 million for geothermal research. According to Karl Gawell, executive director of the Geothermal Energy Association, if you count matching funds, the total research investment could be closer to $700 million. It's taken a couple of years for the DOE's geothermal research program to ramp up. Gawell expects the DOE to give out on the order of $150 million for geothermal research in the 2011/2012 fiscal year.

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ALUMNI NOTES

Meet the Class of 2016: Incoming Jackson School undergraduates hiked to the top of Enchanted Rock as part of their NeoGeo orientation field trip in the fall of 2011.

1940s

T.J. Burnett, Jr. (B.S. '49) writes, "As I approach my 89th birthday, I enjoy my 8 grandchildren and 9 great grandchildren, my lodge, and my church." T.J. is retired and lives in Houston.

Thurman Geddie (B.S. '45) writes, "Still drilling oil and gas wells." Thurman lives in Austin and works for the Geddie Oil Company Partnership. He can be reached at tgpgi@aol.com.

John Seale, Jr. (B.S. '41) writes, "Retired—enjoy reading the newsletter." He can be reached at jesealejr@aol.com.

1950s

Jim Adams (B.S. '51) writes, "It was fun to run a geologic field trip to the Glass Mountains for EOG personnel in their Midland, Texas office. By coincidence the date fell on the 80th anniversary of BEG Bulletins by Phillip B. King and Robert E. King. These pioneer geologists did superb surface geologic mapping and paleontology in the type localities of the Permian Wolfcamp and Leonard rocks for North America." Jim lives in Midland, Texas and works as a consultant. He can be reached at slatsjacobs@att.net.

Ernest Baker, Jr. (B.S. '55) writes, "Presently, I have 55 years of experience with the USGS, and know Texas geology and hydrology top to bottom. Hot news: I know of an extremely good Edwards Limestone drill hole that needs re-entering, high on the structure, that will easily make you $70 million. Also a choice, shallow, productive Barnett Shale-Marble Falls site. Finally, a $168 million net income deal in central Russia—and get this—it's financed and insured by the U.S. Government." Ernest lives in Austin and is a Geologist/Hydrologist Emeritus for the USGS. He can be reached at etbaker@usgs.gov.

Harvey Blatt (M.A. '58) writes, "Will be 80 on the infamous 9/11. The whole world talks about my birthday. Not teaching anymore but still writing books on the environment. The most recent came out this year. Two in press with Freeman at the moment and I'm working on another. It keeps me out of mischief." Harvey lives in Jerusalem, Israel. He can be reached at harvey@vms.huji.ac.il.

Walt Boyle (B.S. '54, M.A. '55) writes, "Vada and I continue to enjoy traveling, attending the Jackson School of Geosciences Luncheons and Dinners in Austin, and the Houston Symphony Concerts and seeing 'Old Friends' we were in school with, and the Jackson School of Geosciences staff. We were honored to be inducted into the L.T. Barrow Founders Circle and the Robert T. Hill Society." Walt lives in Houston and is retired.

Robert Brandt (B.S. '57) writes, "Retired from teaching geology, environmental sci-

Holland Honored With Honorary Life Membership in Advisory Council

Scotty Holland

This past Spring, the Jackson School honored David Scott "Scotty" Holland (B.S. '57) with honorary life membership in the Geology Foundation's Advisory Council (AC). He has served on the AC since 1986 and served as chairman of the AC from 1991-93. He funded the Jacque Nell and David Scott Holland, Sr. Student Excellence Fund in the Geosciences. Active donors to Hardin-Simmons University, which is home to the Holland School of Sciences and Mathematics, Holland and his wife Jacque are strong believers in the power of higher education.

"Scotty Holland is truly a class act, a fellow who has left and is still leaving a real mark in the profession of geology and in the business of petroleum exploration. He is a long-time friend with whom I have had the pleasure of sharing several agendas through the years," said William Fisher, inaugural dean of the Jackson School, where he holds the Leonidas T. Barrow Centennial Chair in Mineral Resources.

After graduating from Abilene High School in 1949, Holland enrolled at Hardin-Simmons but left when the Korean War broke out, volunteering for the Air Force and serving until 1954. He went on to receive his B.S. in geology from The University of Texas at Austin in 1957 and then joined Marathon Oil Company in Midland, Texas, as a geologist.

In 1966 he was employed by the Pennzoil Company as a senior exploration geologist, where he rose in the ranks to president and CEO of the Pennzoil Exploration and Production Company. He served as a group vice president of the Pennzoil Company until his retirement in 1990.

He currently serves as president of Holland Holding, Inc., Holland Energy, Inc., and Post Oak Petroleum, Inc. He is chairman of Trend Exploration, I, L.L.C., a director of Gather Petroleum Co., and has served on the boards of the Houston Museum of Natural Science and the Geology Foundation of AAPG, in addition to the Jackson School's Advisory Council.

ence, and oceanography at Houston Community College in May 2007. Enjoying life while coping with the vagaries of advancing age. Have attended five alumni gatherings over the last few years. Thoroughly enjoyed!" Robert lives in Houston and can be reached at rfbrandt@aol.com.

Jim Richards, B.S. '56, continues to wear his Jackson School swag with pride all over the world, pictured here in Spain.

Robert Doyle (B.S. '55) writes, "We remain active in the Gulf of Mexico, Eastern Europe, and Russia. Give me a call when convenient and perhaps we can visit over a cup of coffee or lunch." Robert lives in Houston and works as the Owner/President of American Energy Investment Group, Inc. He can be reached at rbtdoyle1aeig@comcast.net.

Ralph Duchin (M.A. '55) writes, "Twenty-one† years in Tucson. Still have apartment in Houston for limited oil & gas activity." Ralph is the owner of Duchin Oil & Gas LLC.

Fred Gibson (B.A. '51) writes, "Still retired and living in Austin, Texas."

Wyeth Goode (B.S. '53) writes, "All is well in West Texas. Business is good. My best to everyone." Wyeth lives in Midland, Texas and works as a consulting geologist.

Nancy Lister (B.A. '55) writes, "All is well with me and my husband Ray. He had a total knee replacement in April. Other than that, we have had a good year. We spend time in Houston, Rockport, Texas, and Estes Park, Colorado and enjoy the glorious activities in each place. Our three sons are fine. We love being with our grandchildren who are 12, 9, and 4. Best wishes to all of you. I really enjoyed the article about Dr. Clabaugh—he was a wonderful man! My geology experience at UT was fabulous." Nancy lives in Houston and can be reached at raylister3@aol.com.

Wayne Miller (M.A. '57) writes, "I continue to stay busy consulting full time. The last year has gone by too quickly. Hope to take some time off and do a little traveling. Family is fine. Regards to Sam Sims: Carol and I still remember you fondly." Wayne lives in Midland and can be reached at wdmillergeol@aol.com.

John O'Donohoe (B.S. '50) lives in Houston, Texas.

Stay in Touch!

Use the enclosed envelope or our online form (linked to the JSG alumni Web site) to let us know what you've been up to and to update your contact information.

1932 Field Camp

Mary Simkins Luzius of Georgetown sent us these wonderful pictures of her father John J. Simkins (B.A. '33) from the 1932 summer geology field camp. We sure appreciate it! Clockwise from top left: Santa Elena Canyon, 1932. Strong guys (some things about field camp never change). Joe Simkins and Terry Pollard.

James Richards (B.S. '56) writes, "Still doing some consulting for Genesis Producing Company in Houston. Writing several articles including one on the Good, Bad, and Ugly side of the shale drilling boom. The oil exploration business is undergoing major changes, some of which are not pretty. Drilling funds for traditional prospects are getting harder and harder to find. Still enjoying my contacts with the Jackson School. Great bunch of folks there doing a smashing job." James can be reached at jr1934@aol.com.

Jimmie Russell (B.A. '52, M.A. '54) writes, "Probably the best thing I did this past year was reconnect with OLD friends. Most of these I worked with at the state water agencies, some I had not seen in 20 years; it was great being with them again! Incidentally, I still keep up with 2 of my army buddies that I was with in Korea in 1956; one lives here in Austin, and we have lunch together occasionally. The other is in Iowa; he visited us once. Also, recently I have reconnected with Theta Chi Fraternity. I still live in the same house I had constructed, and moved into on the 4th of July 1969. I retired 8/1993 and began in public education 8/1994. I will start my 15th year as an assistant teacher of Special Needs, emotionally disturbed, mid-& high-school students at the GOALS Learning Center of the Round Rock ISD.

Now for the more-unusual event this past year. In April-May, Rita and I joined the Jackson School Friends and Alumni Network on a trip to northern Italy. The trip was organized by the Flying Longhorns. Dr. Earl McBride had the honor of trip host and shared stories of him and Folk working together in Italy. Comments on the trip follow:

I fell in love with Spain while working there 50 years ago, and this year I fell in love with Italy, primarily because of the Italian people; they are so charmingly friendly. Greatest experience: encountering teenage students on school field trips at many of the places we visited.... The first of the groups were at the Carrara marble quarry. Famous statues are of marble from this dangerous quarry in very steep mountains.

We encountered similar student groups at several other places we visited.... Most unusual experience: being kissed on both cheeks by the manager—a man when I paid the bill when Rita and I finished lunch al-fresco in the large cafe in the plaza in Stresa....

Most impressing art: the museum quality beautifully inlaid large panels of jasper slabs adorning walls in the Medici Chapel of the Church of San Lorenz in Florence. As Jasper is harder than steel, how were the artisans able to perfect these impressive feats, so many centuries ago? Photos were

not permitted during our visit, but Dr. Mcbride has some he took years ago.

Engineering: the arch was invented by the Etruscans; an ancient example seen in the fortress-like walled town Voltaire in Tuscany....

Food: we always had very good and interesting foods, but never gourmet. Most unusual: antipasto of very thinly sliced dried donkey, a delicacy of the region around Stresa....

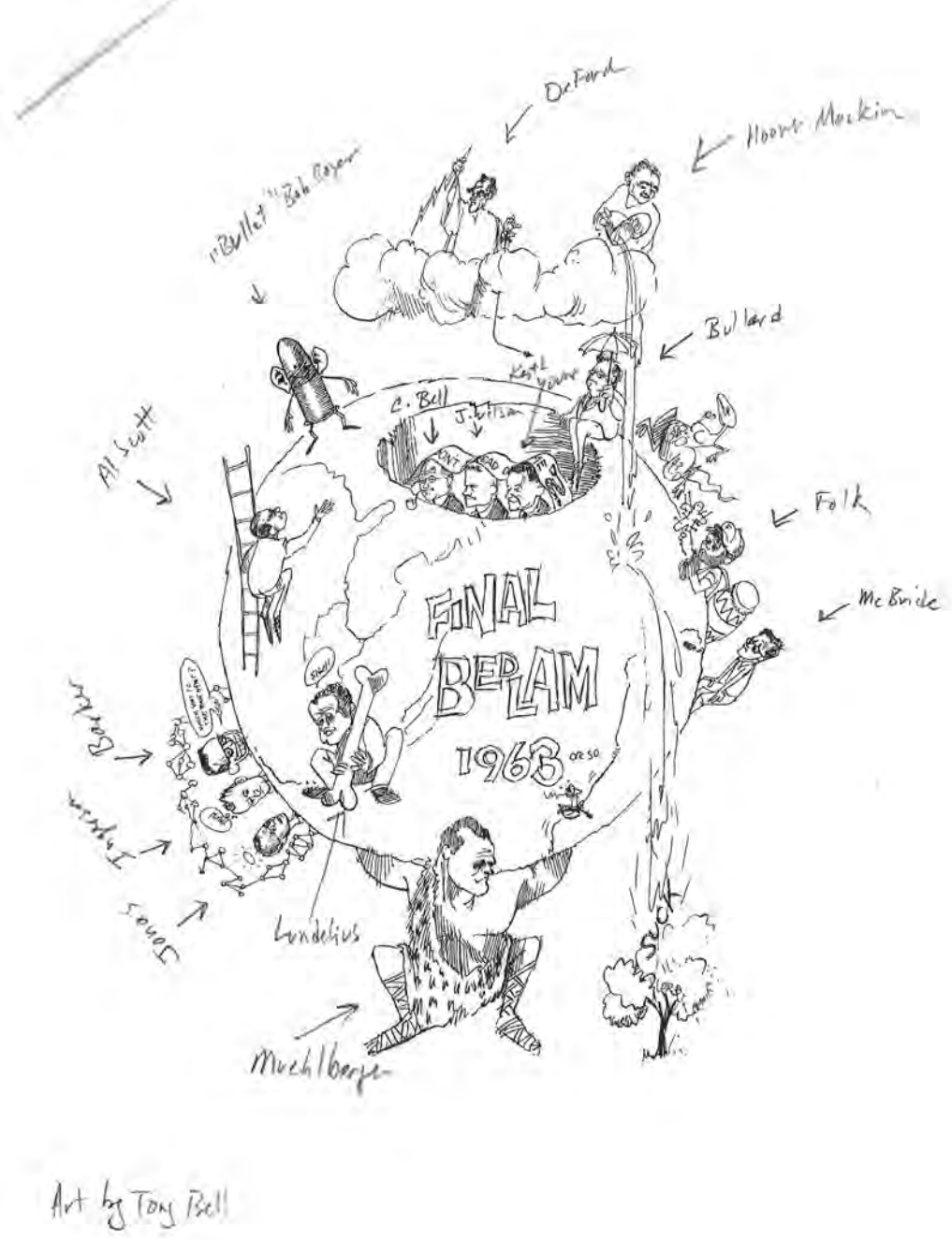
Beverage: Chianti Classico; wonderful; we visited a villa in a tiny village, 'Castellina in Tuscany,' where it was made from their grapes.... Licorice grappa; smooth and tasty, but not 'heavy'....

Hotels: we stayed at great ones, including Villa San Filippo in the Chianti region of Tuscany. The most luxurious was the Dei Dogi in Venice; previously it was the French embassy, and beautiful marble was throughout it....

Best bargain: a liter of wine at the '99 centavo' (about $1.45) store in Florence, near the Church of San Lorenzo....

Eugene Scott (B.S. '57) writes, "I'm still a consultant/petroleum geologist in Corpus Christi, Texas."

Marriott Smart (B.S. '57) writes, "Newsletter is better every year. Thank you. I especially like the short articles from newspapers and magazines. They show what others are thinking. The scientific reports by various researchers are excellent. I am required to study them carefully after being out of the scientific community for so long. Maybe I'll learn something. My only regrets about the newsletter are reading the memorials of friends from my days at UT. The years have caught up. I was sad to read about Dr. Clabaugh. He was a very important influence in my college years. Apparently I neglected to send an update for the 2010 newsletter. As I write this John and I are thankful to be in good health. I retired from the library/research field in 1998 but really am only retired in that I am not earning dollars. People keep asking John to do land work so he may never retire completely. He keeps busy with volunteer activities, as do I. We have taken some lovely trips in the last few years both overseas, to Russia and Mexico, and in our wonderful country to Boston, Mt. Ranier, and Glacier Park. Of course, being in Colorado is a special blessing too. We are also thankful that our family is healthy, grandchildren are growing up and are beginning to think of their futures, no geologists though. Our future includes another trip to Europe with a river trip beginning in Strasburg France and finishing in Prague. Best regards to everyone." Marriott can be reached at marriott@ix.netcom.com.



Final Bedlam, circa 1963

Tim Denison, Ph.D. '66, describes this as "a drawing from the old days ... done by Tony Bell, his bother was Jim Bell, a contemporary of mine and Jerry [McQueen's]. The drawing shows each of the faculty with Muehlberger as Atlas, RKD [R.K. DeFord] as God."

Hal Stubblefield (B.A. '54) lives in Kingwood, Texas and is retired. He can be reached at halstub@gmail.com.

T.J. Waggoner, III (B.A. '57) writes, "We love living in the mountains of Montana."

Thomas Anderson (M.A. '67, Ph.D. '69) writes, "I retired from the University of Pittsburgh at the end of August 2010. I had re-assumed the chairmanship of the Department and was not progressing toward completing several research projects. I have spent the past several months aggressively pursuing completion of work in Nevada, California, New Mexico, and Oregon via field trips and attending meetings in Portugal and Turkey. I still have three students completing theses and I

Dan Smith Receives 2011 AAPG Halbouty Award

Former AAPG president Daniel L. Smith, B.S. '58, a Jackson School Advisory Council member and former president of our Friends and Alumni Network, received the AAPG's 2011 Michael T. Halbouty Award, given in recognition of outstanding and exceptional leadership in the petroleum geosciences.

As AAPG reported, Smith "has been a formidable presence in the Association since he became an Active member in 1958. He has served as chair and member of 16 standing or ad hoc committees of AAPG and has been a Foundation Trustee Associate since 1999. Numerous honors/awards have been heaped upon this talented petroleum geologist and hardworking, committed volunteer.

"In addition to being an AAPG Honorary Member, Smith's extensive list of accolades includes being a Distinguished Member of the AAPG House of Delegates, an AAPG Certificate of Merit, a DPA best paper award and the Houston Geological Society's Gerald A. Cooley Award for 'service above and beyond the call of duty over many years.'

"For all those reasons and more it likely surprises no one Smith has been selected to receive the prestigious Halbouty Outstanding Leadership award."

It surprised no one at the Jackson School, where we have been prime beneficiaries of Smith's outstanding leadership and service.

am also working on development of some fun tectonic ideas. Shared the technical chairmanship of combined northeast/north-central GSA meeting in Pittsburgh this spring. Veterinarian Sara Lee (son Andrew) has relocated to Pittsburgh and Garrett (sons Cyrus and Noah) works as attorney in San Diego."

Chuck Caughey (B.S. '69, M.A. '73) writes, "A challenging year. My wife Penni was diagnosed with cancer in March and promptly underwent surgery followed by radiation therapy. She never fully recovered and passed away in April of this year. Following 4 dynamic years working with Iraqis in the Middle East group of ConocoPhillips, the company decided to pull back operations in that area. I retired from the company as my business unit was disbanded last November and then joined Noble Energy in December. Back to exploration in international new ventures and enjoying every minute of it." Chuck lives in Houston, TX and can be reached at Pak_Chuck@sbcglobal.net.

J.A. Fallin (B.S. '69) writes, "After grad school, Arco-Pauhoe Bay, Chevron-Gulf of Mexico, I joined Fugro-West Coast, assessing proposed nuclear sites with million dollar budgets and world-class geotectonists P.B. King (USGS), Ben Page (Stanford), Bill Dickinson (Stanford), et al., opposing numerous locations over active faults, beside tsunami-prone coastlines, atop freshwater aquifers that still got built. Leaving the deathwish crowd, signed on with the USGS-Denver, gaining career-tenure in a year doing mineral resource inventory, co-discovering several world class ore and oil/gas deposits across the west... all with Billy, Eleanor, and Anna listed as my beneficiaries c/o their mother Helen. Internal disruptions led to my forming Janus International, consulting privately, writing 'Petroleum Frontiers,' working with the Texas Water Development Board, discovering and helping develop ground water in Big Bend. And advising USGS Director Marcia McNutt on nuclear issues (Japan-US West Coast microplate sites), the BP-Gulf 'Blow-Out,' etc. and advocating applied geology courses at UT-Austin. Few listen, few care."

Don Kirksey (B.S. '60) writes, "Now that our grandkids and family are occupied with their busy lives, my wife, BJ, and I have taken the opportunity to do our thing. We sold and gave away all our 'stuff,' bought a 38' fifth wheel, and became gypsies, touring the country as fulltime RVers. We're enjoying the simpler life and its benefits, meeting interesting people, and marveling at the beauty of this great country. We are currently touring California where we have found outstanding year-round weather in San Diego. (103 in Austin, 66 in San Diego.) BJ drives out here because I can't keep my eyes off the landscapes. The geology is still intriguing to me. Sure glad she has a strong interest in learning how it all formed. My career in geology was all I hoped it would be back in 1955 when I entered U.T. Sinclair and Tenneco gave me many interesting projects and the chance to live in Alaska and Holland, as well as Louisiana, Houston, and Oklahoma City. Retirement is treating me well, since my biggest challenge is keeping my OU Sooner wife from turning every longhorn symbol she sees upside down."

Rubin Schultz, Jr. (B.S. '61) writes, "Still enjoying retirement. Getting to do some travelling and visiting with grandkids. Attended 50th UT Graduation Reunion and had a nice time." Rubin lives in Corpus Christi, TX.

Alan Shield (B.S. '60) writes, "I have tried to retire for the last 20 years, but have not quite achieved that position. I am still involved with environmental projects and geotechnical consulting. My wife, Kimberley, is an accountant for VCFO Corp. in Austin. Our son, Crawford, has just received his rank of Eagle Scout and will be a senior at Georgetown High this year." Alan lives in Georgetown, Texas and can be reached at alanshield@juno.com.

William Wilson (B.S. '60, M.A. '62) writes, "Engaged in shale gas plays as well as groundwater, geothermal, and aggregate exploration. Still writing a weekly science and agriculture column for the Bandera County Courier. Active in the Hill Country Geoscientists organization. Not about

Alumni Travel:

Scenes from the Jackson School's Italian Tour

This past spring, alumni and friends of the Jackson School took their first ever trip with the Texas Exes Flying Longhorns. Earle McBride, professor emeritus, led the geological tour of northern Italy, including Lake Magiorre, Milan, the Alps, the Italian Riviera, Cinque Terre, Portofino, Pisa, Florence, Siena and Venice. Robert Folk, who has done extensive field research in Italy, was there in spirit and advised the trippers in advance on such crucial matters as not ordering cappuccinos after 9 am to avoid being exposed as tourists. To see more photos from the trip, visit our online photo gallery at https://picasaweb.google.com/jsg.alumni.utexas.edu/Italy

to retire at the age of 76 in good health." William lives in Bandera, Texas and works for Strata Geological Services. He can be reached at featherg@hctc.net.

William Young (B.A. '61) writes, "Linda and I are still enjoying traveling, bridge, and grandkids. Our health remains fine. We're hoping that several of our 12 grandchildren will attend the University." William lives in Shreveport, LA and is retired.

1970s

Thomas Clark (M.A. '72) writes, "I retired at the end of December 2010 after 39 years as a hydrogeologist. Cindy and I spent 6 years in Illinois, and later moved north where I worked 33 years for the Minnesota Pollution Control Agency in St. Paul, helping to protect groundwater in the Land of 10,000 Lakes. We have two grown daughters and four granddaughters." Thomas lives in Mahtomedi, Minnesota and can be reached at tom.p.clark47@gmail.com.

Frank Cornish (M.A. '75) writes, "As a conventional player it's been a slow year for activity, but things are heating up now. The San Antonio Geological Society published my paper 'Incised Valleys of the Upper Wilcox…' illustrating 4 shelf incised valleys of 2 different ages up to 770' deep, possibly supporting GOM isolation from the world ocean. I still remain the JSG alumni rep for Corpus and enjoy all the interaction with UT grads. I gave a talk on SW Speaks field at the national SIPES convention in Jackson, Wyoming this summer. I'm looking forward to fall with cool temps and resurgent Longhorns." Frank is the president of Imagine Resources, LLC and can be reached at frank.cornish@gmail.com.

Patricia Dickerson (B.A. '70, Ph.D. '95) writes, "Looking forward to field work in W. Texas and looking back over events since my prior note in this newsletter. Summer 2010 brought two field training trips in New Mexico for NASA, Canadian and Japanese astronauts. Immediately afterward came the research symposium that we organized to honor my mentor, longtime colleague and cohort Bill Muehlberger. An exuberant reunion of past students, coworkers and family! And we could display our newest map of southernmost Big Bend NP. No overripe produce was thrown following my talk at the Southern Hemisphere Geological Congress (11/10) in Mar del Plata, Argentina - always a relief. First time on the Atlantic coast of South America; I traveled there by train from Buenos Aires. Much like taking a train from Beaumont to Victoria, Texas, through vast flat grasslands, large cattle ranches. Then suddenly! sea cliffs and the great silver-green Atlantic. Mark Cloos' excellent field trip through the subduction complex of California and segments of the San Andreas system launched 2011 in fine style. Fascinating structures, splendid scenery, and a beach-full of elephant seals and seal pups. It was a privilege and a pleasure to participate. Productive and enjoyable field research continues with TCU friends/colleagues in the Marathon area (W. Texas, not Greece). Our session in May was decorated with herds of birds - a vermillion flycatcher, painted and indigo buntings. First time in all the years I've been working in the region, though, that I've seen wildfires - eerie and saddening. The ample and varied geo-marvels of southern and central New Mexico allowed me to introduce a lively crew of non-geologists to all manner of rocks and reefs, dunes and hoodoos, caverns and cool springs, during a Road Scholar (nee Elderhostel) adventure in April. Eager group, great fun, and there's another on the books for April 2012. In the meantime, my work with GeoRef (AGI) continues in the exceptional UT geology library, site of daily encounters with exciting

Gipson's Wine Said to Shine With Age

Ron Saikowski of Houston Wine Walk recently described Jackson School Advisory Council Member William Gipson, B.A. '48, M.A. '49, as one of the grand "Dons" of the Texas wine industry, "silently doing the best with only Texas grapes."

Gipson was one of the initial investors in Pheasant Ridge Winery in New Deal, about 15 miles north of Lubbock on the Texas High Plains, and later became the owner of Pheasant Ridge Winery. He calls Gipson a "dynamo at 84 years young." At a recent tasting, Saikowski said Pheasant Ridge's 2002 Merlot was one of the wine highlights along with a Cabernet Sauvignon that had aged well. "The undeniable conclusion was that Pheasant Ridge Winery was proving that Texas wines have longevity and great balance along with characteristics attributable to those wines of greatness," wrote Saikowski. "Pheasant Ridge Wines join the ranks of Texas Wine icons like Fall Creek Meritus, Inwood Estates Tempranillo, Becker Viognier, Brennan Viognier, and Messina Hof Viviano. The next challenge for Pheasant Ridge Winery is to produce enough wines of superior quality for distribution throughout the State of Texas."


William Gipson

science." Patricia can be reached at patdickerson@earthlink.net.

Ralph Kerr (M.A. '76) writes, "I retired in 2010 from Shell Oil Company after 33 years working both as a geologist and an organizational effectiveness consultant. I realized that I had too much energy to really retire, so have founded Momentum Change Solutions LLC, an organizational development firm based in Houston, Texas. I am finding that my training and experience both as a technical leader and as an executive coach have led me to this 'second career'. Most of my work is in the O&G industry; I am currently helping an executive team in the midst of a large corporate transition, and am coaching a group of high potential technical people to improve their leadership capabilities."

Douglas Toepperwein (B.S. '74) lives in Fair Oaks, Texas and works at Sage Energy and Company. He can be reached at dougt@sageenergy.com.

Van Veenstra (B.S. '75) writes, "We are enjoying retirement in the Hill Country. Left ExxonMobil after 35 years (last 20 in Houston) and built a new home on Lake LBJ, moving here August 2010. Keeping a busy schedule balancing yard work, golf, volunteering, and work at nearby ranch/hunting cabin. It's awfully dry here, please send rain!!" Van can be reached at van.veenstra@gmail.com.

David Angstadt (M.A. '83) writes, "After many years working West Afica (Nigeria, Angola, Equatorial Guinea) mostly from Houston, I've moved to Saudi Arabian Chevron just in time for all the excitement in the Middle East Jasmine Revolution. Also, I've seen the biggest sandstorm in anyone's memory on the Arabian Peninsula (check the internet for some unbelievable photos). I've seen major aeolian sediment transport and deposition in action (including 3" of sand coating my apartment floor from a tiny bathroom slit during the sandstorm!). Any Longhorns passing through Saudi or the Gulf States give me a holler!" David can be reached at angstadt@chevron.com.

Pat Bobeck (M.A. '85), geological consultant and former FANs board member, spent the summer in France. She sent us this picture of a fountain built by the legendary hydraulic engineer Henry Darcy in Dijon in the 1840s.

1980s

Patricia Bobeck (M.A. '85) spent the summer in Dijon France eating mustard and improving her spoken French. She chose Dijon because it's the home of Henry Darcy and his water supply system and the site of the University of Bourgogne. She spent several weeks in the geology department helping students prepare and give oral presentations in English. Then she researched Darcy's list of historical springs in the Dijon area – the springs he did not choose for his water supply. The recorded use of some springs dates to the Middle Ages; the city of Dijon used them for water supply as much as possible for hundreds of years, until 1840 when Darcy diverted water from a large spring 13 km from town to Dijon via an aqueduct and supplied the

Frank Cornish (M.A. '75), president of Imagine Resources and a FANs board member, epitomizes the 70s! The first picture is of Frank (right) and Tim Cejka, former president of ExxonMobil Exploration. "We were flying kites, thus the gloves," writes Cornish. The second is outside Cornish's apartment off Riverside Drive in Austin.

Megaw Wins Carnegie Award

Peter K. M. Megaw, M.A. '79, a new member of the Geology Foundation Advisory Council, won the 2009 Carnegie Mineralogical Award. Megaw is a Tucson mining geologist and mineral collector. The Carnegie Mineralogical Award honors outstanding contributions in mineralogical preservation, conservation, and education that match ideals advanced in the Carnegie Museum of Natural History's Hillman Hall of Minerals & Gems. Established in 1987 through the generosity of The Hillman Foundation Inc., the award consists of a bronze medallion, a certificate of recognition, and a $2500 cash prize. It is presented each February during the Tucson Gem and Mineral Show. Congratulations, Peter!

city through a system of 120 street fountains. Finding the springs required research in the city archives and inspection of the 1812 Napoleonic cadaster, finding approximate locations on recent maps, and locating them in the field. The project was perfect for French practice; she encountered people of all strata of French society – from "traveling people" to an Air France pilot – who responded to her opening line, "Hi, I'm from Texas and I came to France to find a spring that Engineer Darcy described in his 1856 book. . . ." She found and photographed most of the springs, including the famous Fontaine des Suisses, a spring in an encampment (now inside the city of Dijon) from which the Swiss besieged the town of Dijon in 1513 (obviously before Switzerland became a neutral country). She also visited the famous naturalist Buffon's iron forge, the source of the Seine River, the Burgundy Canal, and Henry Darcy's family.

Paul Carpenter (B.S. '86, M.A. '90) writes, "Working as a state regulator on the large-scale cleanup of the former Rocketdyne rocket engine and nuclear test lab near Simi Valley in Southern California. The site has beautiful geology and amazingly complex hydrogeology, but its remarkable history is probably the project's most interesting facet." Paul lives in Sacramento and works for the California EPA. He can be reached at carpenter.ps@gmail.com.

Richard Carroll (B.S. '80) writes, "I am still working at Sanchez Oil & Gas and am now coordinating their new ventures efforts in the continental US. Getting familiar with lots of different basins and plays both conventional and non. I am still traveling whenever possible and will be going on safari with my oldest son, Ian, to Tanzania and then to do some diving off Zanzibar. Ian will be starting at the UT McCombs School in August 2011. My other son, Austin, will be a Junior at College Park High School in The Woodlands this year and will be one of the drum majors for the Cavalier Band. I am very proud of my sons. Please feel free to contact me and join me for a beer if you are ever up in The Woodlands." Richard can be reached at rcarroll16@comcast.net.

Ray Cozby (B.A. '83) writes, "My son, Raymond, is attending UT in the fall of 2011 majoring in Petroleum Engineering. My daughter, Meredith, is matriculating at the University of Arkansas. Go Hogs & Horns!" Ray lives in Tyler, Texas and works for Southside Bank.

Jairo de Souza (M.A. '82) is married to Maria Alcina and father of Vanessa (28) and Lucas (23). From January 1980 to September 1981, he participated in the Graduate Course of Geophysical Exploration at The University of Texas at Austin and got his Master of Arts Degree in December 1982. Since 1984, he has held several positions within Petrobras and currently works as Coordinator of Strategic Business Projects and External Relations of E&P in the Corporate E&P of Petrobras. He is also one of the members of the 'Working Group' coordinated by the Brazilian Navy which deals with the preparation of a 'Revised Proposal of the Outer Limits of the Legal or Extended Continental Shelf of Brazil' to be submitted to CLCS in the near future. He has written many technical reports and has several published papers. Jairo can be reached at jairosouza@predialnet.com.br.

John Doehring (B.S. '82) parlayed an amazing UT education into a successful career with Exxon Company, USA (today ExxonMobil), practicing as a petroleum geologist, regional environmental manager, and specialty products sales consultant - before leaving the company in 1998 to co-found the private equity financed start up of Windward Petroleum - today a large, northeast U.S. petroleum specialty products distributor. Along the way John's geological focus waned - displaced by a true passion for the business side of things - and for the tremendous potential of personal and organization improvement. Today, John is President of J. Doehring & Co., a management consulting, education, and information resources provider helping organizations and their leaders to achieve extraordinary outcomes in business and life. John and his team provide advice on matters of enterprise importance - strategy, marketing, leadership, ownership, and transformation of operations and results. John is an accomplished seminar leader, leadership retreat facilitator and highly regarded professional speaker, and he's delivered presentations to numerous audiences across the country. He lives today with his wife Mega, and two of his five children - in Pepperell, Massachusetts.

Ernie Easley (B.S. '80) lives in Dallas and works for Hunt Oil Company. He can be reached at eeasley@huntoil.com.

David Evans (B.S. '88) writes, "Living in Northern Idaho (Moscow) since 1999 and continue with environmental consulting (23 years). Primary work interests involve chem/ag remediation in the western US. Trying to remember my geochemistry from my UT days. Work is challenging and rewarding, always something new to learn. If your travels bring you to the Inland Northwest, look me up." David can be reached at devans@rubikenvironmental.com.

Rev. Dr. Larry Hensarling, Jr. (M.A. '81) writes, "I graduated with a Doctor of Ministry degree from Reformed Theological Seminary in Orlando, Florida on December 15, 2010. The title of my dissertation was 'The Significance and Impact of the Biblical

Gospel in the Spiritual Renewal of a Congregation.' Congratulations for all the great work at The University of Texas at Austin." Larry lives in Lakeland, Florida.

Bill Layton (B.S. '81) writes, "Exploring Tx Gulf Coast 'even the mighty EagleFord'. KC and I still work hard and play hard. Jessica, 26, has Master's degree in education, teaching in Corpus Christi, Texas. Jordan, 22, junior at A&M Corpus also in science education. Special hello to all 660 buddies 1981. The phantom still rules! 'Boogie till ya puke'. Come see us in San Antone!" Bill works for Abraxas Petroleum and can be reached at bill_n_kc@yahoo.com.

Shannon Morrison (B.S. '82) writes, "It's been almost three years since I started this adventure with the North Caspian Operating Company, seconded from ExxonMobil. Spent 15 months in Paris (yes, France!) and have been in Astana, Kazakhstan for a year. I've made many new friends and have added to my language skills - French, Russian, and even Kazakh. While I enjoyed the 'City of Lights,' I'm also enjoying the people, the culture, and the sunny skies of Kazakhstan. I've spent my career moving back and forth between geoscience and IT and this assignment requires skills in both areas - reservoir engineering and drilling, too! I try to get home as often as I can - still in Houston. When my husband, Mike, and I aren't working, we're fishing or birdwatching and enjoying our grandchildren (6). Life is good!" Shannon can be reached at semorri@swbell.net.

Robert Murray (M.A. '85) writes, "I am now leading Booz Allen Hamilton's office and our Center of Excellence for Energy Analysis in Pittsburgh, PA, working with the National Energy Technology Laboratory and others around CCS, shale gas, energy security, and Old King Coal. Enjoying life in Steeler's Nation, quite a change after years of desert living in Las Vegas." Robert can be reached at murray_robert@bah.com.

Paul Neumann (B.S. '87) writes, "2010 was a busy year with Gyrodata. We helped in the BP relief as well as aiding in the Chilean miners rescue with our Gyro guidance systems. Looking forward to another busy year in 2011. We will be moving into a new office in March. All is well on the homefront." Paul lives in Tomball, Texas.

David Noe (M.A. '84) writes, "I'm celebrating my 20th year with the Colorado Geological Survey! I still spend five months of the spring and summer living in western Colorado doing geologic-mapping fieldwork. This year I lived in Paonia and Craig. The other seven months are spent at home in Boulder and working in our downtown Denver office. It's a great life! Hello to old UT friends from the early 1980s!" David can be reached at dave.noe@state.co.us.

Kimberley Owens (B.S. '82) writes, "I am currently working as an accountant for the VCFO Corp. in Austin. My son, Crawford, will be a senior in high school this coming year. I hope to see him become more interested in geology as a profession. Our family vacations to Alaska and Canada have always included a review of the local geology."

Gene Pisasale (M.A. '80) writes, "To the Master's Degree Class of 1980: I hope you're all doing well. I'm still in touch with Tim Berge, Allen Bertagne, Lee Leininger and a few others… I 'retired' last year (2010) after working as an energy/petrochemicals analyst and

How Do You Lose a Dinosaur?

If you've ever spent much time around The University of Texas at Austin campus, you've probably seen the famous Glen Rose dinosaur tracks outside the Texas Memorial Museum. They were dug up in 1940 and put on display soon after. What most people don't know is that the university collected another, even larger dinosaur trackway in 1936. As part of the state's Centennial Exposition, the 67 foot long limestone slab bearing 17 tracks, topped by a life-size papier-mâché dinosaur model, was displayed in front of Gregory Gym. Wann Langston, emeritus professor in the Jackson School, has long wondered what happened to the university's original trackway. Documents in the university's libraries and archives suggest they were moved to an indoor swimming pool on the university's Little Campus for storage. Within a few short years, all but one track seem to have vanished. Are there any amateur sleuths out there? Were you here in 1936 and do you remember seeing the tracks? If you've got a theory, a photo, or better yet, some rock solid evidence about what happened to UT's missing dinosaur tracks, drop us a line: mairhart@jsg.utexas.edu.

Members of the 2010-2011 JSG Friends and Alumni Network (FANs) board, left to right: Bill Agee (B.S. '83; M.A. '90), Anine Pederson (UGS President), Dax McDavid (B.A. '03, M.A. '06), Kathy Weiner (B.S. '83), Elliott Pew (M.A. '82), Will Green (M.A. '55), Rick Paige (M.A. '88), Richard Leach (B.S. '77), John Long (M.S. '78), Heather Wilson Echols (B.S. '79), Mike Looney (B.S. '71; M.A. '77), Al Erxleben (M.A., '74), Bonnie Weise (B.S. '74; M.A. '79), Mark Ver Hoeve (M.A. '82), Janice Ver Hoeve (M.A. '82), David Wallace (B.S. '86), Dean Sharon Mosher.

portfolio manager for 24 years. I left to assist a family business as Director of Marketing. I'm also writing historical novels and doing a lecture series. My latest book is 'Abandoned Address- The Secret of Frick's Lock'- an historical novel of the Industrial Revolution in America involving the Wright Brothers, Thomas Edison, and Henry Ford, mentioning several places in historic Chester County, Pennsylvania. Luigi Folk loved the previous book 'Lafayette's Gold- The Lost Brandywine Treasure,' so I'll have to make sure he sees the sequel. Visit my site at www.genepisasale.com for more information on the novels and lecture series-glad to do one for your group." Gene lives in Kennett Square, Pennsylvania and can be reached at gpisasale@comcast.net.

Barrett Riess (B.S. '86) writes, "Consulting for Core Laboratories in Houston as a sedimentologist and petrologist specializing in deepwater deposits, offshore East Africa and West Africa."

Margaret Sipple-Srinivasan (B.S. '82) lives in La Canada, California and works for the Jet Propulsion Laboratory at Caltech.

Traci Smith (B.S. '85) writes, "My company was bought out in May of this year by TDECU (our local credit union). I am still in the same location, but with new responsibilities and opportunities." Traci lives in Lake Jackson, TX and can be reached at trackeye@swbell.net.

Steve Speer (M.A. '83) writes, "Life is good and still pretty darn interesting out here in SC. Staying busy with various on-going O & G projects in NM but mostly as a dang accountant… oh well. Also have an Inn, restaurant and wedding center out here that keeps me really on my toes… and I thought rednecks were a pain in the butt... try on some of the food service types if you really wanna have fun. And yes, Therese always questions my sanity... and hers. But we are definitely not bored. So if any of the Dirty Dozen or others want to come out for some good Lowcountry cooking and hospitality, I've got just the place for ya. Hope everyone is doing great and enjoying life as we know it... Cheers!" Steve can be reached at speerex@comcast.net.

David Tolces (B.S. '85) writes, "I am proud to announce that in 2011, I became a shareholder at the law firm of Goren, Cherof, Doody & Erzol, P.A., where I specialize in local government, real estate, and corporate law in Florida. There is not too much in the way of visible geology in south Florida, but I did enjoy a trip to Grand Teton and Yellowstone National Parks with my family last summer. Hiking, horseback riding, and whitewater rafting. It was truly magical. A big hello to the Class of 1985. Hook'em Horns!"

Steve Weiner (M.A. '81) lives in Austin and works as a consulting geologist.

Jeff Williams (B.A. '88) writes, "Working on my business. Raising my daughter (age 6). Continuing Dead Sea paleoseismic research. Participated in ICDP project in the Dead Sea in 2010." Jeff lives in Los Angeles, CA.

Susan Williams Haas (B.S. '86) writes, "Three teenagers. One in college. One in high school. One in middle school. Three harps. One website: www.soloharp.com. Ten years in the Pacific Northwest. Closest I've gotten to my geo degree was playing a gig at the summit of Crystal Mountain (7,000 ft)." Susan lives in Lake Tapps, Washington and can be reached at susanwhaas1@comcast.net.

Clayton Wilson (B.S. '83, M.A. '85) writes, "I've been living happily in Melbourne, Australia since 2007; working exploration geoscience for ExxonMobil. Janene and I got married on Fri. 13 of August, 2010 (it was the only day available at the wedding venue). We bought an old house (built 1876) near the Bay, and are working steadily to renovate it. Please look us up if you are in Oz!"

Marc Wink (B.S. '85) lives in Houston and works for Collaboration Consulting, LLC.

David Worthington (B.A. '86) was both very pleased and very alarmed to just receive 'Happy Anniversary' card from the university. Twenty-five years! Eureka, it's been a great adventure. Enjoying life and career in geology in California. Life is good. Onward classmates!

1990s

Namho Baag (B.S. '91) lives in Missouri City, TX and works for Invesco. He can be reached at wristpad2@comcast.net.

Amy Campbell (B.S. '97) writes, "I recently changed investment firms (moving to UBS after 11† years at Morgan Stanley). The change has been very positive & I've enjoyed rejoining some colleagues who made the move before me. I traveled to New Zealand in January (was an absolutely fantastic trip!) & recently spent an amazing long week in Florence & Tuscany. I had a great time at the recent Geo Tailgate catching up with some fellow Hydro alums." Amy lives in Austin and can be reached at amy.campbell@ubs.com.

Danielle Carpenter (M.A. '96) lives in Lafayette, LA and works for Chevron.

Kristin Elowe (Neilson) (B.S. '98) lives in Anchorage, AK and works for the Bureau of Ocean Energy Management.

Laura Faulkenberry Keevil (M.S. '99) writes, "I've been working deepwater GOM at Maersk for two years. I married Robert Keevil in 2010 and we are expecting our first child in September." Laura lives in Houston.

Mark Gordon (Ph.D. '90) writes, "I am still working with Shell in the research lab doing structural geology. Attended Jackson School events at both GSA and AAPG in the past year and was on campus for the AGL meeting and for the Muehlberger symposium. The Jackson school did a Great job! (as WRM would put it) for the latter." Mark lives in Cypress, TX and can be reached at mark_b_gordon@yahoo.com.

Petro Papazis (B.S. '03, M.S. '05), Shale Gas Team Leader at Chevron and former FANs board member, set two Greek National Long Track Speed Skating records at the 2011 World Masters Speed Skating Championships in Calgary, Alberta, Canada. He is now the Greek national record holder in the men's 3,000 m and 5,000 m distances.

Russell Hamman (B.S. '98, M.S. '01) lives in Houston and works for Hamman Oil and Refining Company.

Steven Henderson (B.S. '90) lives in Burleson, Texas and works for Halliburton Wireline and Perforating.

Kirby Wynn (B.S. '92) writes, "Started up my own water consulting firm, Wynn Environmental, in 2009 after 23 great years with USGS. Continue to work with public and private groups to assess and manage waters of western Colorado and throughout the region. Have had a ball in the last year helping develop the newly-created Water Center at Colorado Mesa University (formerly Mesa State). Bess joined Chevron E&P a few years ago and works on their natural gas property development here in Colorado." Kirby can be reached at kirby@kirbywynn.com.

Tania Campbell (M.S. '04) writes, "Sr. Geologist at Oxy Permian working mature CO2 floods. Responsible for reservoir characterization, field surveillance, and infill opportunities." Tania lives in Bellaire, Texas and can be reached at tania_campbell@oxy.com.

David DaGian (B.S. '09) lives in Austin and works for Jones Energy, Ltd.

Luke Francis (B.S. '07) is a graduate student at the University of Houston working on his masters in geochemistry and hydrology. He can be reached at fiddleman6384@gmail.com.

2000s

Blair Francis (B.S.'07, M.S. '09) lives in Katy, Texas and works for BP America. She can be reached at blair.a.francis@alumni.utexas.edu.

Paul Kirby (B.A. '02) writes, "I earned my Professional Geoscientist license in November 2010. I'm teaching myself to play the mandolin and found a passion for cycling. My kids, ages 8, 6, and 4, enjoy school (mostly), love playing the Wii, and really enjoy our nature outings with our Campfire Kids Unplugged group, the Terra Terrors." Paul lives in Austin and works for Daniel B. Stephens & Associates, Inc. He can be reached at paulbkirby@yahoo.com.

Lauren Martin (B.S. '07) lives in Houston and works for Apache Corporation.

Amanda McCutcheon (B.S. '02) lives in San Francisco, CA and works for Oracle. She can be reached at mccutcheon.amanda@gmail.com.

Petros Papazis (B.S. '03, M.S. '05), is a skating sensation (see photo and caption above) and has accepted a new position in Houston with Chevron Energy Technology Company after three and a half years in Calgary with Chevron Canada Resources. Petros can be reached at p.papazis@alumni.utexas.edu.

James Pape (B.S. '08) lives in Houston, TX and works for ExxonMobil.

Roman Pineda (B.S. '00) lives in San Antonio, TX and works for Pape-Dawson Engineers. He can be reached at utexgeologist@yahoo.com.

Stephanie Reed (B.S. '00) writes, "Since graduating the school of geosciences in 2000, I've been actively regulating coal and lignite mining and uranium exploration in Texas. I continue to live in Austin while traveling nationwide (and within the state) to explore every inch of magnificent geology. I've been fortunate to stay in touch with so many of my fellow colleagues and I welcome more reconnections. Geoscientists are the schist!" Stephanie can be reached at steferoni_99@yahoo.com.

Thomas Thacker Jr. (B.A. '08) lives in Wichita Falls, Texas and works for 3-T Exploration, Inc. He can be reached at Thomas@3texploration.com.

J. David Tovar (B.S. '09) lives in Austin and works for Three Rivers Operating Company.

Jean-Paul van Gestel (Ph.D. '00) writes, "After more than 5 years as ex-pat with BP in Europe, we came back to Houston in the summer of 2010. We are sad to leave Europe, but glad to be back in Texas enjoying the Texas friendliness and weather. Our 1.5 year old son Jasper and 3 month old daughter Fleur are keeping us plenty busy for now. I am back at BP where I am working the Gulf of Mexico production fields like Atlantis, Thunder Horse and Horn Mountain looking time lapse responses and other seismic attribute work. I hope to have more time to come back to Austin and the Hill country this spring."

Karah Wertz (Ph.D. '03) lives in Ashton, South Australia.

Sam Beckham (B.S. '10) lives in Austin, TX and works for Jones Energy.

Natalia Chwialkowski (M.A. '10) lives in Irving, Texas.

Edward "Ted" Cross lives in San Antonio, TX and can be reached at ecross@utexas.edu.

Nimesh Kapadia lives in Sugar Land, TX and can be reached at nimeshk@utexas.edu.

60 Minutes: JSG Alum Saves Children in Japanese Tsunami

Jackson School graduate David Chumreonlert (B.S. '08) was among the teachers and students who were wrapping up the day in the small Japanese coastal town of Matsushima when the building began to roll during the greatest quake Japan has ever seen. Steve Pelley of *60 Minutes* interviewed Chumreonlert after the quake.

The Texas native described a harrowing scene in the school's gymnasium, where teachers and students had been herded for safety after the initial tremors. Within 30 minutes, the students and teachers found themselves floating toward the upper walls of the gym as sea water flooded in from the tsunami. Chumreonlert found his footing on what he thinks was the top of the basketball goal. Around 200 people, children from ages 6 to 11 and parents who had come to pick them up, were now floating in the gym, many struggling to survive. The water, Chumreonlert said, came all the way up to the second floor balcony. There was some narrow standing room between the railing and the second floor wall.

"I saw one of my kids, he was struggling. But he came close. I grabbed him, I grabbed his shirt, and I was able to pull him over to the side, and he was able to grab onto the railing. And I helped heave him over," Chumreonlert remembered. "And I saw a big desk with four or five of my kids hanging on to it and they were shouting 'Help me, help, help us, help us,' and I was able to grab a hold of the desk and pull it closer to me and then was able to grab them one by one and we were able to get them over and then there was one more lady and we got her over too."

In two hours, night had fallen. Chumreonlert and the others were in total darkness, with seawater all around them for hours, wondering when the rescuers would come. "And then the aftershocks would come and everyone would huddle down together and be afraid again," he remembered.

"What were you saying to the children over that long dark night?" Pelley asked.

"I just kept saying 'Hang in there, hang in there' and just tried to give them a little smile, make them smile a little bit," he recalled.

"How many survivors would you estimate were up there on the balcony?" Pelley asked.

"I'm hoping at least over 100, I hope, hope. I'm not sure though," Chumreonlert said.

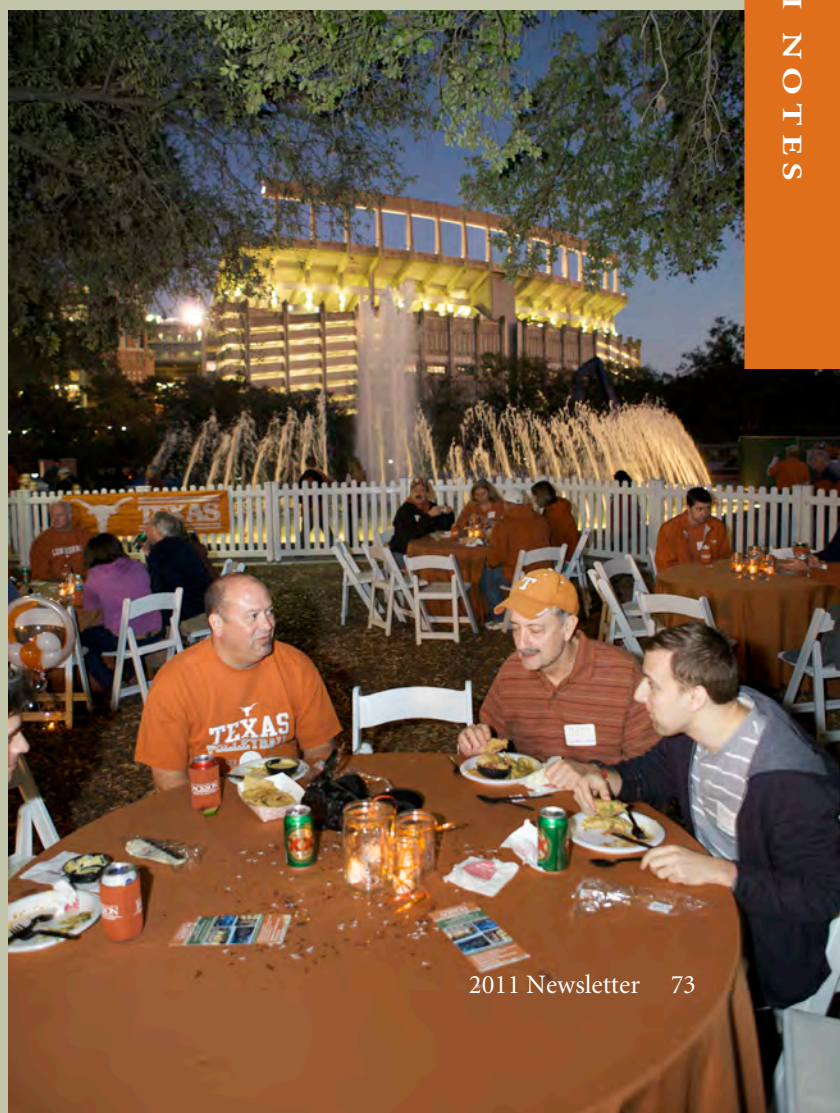
Derek Sawyer (Ph.D. '10) lives in Houston, TX and works for ExxonMobil Exploration Company.

FACULTY & STAFF

Bill Woods writes, "This summer Francisco and I decided to visit Bryce Canyon and Zion National Parks, and come back to Austin via Las Vegas. We had a great time in the National Parks, even climbing to Angel's Landing in Zion! The weather was cool until we got to Las Vegas, where it was very hot. Can't say we enjoyed Las Vegas very much, but did go to see the Hoover Dam and Lake Mead which was interesting. This fall we'll spend Christmas and New Years in Taos. I hope all my friends in GS are doing well!" Bill can be reached at billw@mail.utexas.edu.

Scenes from 2010-11 Events

Clockwise from top left: Alumni and friends at Natural Bridge Caverns on field trip organized by San Antonio Chapter Directors John Long, M.S. '78, David Shetler, B.S. '84, and FANs President Bonnie Weise, B.S. '74, M.A. '79; Philip Guerrero and Clark Wilson at the 2010 JSG Tailgate; JSG FANs past presidents Doug Brown, B.S. '84, Al Erxleben, M.A. '74, and Dan Smith, B.S. '58, at the 2011 NAPE reception; Geology Foundation Advisory Council members tour the Morphodynamics Laboratory at the Pickle Research Campus (see related story, page 47).



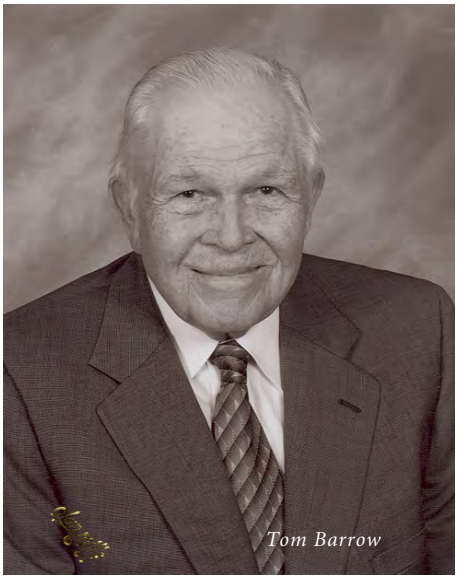
MEMORIALS

Alumni & Friends

Thomas D. Barrow, B.S. '45, M.A. '48, distinguished geologist, business leader, and longtime friend of the geosciences, died Thursday, Jan. 27.

Barrow was a Distinguished Alumnus and a life member and former Chairman of the Geology Foundation. Sharon Mosher, dean of the Jackson School writes, "Tom was one of our strongest, longtime supporters and will be greatly missed."

Dr. Barrow retired in 1985 as vice chairman of the Standard Oil Company (Ohio), one of the companies later merged to become today's ExxonMobil. Among many leadership duties at Sohio, Barrow was responsible for oil and natural gas exploration and production activities and for Sohio's worldwide minerals business Kennecott, of which he had been chairman and CEO prior to its purchase in 1978.



Tom Barrow

Earlier in his career, Barrow helped extend offshore exploration and production to deeper waters throughout the world. A prominent spokesman for the protection of the marine environment and the efficient development of ocean resources, he was one of the founders in the early 1970s of the National Ocean Industries Association (NOIA), which grew into the leading trade association of the offshore petroleum industry.

Dr. Barrow, a native of Texas, earned his B.S. degree in Petroleum Engineering in 1945 and M.A. degree in Geology in 1948 from The University of Texas at Austin. In 1953, he received his Ph.D. in Geology from Stanford University. His doctoral dissertation, done with support from Humble, was on "The Structural and Stratigraphic History of the East Texas Basin."

In 1951, he joined Humble Oil and Refining Company (Exxon) as a geologist in California and by 1962 was named southeastern region exploration manager. He moved up the ladder with Humble to become its president in 1970. In 1972, he was named senior vice president of Exxon Corporation and elected a member of its Board of Directors. In this capacity, Dr. Barrow was responsible for Exxon's worldwide exploration and production activities. Additionally, he was contact director for Exxon Exploration, Inc. and Esso Eastern, Inc. as well as Corporate Planning, Mining, and Synthetic Fuels. His other corporate responsibilities included Exxon Research and Engineering Company, Imperial Oil Limited, Exxon Enterprises, Inc. as well as Production, Science and Technology. Dr. Barrow retired from Exxon in November 1978.

Dr. Barrow was chairman of the boards of GPS Technology (1986-1998), Tobin International (1998-2003), and GX Technology Corporation (1990-2004). He was president of T-BAR-X Limited Co. (1995-2005). Dr. Barrow was a member and former vice chairman of the board of Trustees of Baylor College of Medicine and Houston Grand Opera (president 1985-87, chairman 1987-91). He was a former trustee of Stanford University, American Museum of Natural History, Geological Society of America Foundation and Woods Hole Oceanographic Institution, past president of the American Society for Oceanography and the National Oceanography Association

He was a member of the American Association of Petroleum Geologists, American Geophysical Union and Society of Mining Engineers. He was elected a fellow of the American Association for the Advancement of Science, the Geologic Society of America and the New York Academy of Sciences.

He was a member of the National Academy of Engineering and served on the Commission of Natural Resources and the Commission of Physical Sciences, Mathematics and Resources of the National Academy of Sciences.

The University of Texas at Austin awarded Dr. Barrow the Distinguished Graduate in Engineering in 1970, the Distinguished Graduate in Geology in 1982, the Distinguished Alumnus in 1985 and Distinguished Graduate from the College of Natural Sciences in 1991. In 2005 he was one of the inaugural members of the Jackson School's Hall of Distinction. He is a life member and former Chairman of the Geology Foundation, a Life Member of the Ex-Students Association, member of the Chancellor's Council, member of the President's Associates, and was a member of the Centennial Commission and U.T. Commission of 125.

Dr. Barrow was awarded the Distinguished Achievement Award from the Offshore Technology Conference in 1973. In 1974, the National Ocean Industries Association gave him the same honor. He was named

Chief Executive of the Year for the Metals and Mining Industry in 1979.

Dr. Barrow is survived by his wife, Janice Barrow (nee Hood). They have four children-Theodore Barrow, Kenneth Barrow (member of the Jackson School Advisory Council and former UT doctoral student), Barbara Loyd Barrow McCelvey (UT M.S. '83, Civil Engineering), and Elizabeth Ann Barrow Brueggeman-and nine grandchildren.

James Elwood (Woody) Bryant (B.S. '43, M.A. '48), 88, of Fredericksburg, died Sunday, Jan. 9, 2011, at Hill Country Memorial Hospital. Bryant was born Sept. 15, 1922 in Milam County, the son of Claude Bryant and Mable Miller Bryant. He married Jeneva Wahl on July 23, 1949, in Austin and she survives. After graduation from Cameron Yoe High School and The University of Texas at Austin, Bryant served in the U.S. Army for two years in 1943 and 1945 in the Battle of the Bulge in Germany. After getting his master's degree in geology from UT Austin, he began a long career in oil and exploration, working for several companies and becoming an independent oilman in later years. Bryant belonged to several oil-associated organizations and was also a Mason. In addition to his wife, Bryant is survived by four sons and two daughters-in-law, including Charles Bryant of Fredericksburg; James (Jim) and Elisa Bryant of Marble Falls; William (Billy) Bryant of Dallas, and David and Sharron Bryant of Garland. Also surviving are four grandchildren and four great-grandchildren.

Hiram Worth Burrows, Jr. (B.S. '51) was born on Sept. 25, 1926, in Chicago, Illinois and passed away Feb. 28, 2011, at the age of 84. Mr. Burrows served in the Navy in World War II. He graduated from The University of Texas at Austin as a geologist. He worked for Raflex Exploration for 10 years. He then retired from Motorola after 33 years of service. Among his many interests were teaching, gardening, fishing, golfing, coin collecting, and in his later years playing bridge with friends. He was preceded in death by his son, Hiram Worth Burrows, III. He is survived by his wife of 60 years, Jean M. Burrows; his daughter, Michelle Burrows of Arlington, Texas; his grandson Trent Burrows of Lake Zurich, Illinois; daughter-in-law Ellen Burrows of Lake Zurich; sister Betty Black of Dallas; nieces, Monica Weidmann of Austin and Anita Smith of New Orleans.

Robert William Bybee (B.A. '41) was born Oct. 12, 1919 in Austin, Texas, the son of Hal P. Bybee and Ruth Woolery Bybee. He passed away Sept. 19, 2010. He grew up in San Angelo and Austin and was very proud to be an Eagle Scout. He learned camping, hunting, and fishing at an early age. Bob graduated from Austin High School. In 1941, he graduated from The University of Texas at Austin with a B.S. in geology and was a member of Sigma Nu fraternity. Bob joined Humble Oil Company (later incorporated into Exxon) in 1941. Most of his long career was spent exploring for oil and gas throughout the United States. Bob and his family lived in Louisiana, Texas, and New Mexico. He was involved in Humble Oil's and Exxon's first offshore exploration and for many years was operations manager of headquarters exploration for Exxon. Bob founded the New Orleans Chapter of the American Society for Oceanography and served as the first president. He later served as a national officer of this group for three years. He was also on the National Council of the Marine Technology Society. During 1970-71, he served on the Texas House of Representatives Study Committee on oceanography. In the fall of 1975, he completed two years on the Secretary of Commerce's Advisory Committee on Coastal Zone management. He also served on the Executive Committee and Board of Directors of the National Ocean Industries Association and was active in the American Petroleum Institute, the International Oceanographic Foundation, and American Association of Petroleum Geologists. Bob was also on the Board of the Chihuahuan Desert Research Institute. After his retirement in 1981, he founded Bybee International, serving as a consultant in the oil and gas business. He enjoyed People to People trips with the Petroleum Geology Delegation to China and Russia in the 1980s. His hobbies included hunting, fishing, golf, and travelling. He belonged to the Houston Petroleum Club, River Oaks Country Club, The Old Baldy Club in Saratoga, Wyoming, and St. Charles Bay Hunting Club, where he served as president. His wonderful wife, Elizabeth Rachal Bybee, preceded him in death in 2004 having been married 65 years. He is survived by three daughters and their husbands: Betty and Bob Verplank, Corinne and Bill Sampler, and Joan Bybee and Ira Jaffe; sister Martha Bybee Mills and Herbert Mills; grandchildren: Robert Verplank, Jr. and Delona Kavanaugh, Scott and Kim Verplank, Will and Michelle Simpler, Rachal and Rich Wiski, Trent Simpler and Brody Hooper and Robin Decker. There are also ten great-grandchildren.

Stephen E. Clabaugh (B.S. '40, M.A. '41) died on December 2, 2010. See entry under Faculty & Staff memorials on page 88.

William "Bill" Estel Crawford (B.S. '62), 74, passed away Tuesday, Sept. 14, 2010. Bill was born to William E. and Kathryn Neimeyer Crawford on Feb. 24, 1936, in Dallas. He was a 1954 graduate of Woodrow Wilson High School. After serving on active duty with the U.S. Marine Corps Reserves, he attended Arlington State College and graduated in 1962 from The University of Texas at Austin with a B.S. in geology. Bill spent 37 years working world wide as a geophysicist in oil exploration for Amoco, Mobil, Hunt Energy Corp, and Hunt Oil Co. He was chief geophysicist for Hunt Energy Corp from 1976 to 1980. Survivors: Beloved wife Victora; son, William Crawford; daughters Karen Trout and Linda Bradford; stepson, Aric Griffin; step-daughter, Christina Kitchen; and 11 lovely grandchildren.

Louise Dawson was born in Blackburn, Oklahoma on February 21, 1916 to Ray and Trilby Loper. She graduated from Cleveland High School and Tulsa Business College. Her business career included several years with Baroid in Tulsa and Los Angeles and The Western Company in Midland. Lou was active in several Midland organizations, holding leadership roles in most: First Presbyterian Church, Sam Houston PTA, Rake and Spade Garden Club, Midland Country Club Ladies Association, her "Lunch Bunch", Geological and Geophysical Auxiliary, MRS Investment Club (Mink or Sink), and Girl Scouts. She married L. Decker Dawson on December 23, 1950 and

is survived by him, and their daughter Mary of Denver, Colorado. She is also survived by her sister Maxine Dawson and her husband Arden H. Dawson Jr. (no relation) of Texhoma, Oklahoma; nephew Arden H. Dawson III of Sunray, Texas, and her niece Beverly Harris of Amarillo, Texas and by their children and grandchildren. Her brothers, Raymond who lived in Midland in the late 1950s, and Fremont are deceased. The family would like to express gratitude for the loving care provided by Dr. Gregory Bartha, and Maria Guadalupe Aldama, and caregivers Karen Still, Faye Armstrong, Yvonne Pulchtopek, Susan Lee, Delores Clay, and Latoya Perkins.

Charles J. DeLancey (B.S. '40, M.A. '42) was born March 5, 1919 in West Unity, Ohio to Charles W. and Ruth DeLancey. He is preceded in death by his wife, Eleanor McLerran DeLancey in 2004, and his daughter, Lorna Megan DeLancey in 2002, his parents and sister. Charles grew up in the Houston/Gulf Coast Area. He attended Old Sam Houston High School, The University of Texas at Austin where he earned bachelor's and master's degrees in geology, and California Institute of Technology where he earned a master of science in meteorology. He served in the U.S. Army Air Corp from 1943-1945 and was stationed in Harlingen, Texas, Orlando, Florida, and Guam. Charles began his career as a geologist for Humble Oil (now Exxon Mobil). Charles met his future wife Eleanor on a train trip from Houston to California in 1943 and they married in 1949. After a short stay in California with Humble, they moved back to Houston in 1959 to work in the Major Fields Group. Charles retired from Exxon in 1985. Charles was a member of Tallowood Baptist Church and the Koinoia Sunday School class. He was a member of the Medallion, Endowed Scholarship, and 1845 Societies at Baylor University. Charles is survived by nephews Ken Betts of Houston, Mark Betts of Kingwood, Blake Betts of Austin and many friends at The Hamptons at Tanglewood where he lived his last years. A special thanks to Yolanda Blackshire for her care and friendship of Charles and Eleanor DeLancey through the years.

William R. Dixon (M.A. '58), son of the late William J.B. Dixon and Mary Agnes Butz, was born Jan. 15, 1935 in Rio de Janeiro. He spent his early years in Brazil, Argentina, and Jamaica, moving to Larchmont, New York at age ten. He graduated from Mamaroneck High School, received his B.S. from Lehigh University and his M.A. from The University of Texas at Austin. He served as an officer in the U.S. Army and the Army Reserves. He worked as a petroleum geologist in New Orleans, where he met and married his wife, Sarah Tallulah Taylor. They had three sons, all born in New Orleans, and a daughter, born in Denver, where he moved to work Rocky Mountain exploration in the 1970s. In the 1990s he moved to Dallas to work internationally for a major oil and gas company. He moved to Midland in 2000, a familiar place, as his ancestors were pioneers of the Fort Stockton area. He was a member of St. Stephen's Catholic Church, Sons of the Republic of Texas, as well as professional organizations including AAPG, WTGS, IPAA, IPAMS, and SIPES. He was active in scouting both as a youth and an adult, as well as an avid volunteer at helping Hands of Midland. He enjoyed sailing, vintage sports car racing, hunting, fishing, jazz, and literature, especially poetry. He was preceded in death by his son, William Dixon and his only sibling, Phyliss Jane Dixon. He is survived by his wife Tulie, sons William B. Dixon II, of Houston and Barrett T. Dixon of The Woodlands; daughter E. Paige Sandbom, her husband Jeff Sandom and three grandchildren, Taylor Anders, Victoria Elise and Brendan Mattias Sandbom, all of Parker, Colorado.

John Wesley Duke, Jr. (B.S. '49), 86, of Mexia, Texas passed away Dec. 8, 2010 in Wortham. John was born Feb. 19, 1924 in Woden, Texas to John Wesley and Ketie Mahala (Harrell) Duke. He has been a resident of Mexia since 1993. He graduated from The University of Texas at Austin. He was a geologist prior to his career as a life insurance agent with designation of CLU. John earned two Bronze Stars while serving his country in the U.S. Air Force during World War II. He served as a trustee for Valley Baptist Academy in Harlingen. He was an active member of the First Baptist Church in Mexia. John also enjoyed attending the Men's Prayer Breakfast on Thursday mornings. John was member of many Masonic lodges including Springfield, Dawson, Homer, Thornton, Lufkin, Boggy, Winkler and Barry and served as an officer or Worshipful Master of most of them. He was past District Deputy Grand Master of Masonic District 20, Grand Junior Deacon and was a District instructor for Masonic District #22. John had received his Sixty Year Service Award in July of 2010. He was also a member of the Scottish Rite, York Rite and Shrine. He was preceded in death by his parents, his wife, Lenna Belle, sister, Ruby Duke Alders, and brothers Charles Duke and Clifford Duke. Survivors include his sons, Jerry Duke and wife Anna Schwartz of Gardendale, Texas, and Reverend James Duke and wife Audrey of Mexia; and step-grandchildren, ReJeania Canon, David Bollier and Weldon Bollier. He is further survived by a number of nieces and nephews.

Benjamin Marshall Elms (B.S. '49), 88, of Brenham, died Oct. 16, 2010, at his residence. Elms was born Aug. 9, 1922 in Bettie, Upshur County, Texas, to William Clinton and Mittie (Little) Elms. A graduate of The University of Texas at Austin, he received a bachelor of science degree in geology. Mr. Elms was very proud of his military service to his country in the Air Force. He served during World War II and was held as a prisoner of war in Germany. He was a retired Lt. Colonel in the Air Force Reserve. On May 25, 1947, he married Dorothy Urban in First Baptist Church of Buckholtz. He was confirmed in Mount Olive Lutheran Church in 1952. Elms was a geologist for Union Oil Co. for 35 years, and was a member of Grace Lutheran Church of Brenham. Survivors include his wife of 63 years, Dorothy U. Elms of Brenham; sons and daughters-in-law Clinton and Patty Elms of Houston, and Steven and Karla Elms of Burton; daughter Rhonda Elms of Spring, and daughters and sons-in-law Kaaren and Leon Cummins of Bryan, and Marsha and Bob Hannett of Rockwall, as well as ten grandchildren and nine great-grandchildren.

James Michael "Mickey" Geron (B.S. '60) passed away on Tuesday, Nov. 23, 2010, surrounded by family and friends after a long battle with cancer. He was born on Oct. 25,

1937 to Frances and Bedford T. Geron and was a lifelong resident of Dallas and Estes Park, Colorado. He graduated from Highland Park High School and The University of Texas at Austin. Preceded in death by his parents and brother, Jean Geron. Survived by his wife, Donnie, children Mary Ross and husband, Rusty, Jim Geron and wife, April, and grandchildren, Ryan and Luke Ross and Trip Geron. He had a long career in the investment banking industry where many colleagues remember him as a mentor. He leaves behind many friends from his years as senior vice president at RBC Wealth Management. He served as a board member of the Dallas Crime Commission, Camp John Marc, and The Dallas Woods and Waters Club. Mickey enjoyed a love of the outdoors and a passion for hunting, fishing, and ranching.

Eugenia Rush Gerrard (B.A. '58) was born on July 19, 1937 in Bryan, Texas, the eldest of three beloved children of Eugene Alvin and Dorothy Logue Rush. After a brief illness, Eugenia passed away peacefully at home in La Jolla, California, surrounded by family, on Sept. 4, 2010. Eugenia joyously crafted an adventurous life, one well-lived by any measure. The brightest star in the sky of almost all who knew her, Eugenia will be remembered as a transformative figure, a sweet, complicated, emotionally engaged, and generous woman. Throughout her seventy-three years, Eugenia passionately pursued, nurtured, and maintained complex relationships with an enormous constellation of very fortunate people. Eugenia grew up in College Station, Texas. She graduated from A & M Consolidated High School in 1955 and from The University of Texas at Austin in 1958. As a longtime resident of Berkeley, California, Eugenia was actively involved in the League of Women Voters, and co-founded SAGE, a ground-breaking actualization program for senior living. After moving to San Diego in 1987, Eugenia built a thriving psychotherapy practice. Her deep commitment to the work and to the well-being of her clients will continue to bear fruit for many years to come. Her incredibly full life also included many trips abroad, sailing, and art school, living in a trailer in San Francisco and on a sailboat in Hawaii. If she found it interesting, she did it. Eugenia is survived, mourned, and celebrated by Donald Gerrard, her husband of more than forty years, brothers Alex and Jody Rush, daughter Renee McCracy Kirk, sons Bren and Sean McCrary, and most adored and doted upon grandchildren Bryn Kirk, Sienna Kirk, Caidan speth-McCrary, and Sarah McCrary. While no words can express our collective loss, let it be known to all that Eugenia was a rare and beautiful spirit who continues to be loved and appreciated by all whom she came into contact with.

Curry Walker Hall (B.A. '54), 78, of Houston passed away peacefully Oct. 8, 2010. Curry was born Dec. 23, 1931 to Sam and Phyllis Hall in Tuscumbia, Alabama. He is preceded in death by his parents, two brothers and his daughter, Kathy Hall. Hall is survived by his loving wife Barbara of 27 years; his children, James Hall of Lafayette, Louisiana, Jan Anderson and husband Dr. Stephen Anderson, of Grapevine, Texas, John Frederick and wife Kathy of Diabolo Grande, California; grandchildren, John Frederick, Jr., Greg Frederick, Julie Carter and husband Jim and Reid Anderson; Great Grand Daughter, Camryn Carter. Curry attended Columbia Military School in Memphis, Tennessee for two years before graduating from Tuscumbia High School in 1949. He was a proud member of the United States Marine Corp for two years during the Korean conflict. He graduated from The University of Texas at Austin in 1955 with a degree in geology. Over the next 40 years he worked for prestigious firms such as La Gloria, Trice, Preston, Columbia Gas, Blocker, Wintershell and Flagsdale Hall Consultants. He was a member of GCAGS (Gulf Coast Association of Geological Societies) and AAPG (American Association of Petroleum Geologists). Mr. Curry was an avid runner participating in five Houston Marathons and the Boston Marathon. After retirement in 1994, he enjoyed flying remote control airplanes and spending time with his wife, family, and friends. He was a kind, loving, gentle man loved by all.

John Wade Hampton Jr. (B.S. '53), 80, of Wichita Falls, passed away Tuesday, Aug. 2, 2011. A native and lifelong resident of Wichita Falls, Johnny was born Feb. 12, 1931 to Hazel Edwards Hampton and John W. Hampton. He attended Wichita Falls public schools, graduating from Wichita Falls Senior High School in 1948. He received a bachelor of science degree in geology from The University of Texas at Austin in 1953. While at the university, Johnny was a member of Phi Gamma Delta and later became a lifetime member of Texas Exes. After two years active duty in the U.S. Navy, he returned to join his father in the oil and gas business at John W. Hampton & Son. Johnny took great pride in Wichita Falls and was actively involved in his community. He served two terms on the City Council beginning in 1979 and was active in many civic organizations, serving on the boards of the Central Boys & Girls Club, Wichita County Historical Society and Friends of Kell House. He served as president for the Wichita Falls Symphony League, Broadway Theater League, and the Wichita Falls Council of the Navy League. As a longtime member of the Downtown Rotary Club where he served as president, he was named a Paul Harris Fellow. He also loved cooking with The Mavericks and Ribs, Inc. Johnny had a lifelong passion for hunting and fishing. Some of his most cherished memories were the many outings he enjoyed with his family and friends. He is survived by daughters Kathy Scully and husband Steve, Holly Oman and husband Brady, and Sandy Hampton; and grandsons John Scully, Patrick Scully, Sam Scully, Connor Oman, and Jack Oman.

Cleason Leroy Harris (B.S. '51), age 78, passed away on Wednesday, Jan. 18, 2006 at the Woodlands, Texas. A veteran of World War II, he was preceded in death by his father, C.L. "Dixie" Harris Sr.; his mother, Beatrice Budd Harris; and his son, Michael Harris. Mr. Harris is survived by his daughter, Barbara Harris Labanca and son-in-law, Gary Labanca; by his sons: Mark Harris and Marek Harris; by his grandson, Keith Allen Phelan; and his great granddaughter, Mariana Jayne Phelan. Mr. Harris began working for Stanolind Oil and Gas Company in the 1950s, eventually retiring from Amoco Production Company in 1983.

Roland Banks Hudson (B.A. '58), age 82,

passed away on Thursday, Sept. 23, 2010. He was born Nov. 29, 1927, in San Angelo, Texas, the son of Commie C. Hudson and Marjorie Ellen Carr. He enlisted in the U.S. Navy and graduated from The University of Texas in Austin with a B.S. in geology. Roland was a geologist for most of his life. He was also in a variety of sports in the San Angelo schools. He is survived by his wife, Dolores Hudson of Meadowlakes, Texas; son Stephen Hudson of Marble Falls, Texas; and daughter Diane Hudson of Johnson City, Texas.

Charles Tarleton Jenkins (B.S. '48), World War II pilot, Duncan geologist, and beloved husband, father, and grandfather passed away June 8, 2011 at the age of 87 after a long battle with Alzheimer's disease. Although this affliction removed a lifetime of cherished memories, to the end it never overcame his quiet strength, amiable dignity, and warm kindness—in him these qualities were unconquerable. Charles was born May 20, 1924, to Ethel Means Jenkins and Henry Eades Jenkins, in Casper, Wyoming. The family soon moved to Amarillo, Texas, where Charles graduated from Amarillo High School in 1940. Charles attended The University of Texas at Austin, where he was a member of the Phi Kappa Psi fraternity and where his lifelong passion for the city of Austin and for the Texas Longhorns took root. Answering the call of extraordinary times, Charles entered World War II at age 19 as a C-47 Skytrain pilot and officer of the 437th Troop Carrier Group. He saw action in some of the most dramatic battles of the European theater, including Operation Market Garden, Bastogne during the Battle of the Bulge, and the Allied invasion of Germany at Wesel. Often flying only 300 feet above European soil, dropping off cargo and troops while exposed to enemy 88-millimeter fire, Charles's own planes were hit three times, including a near fatal close call over Bastogne while resupplying the 101st Airborne. Four decades later, he returned with his wife Glennes to some of these historic areas for a reunion of the 437th Troop Carrier Group. There he was gratified to spend time with old squadron friends and enjoy a champagne reception and warm welcomes from still grateful locals. At the American Airborne Museum at Nijmegen in the Netherlands, a photo remains of Charles participating in a military briefing before Operation Market Garden, the largest airborne operation in history at the time.

After completing his service to his country, Charles returned to graduate from The University of Texas at Austin, earning a bachelor of science in geology. He went to work for Skelly Oil Company in Velma, Oklahoma, where in nearby Duncan he met and married on June 10, 1949 in Henrietta, Texas, his dearly loved wife of 62 years, Glennes Dooley Jenkins. With Glennes, he would raise their five beloved children Gay Elaine, Sherry Leigh, Charles Tarleton Junior, Suzanne Marie, and Daphne Jane. During the Korean War, Charles returned to the Air Force for almost two years, after which he retired as a captain. Charles then returned to Skelly in Oklahoma City, and soon afterwards went to work as a geologist in Duncan for Goldsmith & Perkins. In Duncan, he would spend the rest of his career as a leading independent geologist, member of the First United Methodist Church and the American Association of Petroleum Geologists, board member of the American Bank and Universal Life, and past Exalted Ruler of the Duncan Elks Golf and Country Club. Charles's lifetime passions included golf, flying his plane, photography, piano, travelling, and Texas football. All of these pursuits he shared with those he loved; and for the sake of his wife and children—all of whom attended the University of Oklahoma—this Texas Ex had the magnanimity to become a long-time Sooner season ticketholder. Even in Norman he would maintain his characteristic cheerful dignity—although, as he would chuckle and admit, the Longhorns magnified that cheer. Charles and his wife Glennes travelled and photographed many parts of the world, but perhaps no travels meant more to them than their frequent vacations to Hilton Head, South Carolina, where they spent prized time with their children and grandchildren. A wonderful husband, father, grandfather, and friend, Charles was beloved by all who knew him. Strong yet kind, dignified yet affable, authoritative yet warm, he was at home with the best of humanity. But while this world has lost a true gentleman, those who dearly love him can be comforted that Heaven has gained one. Those surviving him include his wife Glennes; their children: Gay Elaine Cox (and husband Robert) of Edmond, Okla., Sherry Leigh Gossett (and husband William) of Duncan, Charles Tarleton Jenkins Junior of Oklahoma City, Suzanne Marie Shields (and husband John) of Edmond, and Daphne Jane Goodson (and husband Jerry) of Duncan; his brother Bill Jenkins (and wife Ann); his brother-in-law Dr. Robert T. Dooley (and wife Jeanne); and his sister-in-law Mary Roberson (and husband Carlos); and many grandchildren.

Joseph Willis Lister (B.S. '55), 81, passed away Sunday, Jan. 23, 2011. He was born Feb. 25, 1929 in Pampa, Texas. He served in the U. S. Air Force during the Korean Conflict. In 1955, he graduated from The University of Texas at Austin with a B.S. Degree in geology. He worked as a real estate agent in Austin and in Rockport. He was active in the Rockport community and in his church. He is survived by his wife, Pat and daughter Pam (Rick) Roe, both of Rockport along with 4 grandchildren; Marc (Alma) Brock of Barton, FL, Meredith Nichole Brock of Rockport, Melissa (Chris) Pump of Medina, Texas and Christy (Marty) Garcia of Bossier City, LA; four great-grandchildren; Kaidanse & Kayleigh Pump, Sebastian Brock and Cheryl Garcia; adopted grandchild, Chelsea Smith and her son, Ayden; 3 sisters, Patsy (Frank) Newton of Little Rock, Arkansas, Fay (Jay) Reynolds of Alexandria, Louisiana and Annis Lister of Atlanta, Texas and niece, Carolyn (Cleon) Harris of Lafayette, Louisiana.


Harry Miller

Harry August Miller, Jr. (B.S. '41), our beloved husband, father, grandfather, great-grandfather, and friend, of Austin, Texas and formerly of Midland, Texas passed away on March 1, 2011. He was 92 years young. Harry was born in Pittsburg, Pennsylvania on Sept. 4, 1918, the son of the late Harry and Margaret Zehfuss Miller. He was married to Anne Sheridan, who predeceased him in 1982 and Marion "MoMo" Miller of Midland, Texas who

survives him. He courageously served our country in World War II as a B-25 bomber pilot in North Africa under General Montgomery. Harry was awarded the Air Medal with three oak leaf clusters for completing over 25 combat missions with General Doolittle in charge. He was then sent to St. Joseph to train women pilots (WASPs) in instrument flying. He was a graduate of The University of Texas at Austin in 1941 with a degree in petroleum geology and served on the Advisory Council for the Geology Foundation. After graduation, he worked for Marathon and Hancock Oil companies and in 1953 became an independent consulting geologist. He was named as an Honorary Member of the American Association of Petroleum Geologists and was past president of the West Texas Geological Society and president of the board of directors of the National Association of Petroleum Geologists. Awed by its magnitude and majesty, nature was one of his greatest joys. His commitment to his community was evident by his active leadership in the American Cancer Society, the Board of the YMCA, and SIPES (Society of Independent Professional Earth Scientists). He is survived by his son, Harry A. Miller, III and wife Dayna of Austin, Texas; and daughter, Margaret (Margo) Carrico and husband Frank of Stockholm, Sweden. He has five grandchildren, Harry Miller, IV, Tiena Brandt and husband Paul of Driftwood, Texas, Frank (Trey) Carrico, III of Austin, Isaac Carrico and wife Liz of Stonybrook, New York and Zachary Carrico of Berkeley, California; stepdaughter, Sully Schreiner lives in San Antonio. Harry has six boisterous great grandchildren, Miller, Mason and Sheridan Brandt, Harry V and Bennett Miller and Cannon Carrico, who will carry on his legacy of the art of a "Granddad joke". Siblings are brother, Mark Z. Miller and wife Katherine, the late George Miller and wife Monette Miller all of Houston, Texas, always waiting for the other to pay the bill. One of his many talents was being a great dancer, both in and out of a wheelchair. He leaves behind many dancing partners, who will forever remember his rhythm and charm. The family would like to express their deep gratitude to Eliborio (Libby) Pena, who was a compassionate caregiver and dear friend to Harry. Also our heartfelt thanks goes to Hospice Austin for the comfort they provided to Harry and the family during his final days.

Benjamin Ernest Morgan (B.S. '48), died quietly at home April 13, 2009. His wife kept loving watch at his bedside. Born to Chester Stephen Morgan and Anna May Smith of Hillsboro, Texas, on March 11, 1924. Hillsboro was his home until he volunteered at age 18 to serve his country in the army. He served honorably in the European Theater of Operation in England, France, and Austria. On returning to the States, he enrolled under the GI Bill of Rights at The University of Texas at Austin to pursue a B.S. degree in geology. It was at the university that he met Cornelia Sample, a fellow student, who became his wife on June 25, 1949. A son, Stephen George, came into their lives in 1953. Ben's first job after attaining his degree was as a scout with the Arkansas Fuel Oil Company. The couple moved to Corpus Christi when Ben became a geologist for Sam E. Wilson. Later he became an independent geologist. When the oil slump hit, a decision was made to stay in Corpus Christi so that his son's education would not be interrupted. He taught math at Tom Brown Middle School for twelve years. With the resurgence of the oil industry, Ben returned as a geologist with Nugget Oil Company. He also enjoyed many years coaching Little League through Youth Baseball. A tragedy struck when his son Stephen drowned, April 2, 1975, while a student at The University of Texas at Austin. The years of retirement allowed Ben time to further cement friendships made in his profession. He enjoyed gardening and playing poker with his former business associates. A new world of interest began when Ben purchased an interest in a leading sire's son, thus began a hobby of ten years duration. Memories that live on in each heart of those who knew him will long remember his even temperament, accepting nature, dry wit, and gentle manner. His word was his bond. Honesty was maintained in all things. Survivors are his wife of 60 years, Cornelia, one brother, Chester S. Morgan and Helen of Oak Ridge, Tennessee, Julian and Mary Rose Brown and Elizabeth Trickett of Baton Rouge, Louisiana; many nieces, nephews, grandnieces and grandnephews.

Charles Brady Morris (B.A. '51, M.A. '55), son and only child of Brady D. Morris and Mary Mozelle Huntington, died peacefully July 12 at his home at Grace House of Lake Travis. He had celebrated his 81st birthday June 18. An Austin native, Charles graduated from Austin High School in l947. The University of Texas at Austin awarded his bachelor's degree with honors in 1951 and his master's degree in geology in 1955. He was a petroleum geologist for years, living in Egypt, Turkey and New Orleans. From 1970 to retirement in l994, he was a programmer at the Texas Rehabilitation Commission. Charles never married and left no offspring. His friends remember him for his sense of humor, his inquisitive and energetic nature, his true support as a friend and colleague, and his love of fun. Besides his friends in Austin and relatives on his father's side, Charles is survived on his mother's side by his first cousins Frank Stack of Columbia, Missouri and Stephen Stack of Fort Collins, Colorado.

Jane Frances Oliver, loving mother, grandmother, unwavering friend, and devoted wife was called to her eternal home on May 22, 2011. Frances was born Sept. 25, 1927 to Grace and Thomas E. Schmidt in Floresville, Texas. After graduating from St. Gerards High School in San Antonio, she went to work for Southwestern Bell Telephone Co. becoming the youngest accounting supervisor. On July 1, 1950, Frances married Fred L. Oliver. Their marriage spanned 62 happy years. Seven children blessed their home in the next eight and one-half years. In 1954 the family moved into the St. Thomas Aquinas Catholic Church Parish where their children attended school. Frances was an active member of the Parish, involved for many years with the Altar Guild. She volunteered for the Ladies of Charity Thrift Shop. Frances loved reading and was involved in The 4th Crane Book Review Club for over 35 years. She loved her Birthday Group friends; they celebrated for over 30 years. She was a den mother, Girl Scouts leader, short order cook, travel guide, bus driver, bed warden, life guard, fire marshal, party planner (hostess extraordinaire),

Fred and Frances Oliver at their induction into the Jackson School's Robert T. Hill Society.

beach babe, vacation home manager, casserole queen, field medic, pet manager for exotic strays including a boa constrictor, coatimundi, raccoons, a javelina, squirrels, chipmunks, bunnies, chickens, doves, parakeets, Tiger the cat, Perky, Noche and Bandit, her beloved dogs. Frances had a passion for traveling and exploring the world with friends and family. Frances is survived by her devoted husband Fred L. Oliver, her children, grandchildren and spouses: Fred L. Oliver, Jr., wife Lori Green Oliver, their children, Jaclyn and Jacob; James Cylburn Oliver; Duane Louis Oliver, daughter-in-law Robin Pulley Oliver and their sons, Christopher and Chase; Jane Marie Oliver Smith, her husband Steven S. Smith and their sons, Oliver, Austin, and Mason Smith; Gary Patrick Oliver, his wife Peggy McDowell Oliver and his son Patrick Oliver; Paul Edward Oliver, his wife Shannon Price Oliver, their sons Nicolas and Travis, and Judy Oliver Lee, her husband Frank P. Lee, and their children, Grace, Parker, Jane Perry, and Jay Lee. Frances was preceded in death by her older brother, Thomas Schmidt Jr. and her parents. The family appreciates the care and compassion from the nurses and staff on the 3rd floor Presbyterian Hospital Hamon Bldg, Dallas Faith Hospice nurses, and Dr. Maureen Gutierrez.

Lucy Owings Ross (B.S. '50), a 55-year resident of Colorado Springs, passed away suddenly on March 9 in Tucson, Arizona. Mrs. Ross was born Lucy Penrose Owings on Aug. 7, 1928, in Prescott, Arkansas. She earned a bachelor of science degree in geology from The University of Texas at Austin in 1950, one of only six women in her class of several hundred to be awarded that degree. She worked for Continental Oil Co. for two years after graduating. Mrs. Ross married James Robertson Ross in Fort Worth, Texas, on July 11, 1952. She moved to Colorado Springs in 1955 and began an extraordinary career in volunteerism that spanned more than 45 years. Among other things, Mrs. Ross was president of the Colorado Springs Child Nursery Centers, president of the Junior League of Colorado Springs, president of the Colorado Springs Alumnae Association of Kappa Kappa Gamma, and founder and president of the Downtowners, a grass-roots organization dedicated to preserving downtown Colorado Springs as the cultural and artistic heart of the city. In 1980, she served as co-chairman of the Greater Downtown Colorado Springs Bed Race with then-mayor T. Eugene McCleary. Her commitment to the revitalization of downtown Colorado Springs was reflected in her service as a member of the Citizens Goals Task Force on Design of the Community; her participation in the Citizens Goals Downtown Council; and her membership on the steering committee to update the city's downtown comprehensive plan. She was fundraising chairman for the Colorado Springs Centennial Committee in 1972. Mrs. Ross was campaign manager for her husband in his successful bids for El Paso County Commissioner and Colorado State Representative in the late 1960s and early 1970s. She was honored in 2009 as a key contributor to the public art initiative of the Downtown Partnership with her name inscribed on a new bronze sculpture, a woman riding a mountain bike, on the downtown side of the Bijou Bridge. Mrs. Ross was named Colorado Springs Woman of the Year in 1976. She returned to a career in mineral management in 1985, when she became president of Deltex Royalty Co., her father's company. She later became president of LMA Royalties. She retired in 2007. Mrs. Ross was preceded in death by her husband in 1992, and by her sister, Audrey Owings of Aspen, in 1981. Survivors include her two daughters, Molly Owings Ross of Castle Rock and Amanda Ross Ritchie of Tucson; her son-in-law, Dennis Ritchie of Tucson; and two grandchildren, Hannah Ritchie and Benjamin (Ben) Ritchie, both of Tucson. Lucy will be fondly remembered for her wonderful sense of humor, her loving acceptance of others, and her ability to inspire people with her infectious enthusiasm for so many worthwhile causes.

Matthew Jay Parsley (M.A. '88), 53, passed away Tuesday, Aug. 31, 2010 in Austin, Texas. Born Oct. 9, 1956 to Bill J. and Alice Hix Parsley, Matt's early years were spent in Lubbock, where he graduated form Monterey High School. He had a love for both sports and music and played basketball and music throughout high school. An accomplished guitarist, he played with his band in college and always loved playing music with his friends and sons. Matt attended Texas Tech University where he received a B.A. in English and Anthropology in 1980 and a B.S. in Geoscience in 1984. He also received a master's degree in geological sciences from The University of Texas at Austin. On Aug. 4, 1984, Matt married Lynne Opryshek in Austin, Texas. They moved to Fairfax, Virginia where Matt began a long career as he said "serving America's energy needs." A desire to return to Texas led Matt to a job with Marathon Oil, and they moved to Midland in 1989. In 1997, Matt formed Parsley Resources, Inc. and began his career as an independent petroleum geologist. He was a member of the American Association of Petroleum Geologists, West Texas Geological Society, the Society of Independent Professional Earth Scientists, and First Presbyterian Church. Matt served for many years on the Board of Directs of the Boys and Girls Club of Midland, including three years as president. He also participated in numerous church and community volunteer activities, always ready to help others. As a devoted father, Matt spent many hours coaching his sons in baseball, and continued to participate as an active supporter of the Midland High Football Booster Club. Many wonderful memories were made golfing, hunting, snow skiing and surfing with his beloved sons. Matt is preceded in death by his father, Bill J. Parsley and his brother Clay parsley. He is survived by his wife, Lynne, sons Nicholas and Samuel, his mother, Alice

Parsley of Lubbock, and his brother and sister-in-law, Clint Parsley and Alex Albright of Austin and his nieces and nephews. Matt was a loving father, husband, son, brother and friend; he will be missed by all who knew and loved him.

William Parker Slater (B.A. '50), resident of Canyon Lake, Texas for 30 years, passed away Feb. 5, 2011 at Christus Santa Rosa Hospital, New Braunfels, Texas. A graduate of The University of Texas at Austin with a degree in geology, he worked for Sinclair Oil & Gas in Midland, Texas before becoming an independent geologist in Midland, then at Canyon Lake. He is survived by his wife Barbara; daughters: Kay Conry (Mike), Trisha Dixon (Billy Edd), Dianne King (Dave), Barbara Goldsmith, Elizabeth Larson (Robert), Lisa Ryan (JP), Valerie Sewall (Kevin) and son, Mark Williams (Dea); grandchildren: Pamela, Melissa, Kelly, Kody, Brandon, Parker, Kristen, Vanessa, Cheyenne, Riker, and Michael; great-grandchildren: Jazmyn, Bryson, Dylan, and Wyatt. Bill was a friend to everyone he ever met and will be missed by all of them. The family would like to express our gratitude to all of the ICU personnel at Christus Santa Rosa for the many kindnesses extended to Bill and his family during his illness.

John Lewis Stripling (B.A. '40), 94, was called by the Lord in the early morning hours of Sunday, Jan. 30, 2011. John was born Jan. 15, 1917, in Big Spring, Texas to the late Fox and Fannie Stripling. John received his bachelor's degree from The University of Texas at Austin and his master's degree from McMurry in Abilene. He served in the military for much of his life and retired as a lieutenant colonel from the Army at Dyess Air Force Base in Abilene, after serving in World War II and the Korean War. Although he and his family lived in various places all over the world, they had made Fort Worth their home for the past 40 years. After military retirement, he began a career as a teacher and later retired from O.D. Wyatt High School in Fort Worth. John loved to play both golf and tennis and played until his late 80s. He was a wonderful storyteller who touched many lives during his 94 years. He will be missed by all who knew him. John was preceded in death by his parents; four brothers; one sister; and grandson, Stefan Schultz. Survivors: His beloved wife of 65 years, Marjorie Albaugh Stripling; children, Marjorie Schultz and husband, Albert, Jeanne DuBois and husband, Richard, John Stripling Jr., Martha Walsh, Julie Mulvey and husband, Kim; grandchildren, Hailey Allen, Amanda Allen, Cameron Walsh, Mackenzie Mulvey, Ryan DuBois, Connor Walsh, and Mollie Mulvey; great-grandson, Fritz Schultz; sister, Emma Ruth Webb and husband, Darrell; and many nieces and nephews.

Richard Kent Waddell (M.A. '41) peacefully passed away Friday, Sept. 25, 2010, after living a long, full life. He died from a medical condition he proudly called TDO (too damn old). He was born in Manila, Philippines on Dec. 17, 1916 to Cyrus and Golden Kelley Waddell, who were teachers at a school for Philippine children. His wife of 64 years, Kay, preceded him in death in 2006. Kent grew up in Sedgwick and Wichita, Kansas. He began loving motorcycles and airplanes while in high school. He graduated from Wichita State University with a degree in geology in 1938. Kent earned a master's degree in geology at The University of Texas at Austin in 1941. During World War II, Kent worked for the Boeing Company as a factory representative, and logged more hours in B-29s than most Army Air Force pilots. Kay and Kent moved to Abilene in 1950 with their two older children. He worked in the oil field full time until motorcycles and airplanes began to take over his interests in the early 1960s. He started Kent's Harley-Davidson in a small shop on Walnut, and was a founder of Abilene Aero. Even in his nineties, he was active in both businesses. He was honored by the Taylor County Chapter of the American Heart Association at Heart Beat '09. The program noted: "Kent Waddell has been a fighter who has loved life. He has survived adversity and lived on. He is probably the best friend one could have. He managed to turn his hobbies into businesses–liked motorcycles, got a motorcycle shop; liked airplanes, got an airport; and loved geology and reading the earth, and made a living sitting on wells. One of the family friends said a long time ago–Kent's got everything wrong with him, and he's going to outlive us all. He's 92, and nowhere near ready to quit!" Kent is survived by Meredith Waddell and David Kaplan of Hudson, New York; Rick and Diana Waddell of Boulder, Colorado; Grady and Rose Waddell of Abilene and Austin, Texas; and Ginger Waddell and Efrain Perez of Costa Rica; 10 grandchildren; and three step grandchildren. The family requests that Kent's friends start each day remembering his recent advice, "Do what you can while you can!" Kent did!

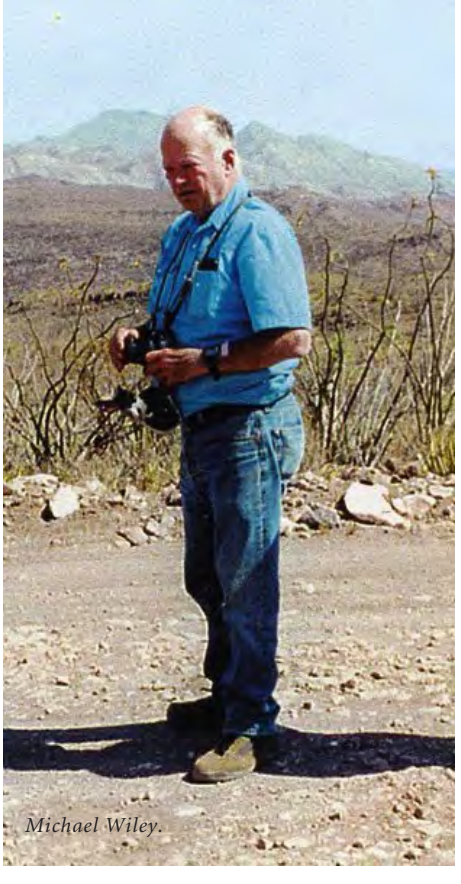
D. R. "Rudy" Wadlington (B.S. '50) was born April 9, 1925 in Haynesville, Louisiana and passed away Oct. 31, 2010 in Allen, Texas. Preceded in death by parents, Clinton and Margaret Wadlington; brother, Ralph Wadlington; and sister, Margaret Gentry. Survived by his wife, Joan Wadlington; daughter, Kelly Fitzgerald and husband Doug; 3 grandchildren; 2 great grandchildren; 2 nephews; and a niece.

William (Bill) C. Ward (B.S. '55, M.A. '57) of Boerne, Texas died early in the morning on Jan. 8, 2011 after a stroke. He was born in Waco, Texas in 1933. After attending Jefferson High School in San Antonio, he received his B.S. and M.S. in geology from The University of Texas at Austin and, after a nine year stint in the oil industry, returned to school to get his Ph.D. at Rice University. He taught geology at the University of New Orleans for 25 years and did academic research in limestone and other sedimentary rocks of Mexico, Spain, Puerto Rico, Egypt and the U.S. Gulf Coast. In 1995, he retired from UNO as an emeritus professor of Geology and with his wife, Kathy, returned to their native Central Texas, where he was an enthusiastic and well-loved volunteer teaching Texas Hill Country geology for several Master Naturalist chapters, as well as for the Cibolo Nature Center, the Gorge Preservation Society (Canyon Lake Gorge), and other groups. Bill also was very active in the Native Plant Society of Texas, wrote a column on native plants for the Boerne Star, and was an avid birder. He and his wife, Kathy Agnew, enjoyed 53 years of marriage. Bill will be missed by his mother Louise (Momo) Ward, daughters Laura Good and Diane Sparkman, son Bruce Ward, sister

Jeanne West and two brothers, Lee Allen Ward and Phil Ward, and five grandchildren, two son-in-laws, and a daughter-in-law.

Michael Alan Wiley (B.S. '57, M.A. '63, Ph.D. '70) was born in Brownwood, Texas on April 25, 1935, the only child of Ruby L. Wiley and Joe L. Wiley. He spent his formative years in University Park (Dallas) and graduated from Highland Park High School in 1953. Mike was introduced to the Navy through ROTC while in high school, an endeavor that proved to eventually become a second career. He then entered The University of Texas at Austin and received the degree of bachelor of science in geology in June 1957. As an undergraduate he belonged to Delta Chi (social fraternity), Alpha Phi Omega (National Service Fraternity), Phi Eta Sigma (National Freshman Scholastic Honor Society), the UT Student Geological Society, and the Young Republicans.

Active in Naval ROTC throughout his undergraduate days, Navy and geology proved to be longstanding careers for him. In September 1957 he was commissioned as an ensign in the U.S. Navy and served aboard the USS Inflict and the USS Alacrity as a minesweeping officer for four years. Following active duty, he continued his military career in the Naval Reserve from which he eventually retired as a Lt. Commander. Always close to water, he was a lifelong sailing enthusiast and was active in sailing organizations including the Grapevine Sailing Club, the Dolphin Sailing Club, and the Power Squadron. His interests and talents were not limited to aquatic activities as he was a long time active member of the Dallas Investment Club.



Michael Wiley.

From 1959 through 1961 he worked as a geophysical computer for Geophysical Service Inc. and National Geophysical Co. (Dallas), as well as Photogravity Co. (Houston). He entered graduate school at UT Austin in September 1961 and received the master of arts degree in geology in August 1963. While pursuing the master's, he found time to return to and become active in Alpha Phi Omega, the National Service Fraternity that he had joined as an undergraduate. Mike's tireless efforts with chapter pledges were recognized with a permanent award in his name, which continues some 40 years later.

He joined Atlantic Refining Co. (now BP) in 1963 and worked as a geologist and geophysicist in Dallas and Houston, Texas and in Lafayette, Louisiana. In 1966 he returned to UT Austin to pursue the doctorate in geology, conferred in 1970. In January of that year he rejoined Atlantic Richfield as a research geologist in their Dallas laboratory and worked there until 1985, when he left to build a successful computer software consultancy specializing in the earth sciences. At the time of his death he was a contract employee for Colorado-based GeoTech Computer Systems, engaged in software development. His professional service commitments most recently included serving as the Gulf Coast Councilor for the Energy Minerals Division of the American Association of Petroleum Geologists. The complete list of Mike's professional activities and accomplishments is lengthy and one of which to be very proud.

In 2000 Mike relocated to Westhaven Community on Canyon Lake near Startzville, where he resided until his death. He was actively involved in the West Haven Home Owners' Association, serving on its board of directors and taking charge of the community security gate for several years.

In 2008 Mike fulfilled his long-held dream of establishing an endowment for acquisition of significant hydrogeology literature for the Walter Geology Library at UT Austin – the Hydrogeology Library Fund.

Following heart surgery in January he was diagnosed with COPD, which rapidly worsened over the past six months. On the night of July 21, 2011 he succumbed to COPD and double pneumonia at Eden Hill Rehabilitation Center in New Braunfels, Texas.

Several cousins survive Mike, along with many good neighbors, friends and colleagues scattered from next door to around the world. Those who knew and loved him will dearly miss his thoughtful and analytical mind. His neighbors and friends will certainly miss his famous barbecued hams, seasoned with his dry wit. We wish you fair winds, calm seas and smooth sailing, Mike.

Addison A. Wilkinson (B.S. '56), 77, passed away on April 12, 2011 at his residence. Mr. Wilkinson, a resident of Lafayette, Louisiana, born on April 5, 1934 in Alexandria, Louisiana, was the son of the late Mason Wilkinson and the former Janet Wyatt, both of Alexandria. After moving to Texas at the age of 5, he graduated high school in 1951 from Denison High School in Denison, Texas. After high school, he attended and graduated from The University of Texas at Austin with a bachelor's degree in geology in 1956. After graduation, he began working as a geologist for Plymouth and Delhi-Taylor Oil Companies. He then began a 25 year career with Tenneco Oil Co., beginning as a geological engineer in South Texas. Throughout his years with Tenneco, he held many positions in many states, as well as in The Netherlands. Addison finished his career with Tenneco in Lafayette, where he made his home, as a vice president and the general manager of their Eastern Gulf of Mexico Division. After his retirement from Tenneco, he was a founding partner and vice president at Newfield Exploration Co., as well as serving on their board for a number of years.

He was a member of the Lafayette

Geological Society and the Lafayette Petroleum Club, the Chancellors Council of The University of Texas at Austin, the Littlefield Society at UT Austin, and a past member on the Advisory Council of the Geology Foundation at UT Ausin. In addition to serving as a board member at Oakbourne Country Club, Ad enjoyed many a fine day on the golf course there with close friends. During his retirement, he developed an interest in working with stained glass, the results of which decorate his home, the homes of his family, and those of many of his friends. As a 25 year resident of Lafayette, he focused his philanthropic efforts on a variety of local groups specializing in education.

He is survived by his wife of 53 years, Betty Wilkinson of Lafayette; one son, Robert Mason Wilkinson of Carlsbad, California; one daughter, Elizabeth Janet Wood and her husband Adam of Dallas; and two granddaughters, Allison Paige Wood and Leah Elizabeth Wood, both of Dallas. He was preceded in death by his parents.
The family is most grateful to the staff of Hospice of Acadiana, especially to Rose and Jenny for the kindness and care given to Addison at home during the last two weeks.

James Anthony Wolleben, Ph.D. born May 6, 1935 in Brooklyn, New York was called to the Lord Aug. 26, 2009. Dr. Wolleben attended St. Augustin High School in Brooklyn, New York where he excelled in academics and basketball. Upon graduation James went on to attend St John's University on a basketball scholarship. He later transferred to the University of Southern Mississippi where he continued to play basketball and where he earned a bachelor's degree in geology. Upon graduation James pursued his master's degree in geology at Louisiana State University. While completing fieldwork in Mexico for his thesis James had the opportunity to meet the love of his life, Margarita Mandujano. Following their marriage James completed his doctorate in geology at his beloved University of Texas at Austin and went on to teach geology at the University of Missouri. James, following his stint at the University of Missouri, went on to teach at the University of New Orleans and later became chairman of the department. In 1976 James accepted the position of Dean of Sciences at Sul Ross State University in Alpine, Texas. During his distinguished years of teaching James received many awards including "Outstanding Educator" and various USGS best white paper awards presented to him at the annual USGS conference.

After his years in teaching James moved into the private sector as senior geologist for Gulf Oil. He later participated in the establishment of Eureka Resources, a geologic consulting company based in Oakland, California. In 1983 James and the family moved back to Austin, where James created and established Advanced Micromagnetics, an oilfield geologic consulting company. James participated in the company's research and day to day activities until the time of his passing. James and Margarita have been active members of St. Theresa's Catholic Church since 1983 where Margarita participated in many of the programs offered by the church. Survivors include his loving wife, Margarita Wolleben of Austin; four sons, Mark Wolleben, Michael Wolleben, Stephen Wolleben, Alex Wolleben, all of Austin; along with two daughters, Adriana Orta of Austin and Monica Volz of San Francisco. Other survivors include his grandchildren, Jordan Wolleben, Rachel Wolleben, Ronald Wolleben, Isabella Orta, Nicholas Orta, Chloe Orta of Austin, and Oliver Volz of San Francisco; as well as son- and daughter-in-law, Matt Orta and Denise Wolleben, both of Austin.

Mark Yelverton (B.S. '78), 55, died suddenly Jan. 25, 2011, while on a business trip in Edmond, Oklahoma. Mr. Yelverton was born on Nov. 4, 1955, in Houston, Texas, to Thomas and Margaret Yelverton, both deceased. He spent his summers as a child and young adult in Riverside, Texas, where his grandfather, John Yelverton, and father, Thomas Yelverton, had historic roots and profoundly close relationships with the community. After raising his family in New Orleans, Mr. Yelverton returned to Riverside to renovate his great-aunt's house, transforming it into one of the most beautiful homes in the area.


Mark Yelverton

Mr. Yelverton graduated from The University of Texas at Austin with a bachelor of science in geological sciences in 1978 and a master of petroleum engineering in 1981 before moving to New Orleans to begin a career at Chevron Corporation. He later accepted a position as the director general of Phibro Energy in the Siberian town of Raduzhny, Russia just months after the fall of the Soviet Union. After subsequently serving as the vice president of the Gulf of Mexico and onshore U.S. divisions of Forcenergy, Inc. in New Orleans and operations manager of Harvest Natural Resources in the region of Maturin, Venezuela, Mr. Yelverton was happy to return to the house he renovated in Riverside to work as an oil and gas consultant.

From the time he was a young man through his adult years, Mr. Yelverton enjoyed spending time with his family in Riverside. He was a gifted equestrian from his youth, and had a passion for keeping up to date with current events and engaging in lively discussion with close friends and family. Mr. Yelverton was a private person, but was known by all for his trustworthy character and honest dealings, both personally and professionally. Throughout his life, he consistently demonstrated an unequivocal loyalty to those that were close to him. Although not outspoken about his faith, he was a Christian who always kept his family Bible nearby and looked to it frequently for guidance and support. Mr. Yelverton is survived by his children, Grant Yelverton and Blaine Yelverton, sons of Lisa Richardson; sister, Carolou Yelverton Ward; brother, Thomas Yelverton, and his wife, Mary Allen Yelverton; brother Andrew Yelverton, and his wife, Loretta Yelverton; uncle, James Harvey Yelverton; many nieces, nephews, and cousins; and his loyal dog Meg. Mr. Yelverton showed compassion toward those struggling with Alzheimer's disease.

James LeGette Yelvington (B.S. '51), 93, was welcomed into God's Kingdom in Heaven on June 11, 2011. Jim was born in Port Lavaca, Texas to Anne Pauline Moore and Henry Blakely Yelvington on Aug. 17, 1917. He earned his associate's degree from Schreiner Institute and his bachelor of sci-

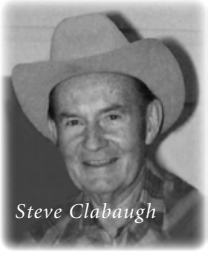
ence Degree in geology from The University of Texas at Austin (Hook 'em Horns!). He retired from Meade Energy after 30 plus years in the oil and gas industry. Jim served in the United States Air Force during WWII as a bomber pilot and was decorated with the Silver Star and Purple Heart.

He was a longtime member of Calvin Presbyterian Church. While attending UT Austin he met the love of his life, Jean Simmons, and they enjoyed many fabulous years of marriage until Jean passed away in 1976. In 1978, he was blessed with a loving marriage to Mary Bernard and they spent many happy years together until her death in 2007. Jim is preceded in death by his parents, four brothers, Henry, Armand, Thomas, and Alvaro, and one daughter, Carol Beaty. He is survived by two sisters, Mary Joe Burleson and Polly Posey; daughters, Priscilla McMillen (Steve), Melinda Earnheart (Bill), and Leigh Tennant. "Grandaddy" will be missed by Brian and Jordan Kelley, Tommy Kelley, Amy Kelley, Sid Earnheart, Ross and Christel Earnheart, Kyle Earnheart, Trevor Tennant, and Joey and Lauren Beaty. His great granddaughter, Adeline, will also miss her "Great Daddy." Even at the very end, he was still concerned with others more than himself, asking "What can I do for you babe?" The family would like to extend our heartfelt gratitude to Dr. Brian Geister for all the years of compassion and care. Also, thanks to Debbie Crouch who took such wonderful, loving care of our Dad.

Faculty & Staff

Stephen E. Clabaugh (B.S. '40, M.A. '41) died on December 2, 2010. He lived a long and full life of 92 years.

He was born in Carthage, Texas to Edmund Cumberland Clabaugh and Cosette Hawthorn on April 2, 1918. He graduated from the University of Texas in Austin in 1940 with a degree in Geology. He earned his Masters from UT in 1941 and his Ph. D. from Harvard in 1950. After working for the U.S. Geological Survey from 1942 to 1946, he began his teaching career at UT in 1947. In 1945 he married Patricia Sutton, a geologist working for the USGS in Washington, D. C. They moved to Austin in 1947. Through the years, their sense of adventure and widespread family lead them on many travels when not enjoying their home on the Pedernales arm of Lake Travis. His interests included gardening, growing vegetables as well as flowers, drawing and painting; he was an animal lover and an avid reader. He was, above all, a teacher and a storyteller and he loved to share his enthusiasm and interests with family and friends. He touched the lives of many people throughout his lifetime.


Steve Clabaugh

He taught at the University of Texas for 33 years. He was the Fred M. Bullard Professor Emeritus in Geological Sciences. He taught physical geology, mineralogy and petrology, metamorphic petrology, and an elementary field geology course, among others. He received the UT Student's Association Award for teaching excellence in 1957. In 1958, he received the Minnie Stevens Piper Award for "outstanding academic, scientific, and scholarly achievement and for dedication to the teaching profession." He served as Department Chair from 1962 to 1966. In 1974 and again in 1978, he received UT's Carolyn G. and G. Moses Knebel Distinguished Teaching Award. Through the years, he supervised an impressive 11 Ph.D. students and 33 Master's students. He was a member of the Geological Society of America for more than 50 years. In 2006, he was inducted into The Jackson School of Geosciences Hall of Distinction.

His wife of 52 years, Patricia, and two brothers preceded him in death. He is survived by three daughters, Catherine Davey and husband Richard Davey of Spicewood, Texas; Cynthia Frederick and husband Steve Hempell of Lillooet, British Columbia, and Deborah DeWig and husband Michael DeWig of Portland, Oregon. There are six grandchildren, Shandra Singer (husband James), Jocelyn Dowd, Nathan Frederick (wife Karen), Ariana Frederick, Heather DeWig, and Paul DeWig; plus 5 great-grandsons, Steven, Jonathan and Zackary Singer, Hunter Dowd and Alex Frederick. He also leaves behind many nephews and nieces and great nephews and nieces.

William Muehlberger, professor emeritus, died of natural causes Wednesday, Sept. 14, 2011.

Muehlberger taught at The University of Texas at Austin for nearly 40 years before officially retiring in 1992. He also taught geology to multiple generations of NASA astronauts beginning with Apollo.

"First and foremost, he was a teacher," said his son Eric. "He loved to teach and had a motivated and captivating audience" in the astronauts.

Bill Muehlberger's shadow looms large in the field of geology. He published the Basement Rock Map of the United States


Steve Clabaugh and his wife, Patricia.

with the USGS in 1968. He published the definitive Tectonic Map of North America, for which he received the 1998 Best Paper Award from the Structure/Tectonics Division of the Geological Society of America.

"[It's] an award-winning map that hangs in probably every geoscience building in the country," said Sharon Mosher, dean of the Jackson School and longtime friend and colleague of Muehlberger.

He conducted field investigations all over the world. He helped train nearly every class of astronaut from Apollo through Skylab and on to recent shuttle crews. He was principal investigator for Apollo 16 and 17, the two missions in which astronauts carried out significant geological research.

He began teaching geology at The University of Texas in 1954. During his tenure as professor and chairman of the Department of Geological Sciences, he supervised 61 master's and 26 doctoral students. His students worked on problems in tectonics, structural geology and petrology in Texas, New Mexico, Colorado, the southern mid-continent basement, Vermont, the Canadian Rockies, the Gulf of Mexico, Mexico, Guatemala, Honduras, Turkey, and the Moon. He and his students made the first geological maps of Honduras, as well as parts of Guatemala and Mexico.

For his work over the years, he received the Medal for Exceptional Scientific Achievement and the Public Service Medal from NASA, as well as the Houston Oil and Minerals Corporation Faculty Excellence Award. In 2009, he was inducted into the Jackson School's Hall of Distinction.

In 2010, a research symposium was organized in his honor, bringing together over 120 colleagues, friends and former students to share the fruits of their research in fields as diverse as North American tectonics, Central American and Caribbean geology, nuclear waste storage in Japan, natural resources, lunar geology and human exploration of space. Speakers and attendees included two Apollo astronauts (Charles Duke and Harrison "Jack" Schmitt), three presidents of the Geological Society of America, three university deans, and representatives of state and federal government agencies, universities, petroleum and mining companies, and consulting firms.

Bill Muehlberger at his retirement party (above) and in the field (below).

Ensuring that his legacy endures in the school, the William R. Muehlberger Graduate Fellowship in Structural Geology/Tectonics was established the same year to support "a graduate student possessing the greatest breadth and depth of geologic knowledge and who is focused on a research project aimed at resolving an important structural geology or tectonic problem." Within a few short months of establishing the fellowship, donors contributed the full $250,000 needed to fully fund the endowment. The first recipient was John S. Singleton, a doctoral student.

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The staff and members of the Jackson School of Geosciences would like to convey our respect to the families of the following alumni:
Richard S. Howell, Jr. (B.A. '50, M.A. '52)
W. J. Roper (B.S. '48)
Wahnez W. Smith (B.S. '41, M.A. '41)

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All alumni, including former researchers and staff affiliated with the school's organized research units, are encouraged to submit. If you are not receiving the newsletter in the mail, this form will ensure that you receive future copies.

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