

THE UNIVERSITY OF TEXAS AT AUSTIN

JACKSON

SCHOOL OF GEOSCIENCES



CHANGING THE **WORLD** OF **GEOSCIENCES**



GRADUATE PROGRAMS

DEPARTMENT OF GEOLOGICAL SCIENCES

DEAN'S WELCOME



This is an exciting time to pursue graduate studies at the Jackson School of Geosciences. Building on our strong tradition of excellence, we are completing the first phase of growth on our path towards becoming the country's preeminent geoscience program. To reach our goal, we are engaged in a series of new strategies that benefit graduate students:

- Creating the world's most student-centered earth science program.
- Attracting and retaining the best faculty and research talent, especially emerging stars who will transform our discipline.
- Increasing the breadth and depth of our faculty and research community.
- Establishing the fabric of a great school—a school of valued partnerships, with a strong sense of community, global in reach, empowering the next generation of scholars and transforming lives for the benefit of society.

In one of the first major moves toward realizing our vision, the school has added 17 outstanding new faculty members. This represents a 40 percent increase in the size of our faculty from 2007 to 2009. We will continue seeking star and emerging star faculty beyond 2009.

With the new hires, we have dramatically enhanced our climate science group, creating a nationally significant resource for graduate studies. At the same time, we attracted outstanding individuals in the school's other key thematic areas, as outlined in the pages that follow.

When the late John A. Jackson endowed our school, he directed his investment broadly, toward "the subjects of geology; geophysics; energy, mineral and water resources; as well as the broad areas of the earth sciences, including the Earth's environment." His investment was the largest single gift by an individual ever made to a public university. The charge of his gift and the responsibilities that come with it are enormous—and so are the outcomes we seek. Please consider joining us in this great adventure.

SHARON MOSHER, DEAN
Jackson School of Geosciences



JACKSON SCHOOL DISTINCTIONS



FACULTY & RESEARCHERS

- Leaders in all disciplines
- School attracting top talent with largest endowment of any geoscience program
- Researchers working on frontiers of geosciences
- Chance to work with outstanding basic and applied researchers pursuing solutions to major societal problems

SIZE & SCOPE

- Breadth and depth across disciplines
- Top ten rankings from *U.S. News* in Geology, Geophysics & Seismology, and Earth Sciences overall
- Largest academic geoscience community in the country
- 25 research programs and centers
- Nine graduate subject areas
- 4,500 alumni worldwide

ACADEMIC COMMUNITY

- Student-centered environment
- Benefits of small school within major research university
- Collegial culture

SUPPORT & OPPORTUNITIES

- Highly competitive support packages, annually best or among best in country
- Guaranteed support for two years (master's) or five years (Ph.D.) for students in good standing
- Opportunities at three major research units and many related university units
- Major on-campus recruiting presence

FACILITIES

- Among best in country
- Student use encouraged



Scenes from Texas' natural laboratory: Above: Eastern approach to the Guadalupe Mountains in west Texas. The steep cliffs are built of limestone formed about 250 million years ago in the Delaware Basin. Below: Hamilton Pool just outside Austin, a karst grotto and canyon where a 50-foot waterfall launches over a fern-covered cliff into a deep swimming hole, with 232 acres of preserve managed by the Travis County Parks.



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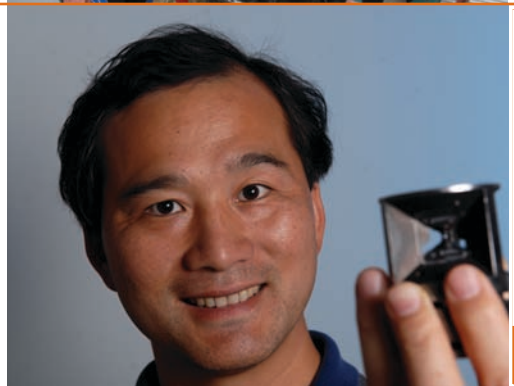


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1

VISION

- 1.1 Changing the World of Geosciences
- 1.2 Faculty & Research Talent

1.1 CHANGING THE WORLD OF GEOSCIENCES

ABOUT THE JACKSON SCHOOL

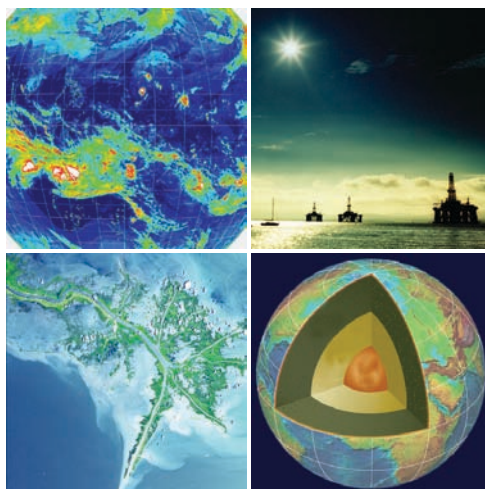
The Jackson School is among the most established and well regarded geoscience programs in the world, uniting one of the country's oldest academic departments of geological sciences with two world-renowned research units, the Institute for Geophysics and the Bureau of Economic Geology. The school is home to the country's largest academic geoscience community with 4,500 alumni, 150 research scientists and faculty members, and the largest combined graduate and undergraduate enrollment (587) of any major earth science program.

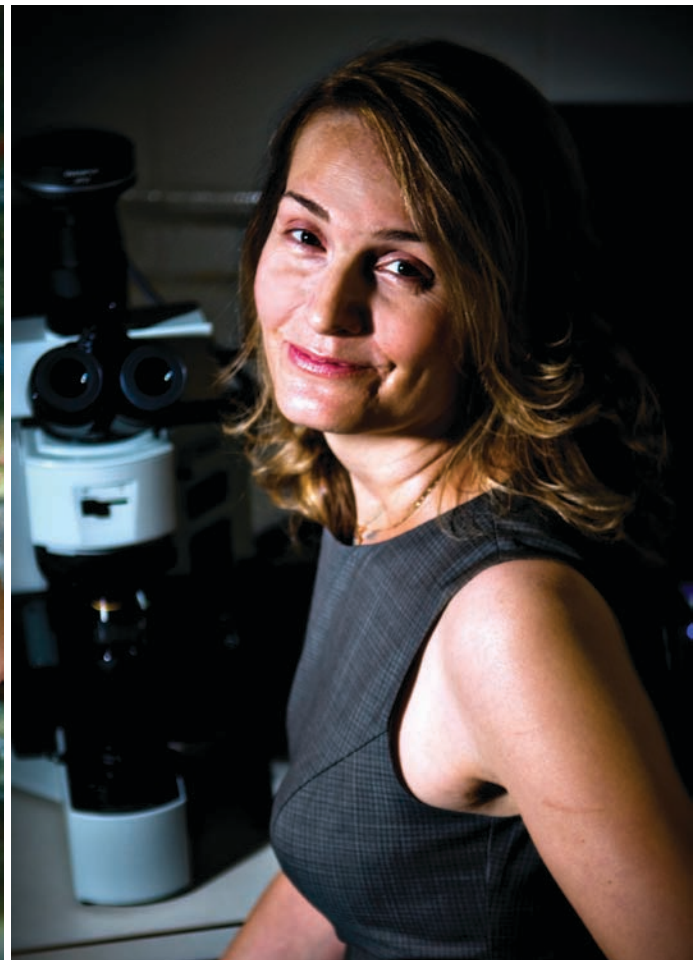
VISION OF THE JACKSON SCHOOL

The vision of the Jackson School is to become the preeminent geoscience program in the country with international prominence in geology, geophysics, energy, mineral and water resources, and the broad areas of the earth sciences, including the Earth's environment. To realize its vision, the Jackson School is pursuing initiatives that place the school at the forefront of research, education, the competition for top talent, and the creation of our future workforce. At the same time, the school is actively maintaining its traditional strength as an institution bridging theory and practice through applied research and the pursuit of projects with maximum benefit for society.

The school is undergoing a major expansion, with rising enrollment, increasing admissions standards, and a substantial influx of nationally recognized and rising faculty and researchers. The heart of the school's expansion is its recruitment of new faculty and research scientists, with growth constellating in four strategic areas related to grand challenges in the earth sciences:

- **CLIMATE:** Improving our understanding of rates of change and variability in Earth's climate; better anticipating changes to determine their impact on society.
- **ENERGY:** Advancing the quest for conventional, unconventional, and alternative sources for the 21st century and beyond; supporting science-based approaches that balance energy and the environment.
- **WATER AND SURFACE PROCESSES:** Seeking the scientific means to create sustainable water supplies for the world's burgeoning population; improving our understanding of critical surface processes such as coastal erosion, river dynamics, and delta formation.
- **SOLID EARTH DYNAMICS:** Working across disciplines to improve fundamental understanding of our planet from surface to core.





1.2 FACULTY & RESEARCH TALENT

AN ESTABLISHED LEADER GETTING STRONGER. Already the largest geoscience research and education enterprise at any university, in 2008 the Jackson School began the largest expansion of any earth science program in the country. By the start of the 2010-2011 academic year, the school has added 18 new faculty members (a 50 percent increase in size), recruiting a mix of established and rising stars. The school continues to pursue highly qualified candidates who complement its core strategic areas. The Jackson School's innovative hiring is highly flexible, targeting researchers who work across disciplinary boundaries and are defining the frontiers of their fields.

The influx of new talent creates outstanding opportunities for graduate students. To explore working with faculty and researchers across the school, we recommend consulting the research expertise database on the Jackson School Web site. (Just do a Web search for "Jackson School research expertise.") You can search more than 200 of the school's research and scientific staff by keyword and area of specialization to find the people and programs you would like to work with.

The school's 17 new hires join a stimulating community whose ranks include members of the national academies, leaders of major collaborative research programs, and current and former leaders of the national geoscience societies. The Jackson School faculty includes past and current leaders of the Geological Society of America, American Association of Petroleum Geologists, American Geological Institute, Integrated Ocean Drilling Program, and Society of Exploration Geophysicists, among many other major organizations. Best of all, the faculty includes a mix of established and emerging research leaders, meaning the people you work with today are likely to have an enduring impact on your career.



Some recent additions to the Jackson School: Opposite page, clockwise from top left: Julia Clarke, Associate Professor, Paleontology; Marc Hesse, Assistant Professor, Geophysics; Elizabeth Catlos, Associate Professor, Petrology and Geochemistry; Joel Johnson, Assistant Professor, Sedimentology and Stratigraphy. This page, left to right: Timothy Shanahan, Assistant Professor, Climate Systems Science; Kerry Cook, Professor, Climate Systems Science; Omar Ghattas, Professor, Computational Geosciences.



Clockwise from top:
Artist's rendering of
the courtyard of the
new student center
to be built in 2012;
GSEC President
Andy Dewhurst
teaches GeoFORCE
students; orientation
barbecue picnic; grad
students at Friday
GSEC social event.



2

COMMUNITY

2.1 Student-Centered
Environment

2.2 Research Culture



“I LOVE THE JACKSON SCHOOL BECAUSE YOU GET TO KNOW ALL OF YOUR PEERS, TAs, AND PROFESSORS ON A PERSONAL LEVEL. YOU CAN WALK DOWN THE HALL AND SEE AT LEAST FIVE PEOPLE THAT YOU KNOW, ALL IN A MATTER OF 30 SECONDS.”

— LIZ DUNN, M.S. ‘09

2.1 STUDENT-CENTERED ENVIRONMENT

A SCHOOL WITHIN A SCHOOL. The Jackson School offers students the benefits of a small school within the overall environment and resources of a major research university. Through shared field work, close ties to professors, and a home base in the Geology Building, Jackson School students forge a strong community. The communal atmosphere is fun, but it’s also sound preparation for the geosciences, where collaboration, networking, and mutual support for lifelong learning are keys to success.

One of the main goals of the school’s strategic plan is to create the most student-centered geosciences program in the country. For graduate students, financial support (page 30), career services, and professional opportunities (pages 32-34) are important ways the school seeks to achieve this goal. Just as importantly, the school fosters a community of professors and scientists who view working with graduate students and helping advance their careers as integral to their jobs.

Weekly presentations by graduate students, Jackson School scientists, and visiting scholars are at the heart of the academic community. The weekly “tech sessions” where graduate students make presentations to their peers and professors are one of the oldest traditions at the school. The student talks culminate with M.S. Thesis Day when graduating master’s candidates present their work to professors and peers. The Bureau of Economic Geology and Institute for Geophysics also host weekly seminars, which are an excellent way to learn about research at the units. Professors and students in hydrogeology, soft rock geology, and geophysics hold their own regular seminars. During any given week of the academic year, anywhere from one to four additional scientists will be on campus making geoscience presentations on a wide range of topics, from the fate of the West Antarctic Ice Sheet to the latest developments in tectonic theory.

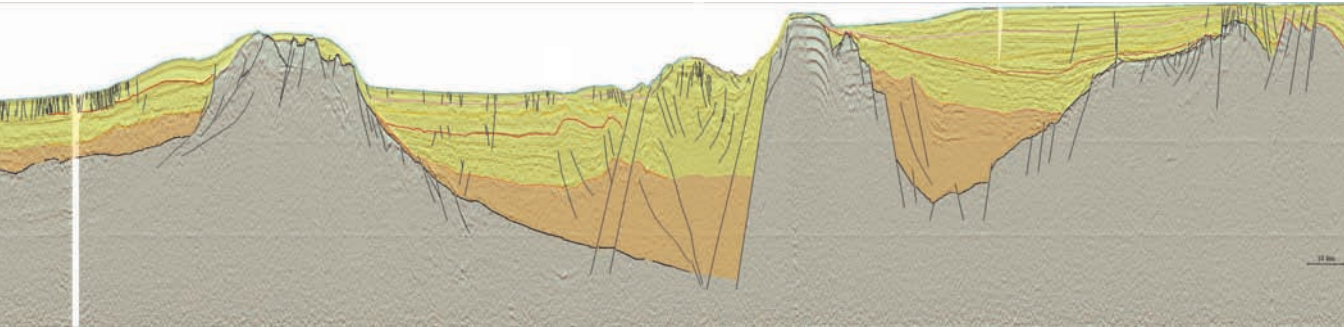
The Graduate Student Executive Committee (GSEC) fosters community beyond the classroom. GSEC’s student officers organize social events, annual meetings, and a weekend for prospective students to visit the school. Two other active student organizations are the chapters of the American Association of Petroleum Geologists and the Society of Exploration Geophysicists. Thanks to these organizations and the professional development funds the Jackson School offers graduate students, the school is strongly represented at the annual meetings of the major geoscience societies. These can be highly valuable trips for students, giving them a chance to meet peers and potential future colleagues, while making poster or oral presentations on their research.

Finally, giving back is an important part of the Jackson School community. Because the Jackson School is a leader in K-12 outreach, graduate students have many opportunities to inspire younger people to explore the geosciences—by volunteering for Earth Science Week, leading activities at Explore UT, the university’s annual outreach event, or teaching with GeOFORCE, the Jackson School’s summer college prep program for minority-serving school districts.



Above, left: Kira Diaz-Tushman, M.S. '07, now an operations geologist for BP, worked in Scotland—with the Bureau's Steve Laubach and Tim Wawrzyneic (pictured) of the University of New Mexico—for the Jackson School's Structural Diagenesis Initiative. Above right: Martin Jackson of the Bureau on the NW coast of Ellesmere Island, Canada, where he co-discovered a partly exposed salt canopy, one of only two known ones in the world. Below, during ICECAP (Investigating the Cryospheric Evolution of the Central Antarctic Plate), Jackson School students flew to Antarctica in an upgraded WW II-era DC-3 outfitted with a suite of geophysical instruments to map the thickness of the ice and measure its topography.





2.2 RESEARCH CULTURE

HANDS-ON OPPORTUNITIES FOR HIGH-IMPACT RESEARCH. Through its three main units and affiliated programs on campus, the Jackson School offers students an outstanding range of opportunities to find work related to their interests—whether they intend to pursue careers in academia, industry, or the public sector. One of the hallmarks of research at the Jackson School is the convergence of basic scientific research with the pursuit of applied solutions benefiting society. As a result, students find many hands-on opportunities in areas of societal relevance such as climate modeling, ice dynamics, reservoir characterization, coastal geology, carbon sequestration, sustainable water supplies, and geohazards.

INSTITUTE FOR GEOPHYSICS

The Institute for Geophysics epitomizes the school's tradition in basic and collaborative research. See pages 8-9 for more information.

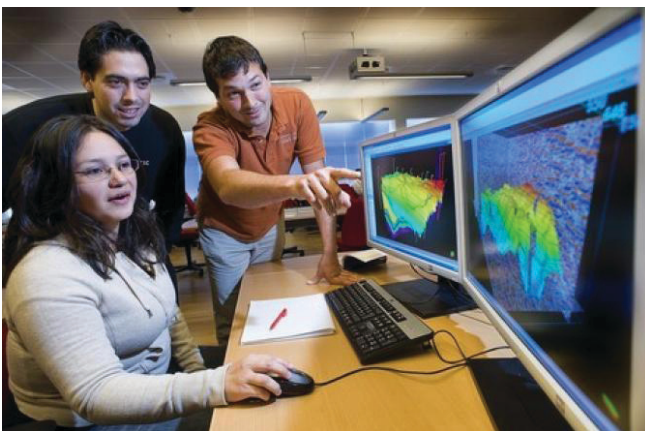
BUREAU OF ECONOMIC GEOLOGY

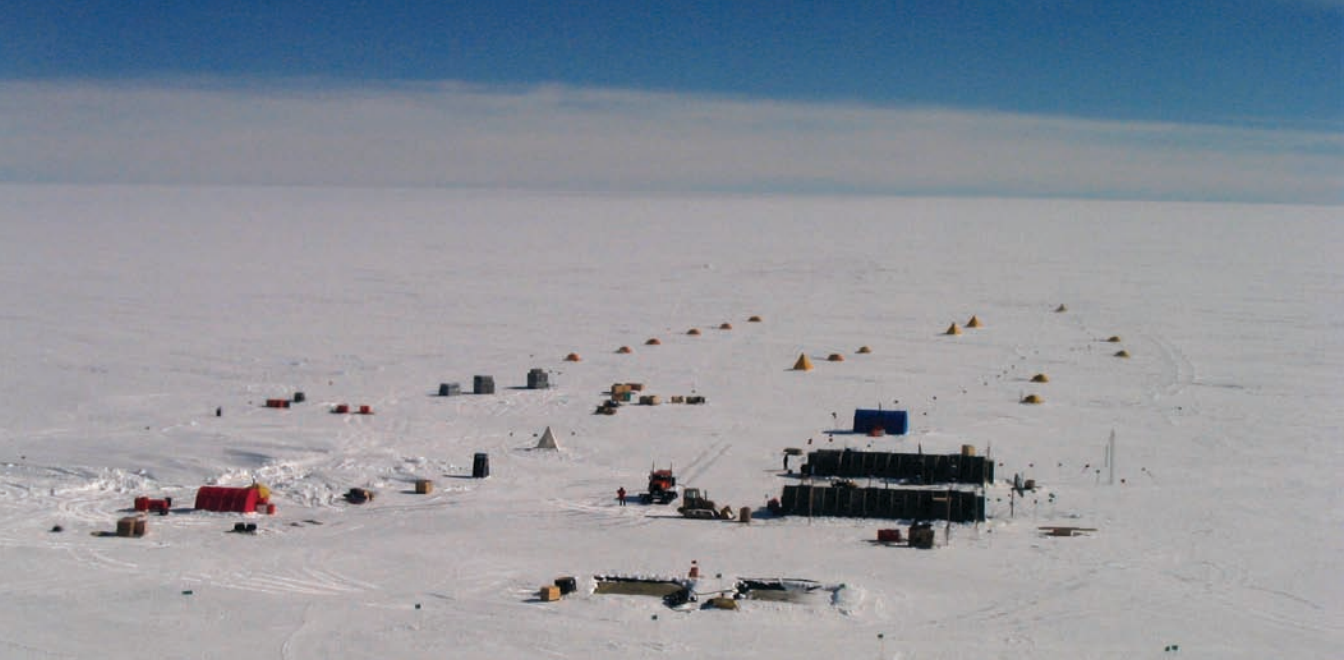
Strength in applied research is highly visible at the Bureau of Economic Geology, a research unit that also functions as the Texas Geological Survey. See pages 10-11 for more information.

DEPARTMENT OF GEOLOGICAL SCIENCES

Opportunities at the Bureau and Institute complement the strong foundation of traditional academic research at the Department of Geological Sciences. The breadth and depth of the Jackson School—with top ten rankings across the earth sciences—make it an ideal place to find mentors and unique research opportunities. The close interaction with faculty is one reason Jackson School students annually win more prizes at the national society meetings for best papers, posters, and research projects than students from any other geoscience program.

Alejandro Escalona, Ph.D. '07 (below left), won the American Association of Petroleum Geologists' award for research in petroleum geology by a younger author. He worked with Professor William Fisher and Paul Mann of the Institute for Geophysics and is now an associate professor of geology at the University of Stavanger in Norway. Marcus Gary, Ph.D. '09 (below right), worked with UT alumnus Bill Stone and Professor Jack Sharp to spearhead a NASA-funded expedition to explore the world's deepest sinkhole, Cenote Zacatón in Mexico. Gary is now a hydrogeologist with Zara Environmental in Austin.





2.3 INSTITUTE FOR GEOPHYSICS

The University of Texas Institute for Geophysics (UTIG) is known for major collaborative projects with an international scope. Founded in 1972, UTIG hosts about 40 scientists, 20 staff, and a rotation of postdoctoral fellows. Students figure prominently in all aspects of UTIG's research programs. By participating in large national and international field programs, students gain technical experience, develop insight into geological and geophysical phenomena, and cultivate professional associations with other scientists.

RESEARCH AREAS

CLIMATE / Climate research at UTIG concerns processes relevant to future global change as well as analysis of past climate over time scales from years to millions of years. Areas of specialization include computing uncertainty in climate models, abrupt climate change, paleoclimatology, and the impact of climate change on the cryosphere.

CRYOSPHERE / For two decades research scientists at UTIG have employed airborne, land-based, and marine geophysical methods to better understand ice sheet evolution, climate, and geologic setting in the polar regions. UTIG is involved in a number of nationally and internationally collaborative polar research projects, such as efforts to examine ice flow history using airborne radar and remote-sensing in Western Antarctica (base camp at Thwaites Glacier pictured above).

MARINE GEOPHYSICS & GEOSCIENCES / Jackson School graduate students work on numerous marine geophysics and geosciences (MG&G) projects through UTIG, which prepares students with an annual MG&G field course. Projects employ a variety of geophysical techniques and target various marine settings including subduction zones in Asia and Central America; mid-ocean spreading centers in the Atlantic and Pacific; complex tectonic settings in the Western Pacific, the Arctic, Alaska (bottom, opposite page), South America, the Caribbean, India, and Antarctica; and coastal systems along continental margins around the world.

QUANTITATIVE GEOPHYSICS / UTIG researchers develop numerical and analytical techniques for modeling, imaging, and geophysical data inversion. They are pioneers in developing practical methods for finding solutions to large inverse problems and evaluating the uncertainty in these solutions. Other interests include analysis of seismic wave propagation, especially in anisotropic media.



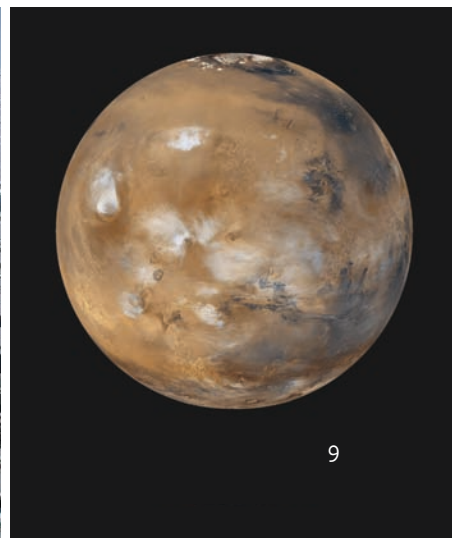
PLANETARY STUDIES / Research on the Earth allows UTIG scientists to make analogies in their studies of Mars and the Earth's moon. The scientists have been funded through NASA and NSF to study multi-frequency radar-soundings, Mars spiral trough and scarp migration, and moonquakes, yielding high-profile discoveries.

SEISMOLOGY / UTIG scientists routinely analyze data from seismographs deployed globally on land, on ice, and on the seafloor as well as on the Moon. Research interests include tectonics, lithospheric structure, mantle dynamics, induced seismicity, seismic/tsunami hazards, theoretical seismology, and lunar/planetary geophysics. In the building where UTIG is housed, computational resources available for algorithm development include an in-house 32-node parallel processor as well as the Texas Advanced Computing Center supercomputer.

TECTONICS / Tectonics research at UTIG ranges from modeling global plate reconstructions to micro-tectonic analysis at the outcrop level. UTIG researchers investigate tectonic processes as diverse as subduction, magmatism, rifting, orogenesis, and plate boundary/triple junction evolution, focusing on how these processes influence and respond to surface processes, glaciation, crustal fluids, climate, and ocean circulation. Two side notes: UTIG's Paul Mann (lower left) was one of the scientists who forecast in 2008 the likelihood of a dangerous earthquake in the region of Haiti. Mann and colleagues regularly take graduate students on field studies throughout the region, such as the NicLakes project (above left) investigating the geologic history of the Nicaragua depression.

INSTRUMENTATION & FACILITIES / UTIG has outstanding technical facilities and instruments, including the *R/V Lake Itasca*, sub-bottom profiling systems, ground-based ice penetrating radar, aerogeophysical systems, a portable high-resolution multichannel seismic system, down-hole technologies for ocean drilling, and supercomputing through the Texas Advanced Computing Center.

FOR MORE INFORMATION visit the Institute for Geophysics' Student Pages at: www.ig.utexas.edu/people/students/





2.4 BUREAU OF ECONOMIC GEOLOGY

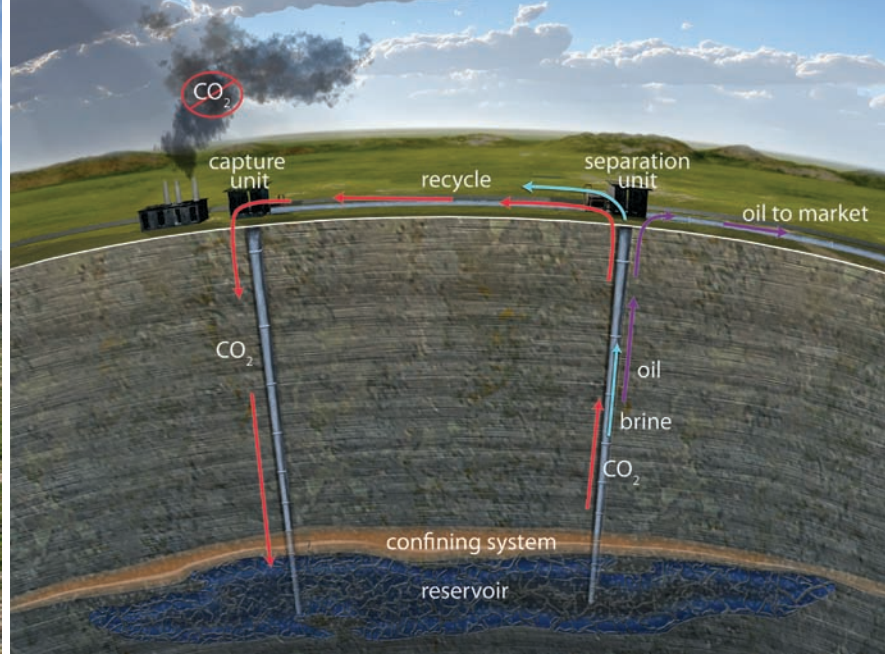
Strength in applied research is highly visible at the Bureau of Economic Geology, a research unit that also functions as the Texas Geological Survey. The Bureau's 70 scientists and engineers conduct a wide variety of high impact research from single-researcher projects to integrated, long-term, multi-disciplinary programs—like the Applied Geodynamics Laboratory working in salt tectonics; FracCity, “dedicated to conquering fractured reservoir problems by 2010”; and the Gulf Coast Carbon Center, managing the country's largest carbon sequestration field experiment. Dozens of graduate students work annually at the Bureau, launching careers in industry, academia, and professional research.

REPRESENTATIVE HIGH-IMPACT RESEARCH

CARBON SEQUESTRATION / The Bureau is the world's leading academic center for research on carbon sequestration—the storage component of carbon capture and storage. Through the Gulf Coast Carbon Center, Bureau scientists led the first U.S. field test of sequestration (2005), the first industry-scale field test (2008-present), and they currently administer a wide-range of ongoing projects funded by industry, federal and state government. Scientists from around the world consult with the carbon center, which employs a cadre of scientists and graduate students.

ENERGY-INDUSTRY CONSORTIA / In addition to research by individual faculty and scientists, the Bureau pursues energy geosciences through consortia—partnerships between industry and academia that give scientists and graduate students exposure to real-world data sets, industry-standard technologies, and pioneering approaches to energy geoscience. Among a wide range of research areas, consortia work on shales, fractures, nanotechnology, reservoir characterization, clastics, and basin analysis in the Gulf of Mexico and Caribbean. See the Energy Geosciences Web site for complete info.

ADVANCED RESOURCE RECOVERY / Through the State of Texas Advanced Resource Recovery project (STARR), Bureau scientists help independent operators around Texas explore the estimated 1.6 bil-

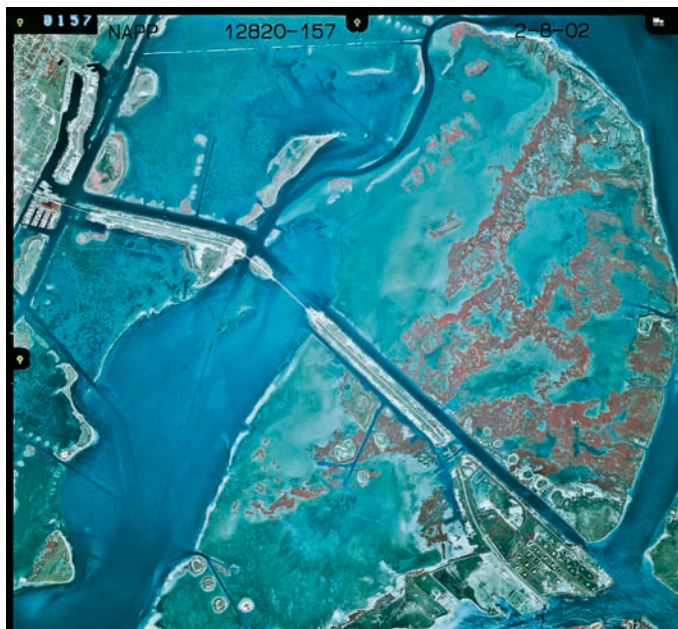



lion barrels of oil and 10 trillion cubic feet of gas that remain to be recovered on state lands. Graduate students learn reservoir characterization in a highly applied setting and have the chance to work with proprietary data sets not usually available to academic researchers.

COASTAL STUDIES & WETLANDS / Coastal scientists at the Bureau conduct research in Texas and around the world. They specialize in mapping coastal environments using advanced technologies such as lidar, radar, multispectral imagery, digital photos, GIS, and geodetic GPS positioning. Recent studies include isotopic age dating to determine sedimentation rates in bay marshes, mapping shoreline types for oil spill contingency planning, and conducting regional assessments of offshore sand resources for beach nourishment. Studies at locations like Harbor Island, Texas (bottom right) examine changes in wetlands distribution through time, particularly as affected by rising sea level.

SUSTAINABLE WATER / The Center for Sustainable Water Resources conducts studies on five continents related to water quantity and quality using field studies and remote sensing, and working at annual to millennial timescales. The center focuses in particular on the impact of agriculture, land-use change, and climate change, with the aim of helping ensure sustainable, safe water supplies for the expanding global population.

FOR MORE INFORMATION visit the Bureau's Web site at www.beg.utexas.edu





Master's degree student Wes Crawford, B.S. '04, M.S. '08, working with Professor William Carlson, relied heavily on data from the electron microprobe, one of the many outstanding instruments available to Jackson School students.

3

ACADEMICS

- 3.1 Degrees & Subject Areas
- 3.2 Climate Systems Science
- 3.3 Energy Geoscience
- 3.4 Geophysics
- 3.5 Hydrogeology & Environmental Geology
- 3.6 Marine Geology & Geophysics
- 3.7 Paleontology
- 3.8 Petrology & Geochemistry
- 3.9 Sedimentology & Stratigraphy
- 3.10 Structural Geology & Tectonics

3.1 DEGREES & SUBJECT AREAS

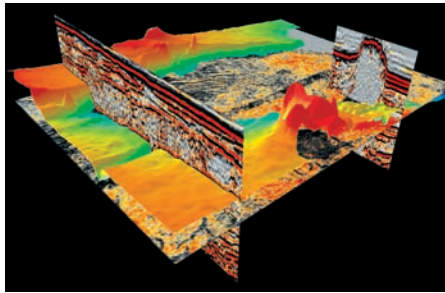
DEGREE OPTIONS TAILORED FOR MAJOR CAREER TRAJECTORIES. The Jackson School offers three degrees through the Department of Geological Sciences: the Master of Science (M.S.) in Geological Sciences, the Master of Arts (M.A.), and the Ph.D. The M.S., which requires twenty-four semester hours of coursework and a thesis, is designed for those planning doctoral study or seeking employment where research and problem-solving skills are essential. The M.A. requires thirty hours of coursework and a report. It is designed for with work experience who wish to expand their professional skill set.

Students pursue graduate work in any of nine subject areas:

- » Climate Systems Science 10
- » Energy Geosciences 12
- » Geophysics 14
- » Hydrogeology & Environmental Geology 16
- » Marine Geology & Geophysics 18
- » Paleontology 20
- » Petrology & Geochemistry 22
- » Sedimentology & Stratigraphy 24
- » Structural Geology & Tectonics 26

ENERGY AND EARTH RESOURCES GRADUATE PROGRAM

The Jackson School also offers a Master of Arts in Energy and Earth Resources (EER). EER is the only program of its kind in the country, teaching students across the disciplines of management, finance, economics, law, and policy in preparation for analytical and leadership positions in resource-related fields. The program is well suited to those seeking careers in energy, mineral, water, and environmental resources. For information, visit the EER Web site at <http://www.jsg.utexas.edu/eer/>.

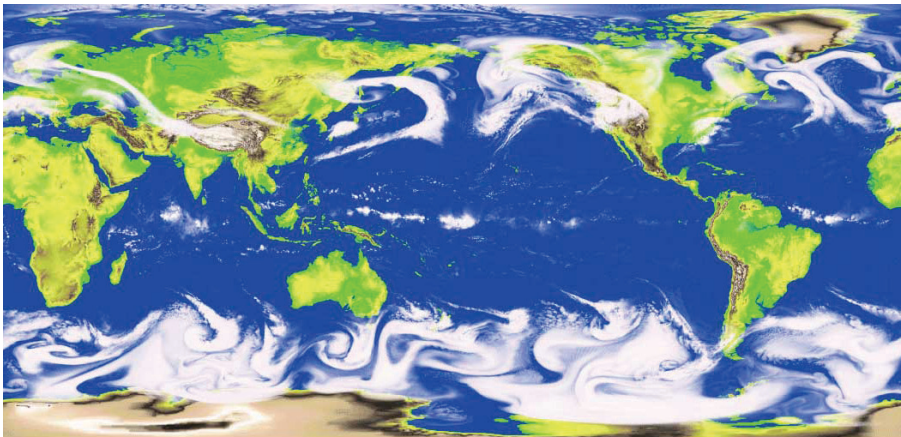


“I WAS ABLE TO WORK WITH THE BEST PEOPLE IN MY FIELD OF INTEREST. MY MENTORS PROVIDED ME WITH OPPORTUNITIES I DON’T THINK COULD HAVE BEEN REPEATED VERY EASILY AT OTHER PLACES. IN MY CASE, I WAS ABLE TO WORK IN AN AREA OF THE ANDES MOUNTAINS THAT VERY FEW PEOPLE IN THE WORLD GET TO VISIT, LET ALONE INVESTIGATE SCIENTIFICALLY. THE OPPORTUNITIES I RECEIVED AT TEXAS GAVE ME EXPERIENCES THAT ARE AMONG THE MOST VALUABLE IN MY LIFE.”

**— KEITH KLEPEIS, PH.D. ‘93, ASSOCIATE PROFESSOR,
DEPARTMENT OF GEOLOGY, UNIVERSITY OF VERMONT**



3.2 CLIMATE SYSTEMS SCIENCE



Global Mesoscale Circulation Model, Geophysical Fluids Dynamic Laboratory, NOAA

With a major influx of new faculty in Climate Systems Science, the Jackson School has significantly risen in prominence as a place to pursue graduate studies in climate. The school previously employed a small cadre of excellent scientists earning competitive national grants for research in paleoclimates, regional modeling, modeling uncertainty, and abrupt climate change. The addition of five new faculty members for 2008-2009 significantly deepened the school's climate team. The new arrivals include two nationally established stars and three professors at earlier stages in their careers who have made significant contributions to the field and show outstanding promise.

Researchers in the Department of Geological Sciences now cover a range of climate topics with particular strength in modeling and the integration of climate science and landscape processes to gain better understandings of the changes that will affect land use, land cover, erosion, sedimentary processes, and environmental quality. Major areas of research include improving global and regional modeling through application of the latest remote sensing technology; mathematical modeling of land surface processes and their role in controlling weather and climate; understanding the processes that control climate variability of the atmospheric hydrological cycle; improving our physical understanding of climate variability and climate change to improve prediction on all time scales; improving regional climate models and building a coupled atmosphere/ocean/vegetation regional model; quantifying the relative role of land versus oceans in determining rainfall in the southwest and south central U.S., with implications for similar semi-arid regions worldwide; investigating the impacts of vegetation-produced chemicals (or biogenic emissions) on air quality.

Paleoclimatology is another well covered subject, involving researchers in the Department of Geological Sciences and the Institute for Geophysics. Studying foraminifera and coral records, Jackson School researchers explore the forcings that initiate climate change and the mechanisms by which

FACULTY & RESEARCHERS

Group Chair:
Robert Dickinson

Jay Banner
Don Blankenship

Dan Breecker
Ginny Catania
Kerry Cook
Robert Dickinson
Rong Fu
Charles Jackson
Terry Quinn

Bridget Scanlon
Rob Scott
Tim Shanahan
Fred Taylor
Liang Yang

See online expertise guide for more..

Climate scientists and computational geoscientists at the Jackson School work closely with the Texas Advanced Computing Center (TACC), home to Ranger, the most powerful supercomputing system in the world for open science research.



climate signals propagate globally. The work synthesizes data and model simulations covering the past 600 million years.

Another set of climate researchers at the Institute for Geophysics has strengths in climate theory and dynamics, ice-sheet dynamics, ocean dynamics, and uncertainties and data inversion. High-profile climate problems are addressed in these disciplines using quantitative models of the dynamic processes of the atmosphere, cryosphere, ocean, and lithosphere; modern satellite, airborne, and in situ measurements of these components of the Earth system; climate proxy time series (paleorecords); and analytical techniques to assess uncertainties in model predictions and proxy reconstructions of climate.

Carbon sequestration does not fit directly into climate science but is a potentially vital tool for mitigating effects on climate from greenhouse gases. The Bureau of Economic Geology is home to the Gulf Coast Carbon Center, one of the world's largest research groups testing the science of sequestration, also known as carbon capture and storage. The center employs a number of graduate students and postdoctoral fellows.

Jackson School researchers in climate include, left to right: Zong-Liang Yang, researching in-situ and remotely-sensed data for the Earth's surface, and modeling studies of weather, climate and hydrology at local, regional, and global scales; Charles Jackson, specializing in abrupt climate change and modeling uncertainty; new faculty member Robert Dickinson, member of both the National Academy of Science and National Academy of Engineering, working on improving the understanding of global and regional climate and earth systems through the modeling of land, vegetation, and radiative processes; new professor Rong Fu, studying processes that control climate variability of the atmospheric hydrological cycle over tropical land for current and future climate.



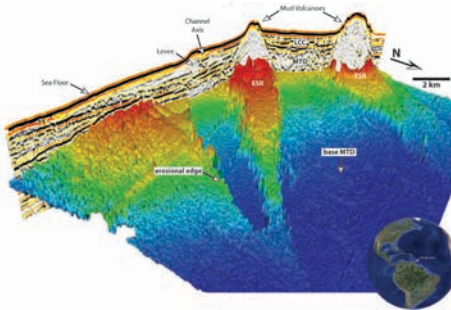
TO LEARN MORE ONLINE ABOUT IN-DEPTH OPPORTUNITIES AT THE JACKSON SCHOOL, VISIT:

- Land, Environment, and Atmospheric Dynamics (LEAD) at the Department of Geological Sciences

- Climate Projects at the Institute for Geophysics
- Carbon Dioxide Sequestration at the Bureau of Economic Geology
- Jackson School Research Expertise Guide

3.3 ENERGY GEOSCIENCE

Left to right: Justin Funk used data from this geophysical survey of Lake Nicaragua for his M.S. thesis, later published in GSA Bulletin; basal surface that defines a regional mass transport deposit in eastern offshore Trinidad, from research by Lorena Moscardelli; Eocene unconformity exposed on eastern flank of Maracaibo basin, Venezuela, photo by Paul Mann.



The Jackson School of Geosciences has a world-class program in energy geosciences research and education. Since its inception as the School of Geology in 1888, it has trained more graduate students who have become petroleum geoscientists than any other institution in the country. Currently, the school has more students pursuing graduate studies in energy geosciences than any other school in the United States. What draws so many energy geosciences students to the Jackson School? Four key elements: the breadth and depth of our research programs; strong ties to the global oil industry and the international firms headquartered in Houston; a collaborative research model allowing students to work as partners in integrated research teams with state-of-the-art industry data; and remarkable past successes of UT geoscience graduates as professionals in the oil industry.

RESEARCH

Energy geosciences at the Jackson School includes five major research areas (outlined in more detail on the school's Web site): 1) Subsurface basin analysis and regional petroleum exploration in clastic or carbonate settings; 2) stratigraphically and structurally complex and fractured petroleum reservoirs in clastic and carbonate areas at all scales; 3) basin analysis, sandstone petrography, diagenesis, and sandstone provenance; 4) reservoir studies and modeling in support of CO₂ sequestration; 5) unconventional reservoirs.

Scientists in the school conduct research that spans all aspects of petroleum geology from the plate scale to the reservoir scale. A long-term focus of the research and education at the school is basinal tectonics that includes world renowned experts and programs in salt tectonics, regional geology of the Gulf of Mexico and the Caribbean, fractured reservoirs, global tectonic reconstructions applied to oil exploration, analog modeling of natural structures, carbonates, diagenesis, sandstone provenance, geofluids, and gas hydrates. The school's research in exploration geophysics and reservoir characterization are

FACULTY & RESEARCHERS

Group Chair: Kitty Milliken

Ruarri Day-Stirrat
Shirley Dutton
Peter Eichhubl
William Fisher
Julia Gale
Charles Groat
Ursula Hammes
Bob Hardage
Mark Hesse
Brian Horton

Sue Hovorka
Michael Hudec
Martin Jackson
Xavier Janson
Farzam Javadpour
Charlie Kerans
Carey King
Steven E. Laubach
Yang Liu
Bob Loucks
Jerry Lucia
Paul Mann
Angela McDonnell
Timothy Meckel
David Mohrig

Lorena Moscardelli
Jean-Phillipe Nicot
Eric Potter
Stephen Ruppel
Diana Sava
Kyle Spikes
Ronald Steel
Scott Tinker
Lesli Wood
Wayne Wright
Christopher Zahm
Tongwei Zhang

See JSG's online Research Expertise Database for more information.

Senior Research Scientist Steven E. Laubach of the Bureau of Economic Geology regularly leads field symposia for the Strategic Diagenesis Initiative and FRAC research consortium, such as this 2007 trip to Scotland.



outstanding. Jackson School research programs address the fundamental problems for the future of the petroleum industry, including unconventional oil and gas, carbon sequestration, and the application of nanotechnology to exploration and production. The school is also home to one of the largest and most diverse sedimentology and stratigraphy faculties in the nation (see section 3.9).

These programs have global reach with ongoing field programs and student opportunities in almost all major petroleum provinces in the world including Texas, the Gulf of Mexico, Mexico, U.S. and Canadian Rocky Mountains, Appalachians, Andes, North Sea, Brazil, Venezuela, Colombia, the Caribbean Sea and Central America region, West Africa, northwest Africa, the Middle East, Indonesia, China and Australia.

Research efforts in pore-scale characterization are supported by an impressive array of in-house instrumentation, including four scanning electron microscopes, an electron microprobe and diverse instruments for light microscopy. Researchers and students have the opportunity to acquire geophysical data through the International Ocean Drilling Project (IODP) and other projects funded by the U.S. National Science Foundation.

INDUSTRY TIES

Close ties to the oil industry in Houston, Texas, and other areas allows access to multi-million dollar, state-of-the-art industry data sets for student research projects. Students have learning opportunities using the most modern computers, software and technical support that are comparable to facilities at major oil companies. In the 1990s, oil companies began shifting a sizeable portion of their research functions to the University of Texas at Austin and other universities in the U.S. and abroad. This new partnership in the form of industry consortia groups that range in size from a few companies to as many as 22 companies insures the close collaboration between the Jackson School and the oil industry in cutting edge fields of mutual interest.

By focusing on the essential problems in the field and developing creative solutions, the school's programs in fractures, porosity evolution, carbonates, clastics, geophysics and salt tectonics, among others, have consistently garnered industry funding at a much higher level than comparable programs at other institutions. Students collaborate with scientists on real world problems in teams that include geologists, engineers and geophysicists. The ability to work in teams on such problems is a highly prized skill in industry. Students working in these areas have the opportunity to meet and work with industry leaders on projects relevant to industry and, when they graduate, to land top jobs.

ENERGY GEOSCIENCES CONSORTIA AT THE JSG

- Advanced Energy Consortium
- Applied Geodynamics Laboratory
- Caribbean Basins, Tectonics, & Hydrocarbons Phase II
- EDGER Forum
- Exploration Geophysics Laboratory
- Fracture Research and Application Consortium
- Gulf Coast Carbon Center

RELATED UT & JSG RESOURCES

- Center for Energy Economics
- Center for International Energy & Environmental Policy
- Energy Institute

- Gulf of Mexico Basin Depositional Synthesis
- Mudrock Systems Research Laboratory
- Plate Tectonics (PLATES)
- Quantitative Clastics Laboratory
- Reservoir Characterization Research Laboratory
- Structural Diagenesis Initiative
- UT GeoFluids

- Department of Petroleum & Geosystems Engineering
- Energy and Earth Resources Graduate Program
- State of Texas Advanced Oil and Gas Resource Recovery

3.4 GEOPHYSICS

Roughly 20 percent of the graduate student body is engaged in research that employs geophysical observations and/or develops new geophysical techniques. The diverse graduate research opportunities in geophysics can be separated broadly into four major themes: field intensive studies, theoretical and numerical investigations, applied geophysics, and regional to global scale studies.

FIELD STUDIES

Examples include Antarctic expeditions with aero-geophysical surveys of major ice sheets; marine geophysical expeditions to understand tectonic and sedimentary processes over the continental margins and deep oceans; broadband seismic experiments to illuminate the structure of the crust and upper mantle; airborne laser mapping of topography to understand terrestrial sedimentary processes; radar and electromagnetic investigations of the near-surface; and active source seismic experiments for near-surface and petroleum exploration studies. There are also development efforts for seismic sources and receivers, gravity, radar, and other field instrumentation.

THEORETICAL AND NUMERICAL INVESTIGATIONS

These include: solutions to inverse problems to estimate complex multi-parameter earth models from large data sets; development of numerical methods to simulate wave propagation and deformation in complex materials via finite element and finite difference methods; inference from and analysis of complex systems, such as Earth's climate variations; and development of algorithms using parallel processing architectures.

APPLIED GEOPHYSICS

Geophysical methods employing seismic and electromagnetic waves can be used to explore for resources, including petroleum, water, and others, and to estimate near surface physical properties for identification of hazards. Examples underway at UT Austin include improved imaging of subsurface structures to support geological interpretation; estimation of subsurface physical properties from conventional and multi-component seismic data; and application of electromagnetic methods (radar and others) to estimate subsurface structure and physical properties.

REGIONAL TO GLOBAL SCALE STUDIES

UT Austin geophysicists develop images of the interior of the earth using seismic waves; study earthquake sources and their distribution in time and space; interpret the deformation of the crust and the forces that cause them; and study Earth's gravity and magnetic fields from surface and space-based observations.

FACULTY & RESEARCHERS

Group Chair: Mrinal Sen

Donald Blankenship
Ginny Catania
Gail Christeson
Michael De Angelo
Sergey Fomel
Clifford Frohlich
Omar Ghattas

John Goff
Stephen Grand
Bob Hardage
Marc Hesse
Jack Holt
Matt Hornbach
Luc Lavier
Kirk McIntosh
Jeff Paine
Jay Pulliam
Diana Sava
Tom Shipley

Mrinal Sen
Kyle Spikes
Paul Stoffa
Robert Tatham
Harm Van Avendonk
Fred Wang
Timothy Whiteaker
Clark Wilson
Hongliu Zeng

See JSG's online Research Expertise Database for more information.



Left: While at the JSG, Eric Lyons, B.S. '02, M.S. '06, helped develop a seismic reference database for Professor Robert Tatham, who leads the EDGER Forum, an industry-academic consortium for geophysics at the Jackson School. Right: JSG students work on vessels around the world, such as Japan's Chikyu Hakken, which in 2007 hosted Research Scientist Nathan Bangs and colleagues on an expedition to the Nankai Trough.

CURRENT AND RECENT RESEARCH PROJECTS

- Development and application of new approaches to the acquisition, processing and interpretation of seismic reflection and other geophysical data.
- Application of geophysical data to problems in stratigraphy and structure.
- Worldwide reflection studies of the continental shelf, slope and rise.
- Plate tectonics, paleomagnetism, worldwide paleogeographic and paleodepth reconstruction.
- Global seismology, seismicity, seismo-tectonics, earthquake hazards, and theoretical seismology.
- Heat flow, subsidence, deposition and tectonic history of continental basins and shelves.
- Studies of Arctic and Antarctic basins.
- Earth rotational and gravity field variations and their causes.
- Studies of the earth's gravity field and geoid anomalies from satellite observation.
- Crustal strain measurements from satellite geodesy.
- Sedimentary economic geology of the Gulf Coast.

TO LEARN MORE ONLINE ABOUT IN-DEPTH OPPORTUNITIES AT THE JACKSON SCHOOL, VISIT:

- University of Texas Institute for Geophysics
- Geophysics Research at the Bureau of Economic Geology
- Exploration Geophysics Laboratory at the Bureau of Economic Geology
- EDGER Forum: Exploration and Development Geophysics Education and Research

RELATED UT AUSTIN RESOURCES

Department of Civil Engineering
 Department of Petroleum Engineering
 Center for Space Research
 Applied Research Laboratory
 McDonald Observatory
 Environmental Science Institute
 Institute for Computational Engineering & Sciences
 Texas Advanced Computing Center
 Marine Science Institute

3.5 HYDROGEOLOGY & ENVIRONMENTAL GEOLOGY



The Hydrogeology & Environmental Geosciences group at the Jackson School reflects the strong connections between land, water, the atmosphere, and life including humans. The Jackson School excels in groundwater and surface water hydrology, vadose zone hydrology, geomicrobiology, basin scale fluid flow, geophysical fluid dynamics, hydrogeology of fractured and karst aquifers, hydrogeology of urban environments, isotope hydrology, and glaciology.

Overall, Jackson School researchers working in hydrogeology and environmental geosciences are motivated by several overarching questions including: How does human activity impact the Earth and the water cycle? How sustainable are our water resources? How can we safely store CO₂ in geologic formations? How does microbial life affect hydrogeologic processes? How do ice sheets respond to natural and forced environmental perturbation?

Environmental geoscience overlaps with major research topics pursued by scientists in the Climate Science group, such as: How realistic are climate models and what are the implications of climate change on hydrogeologic processes? What are the feedbacks between the terrestrial and atmospheric components of the hydrologic cycle? How will the landscape and vegetation respond to climate change?

HYDROGEOLOGY

The University of Texas at Austin campus is close to many unique and beautiful hydrogeological features which offer students and researchers ample opportunities for research. These include the Edwards Aquifer, Barton Springs, Hamilton Pool, Bull Creek, Colorado River, San Marcos River and Springs, and Salado Springs. The city of Austin situated on a karst aquifer experiencing rapid urbanization. Farther afield, the State of Texas offers a wide variety of hydrogeological settings which include arid basins in the west, the Ogallala aquifer of the High Plains, Precambrian rocks of the Llano Uplift, and the large Gulf Coast aquifers.

One focus in hydrogeology is to characterize the geologic and hydrologic controls on subsurface microbial growth, metabolism, and community structure, and the geochemical consequences of microbial biochemical processes. Students and researchers also investigate silicate dissolution ki-

FACULTY & RESEARCHERS

Group Chair:
Bayani Cardenas

Philip Bennett
Jay Banner
Dan Breecker

Bayani Cardenas
Ginny Catania
Peter Flemings
Charles Groat
Marc Hesse
Jack Holt
Joel Johnson
Wonsuck Kim

David Mohrig
Jean-Philippe Nicot
Katherine Romanak
Bridget Scanlon
Tim Shanahan
John Sharp, Jr.

Cuatro Ciénegas (opposite page, left) in Northern Mexico has been the site for groundbreaking hydrogeological research by Ph.D. '08 Brad Wolaver, pictured below with his dissertation advisor, Professor Jack Sharp. Grad student Audrey Sawyer (opposite page, right) took samples during Professor Bayani Cardenas' 2008 field trip to the endangered region. The caves west of Austin (below right, this page) are the scene of research by Professor Jay Banner who finds climate records dating back 70,000 years in their stalactites and stalagmites.



netics, karst and cave formation, sediment transport in karst aquifers, and contaminant transport in fractured rock aquifers, including the fate of pharmaceuticals in karst aquifers.

In physical hydrogeology, researchers investigate regional groundwater flow systems especially in Texas, pressure-thermal-salinity evolution of deep basins and related coastal subsidence, hydrogeology of fractured media, characterizing and modeling the effects of urbanization on groundwater, hyporheic zone hydrology, river-aquifer interactions, non-isothermal mixing dynamics in surface water, hydrogeophysics, accurate modeling and characterization of multiphase and compositional flows from pore to basin scales, studies of cave deposits as records of the links between climate change and hydrology, and modern cave hydrology in response to climate change. Studies of the cryosphere include ice sheet dynamics, mass balance and stratigraphy, subglacial hydrology, and uncertainty in ice sheet response to climate. Other research thrusts include lake paleohydrology, and material transfer between soils and the atmosphere.

ENVIRONMENTAL GEOSCIENCE

Three research units conduct much of the environmental research at the university. The Environmental Science Institute is a multi-disciplinary institute for basic scientific research in global and local environmental studies. Locally, there is heightened awareness of the numerous environmental problems facing the State of Texas and the Texas-Mexico borderlands. These include the contamination and depletion of water supplies, contamination of the atmosphere, and the encroachment of non-native species, all in the face of one of the most rapidly growing populations in the country.

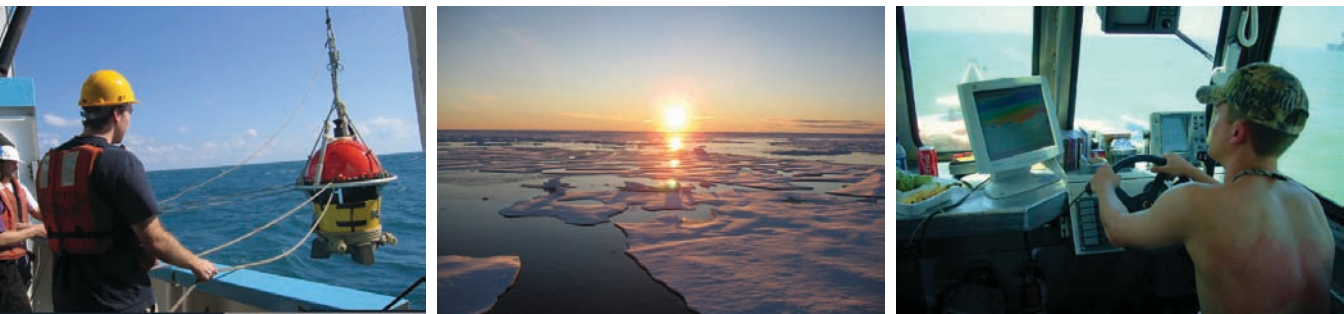
The Bureau of Economic Geology's researchers have major initiatives that relate energy and the environment, including several projects in sequestration of greenhouse gases. The group investigates characteristics and processes of shallow Earth systems and impacts of human activities on those systems.

The Center for International Energy and Environmental Policy supports research informing governments and corporations worldwide on the formulation of policies and strategies on energy and the environment.

TO LEARN MORE ONLINE ABOUT IN-DEPTH OPPORTUNITIES AT THE JACKSON SCHOOL, VISIT:

- [Hydro Research @ UT](#)
- [Climate Research](#)
- [Environmental Science Institute](#)
- [Geoscience/ Environmental Research at the Bureau of Economic Geology](#)
- [Center for International Energy & Environmental Policy](#)

3.6 MARINE GEOLOGY & GEOPHYSICS



Marine geology and geophysical (MG&G) research at the University of Texas at Austin includes the exploration of earth processes through a variety of techniques in oceans and on continental margins around the world. Our research projects have a large emphasis on sea-going field work with active involvement by students. We have research projects currently in Indonesia, Alaska, Scotia Sea, Taiwan, New Zealand, the Caribbean, Nicaragua, New Jersey, the Gulf of Mexico, Australia, and the Arctic with many opportunities for collaboration.

Jackson School scientists apply marine geological and geophysical methods to a broad spectrum of problems, including studies of subduction zone processes and associated hazards, formation and evolution of oceanic crust, tectonic collisions and plate boundary evolution, tectonic-climate interactions, continental margin stratigraphy and sedimentary processes, records of past sea level, and climate change.

Funding from the National Science Foundation, Office of Naval Research, industry, and other sponsors enables our researchers and their national and international collaborators to pursue their interests in many parts of the world. The Jackson School's MG&G scientists are well respected by their colleagues, and their publications are highly cited. The Jackson School is proud to have more than 25 scientists conducting MG&G research under its umbrella. Its researchers and students have earned the Jackson School its reputation as one of the premier places to study marine geoscience.

Since 2008, the Jackson School has offered an MG&G Field Course every May designed to provide hands-on, at-sea and in-the-lab instruction for graduate and upper-level undergraduate students in collecting and processing MG&G data. Instruments and techniques include multibeam bathymetry, sidescan backscatter, chirp seismic reflection, multichannel seismic reflection, and sediment grain size analysis. Few geosciences programs around the country offer this kind of opportunity. Additional courses available to MG&G students include marine tectonics, basin analysis, crustal geofluids, 3D stratigraphy, earth dynamics, geographic information systems, seismic reflection processing, hydrogeophysics, paleoclimatology, paleoceanography, numerical methods, morphodynamic modeling, and topical seminars of current interest. MG&G students at the Jackson School

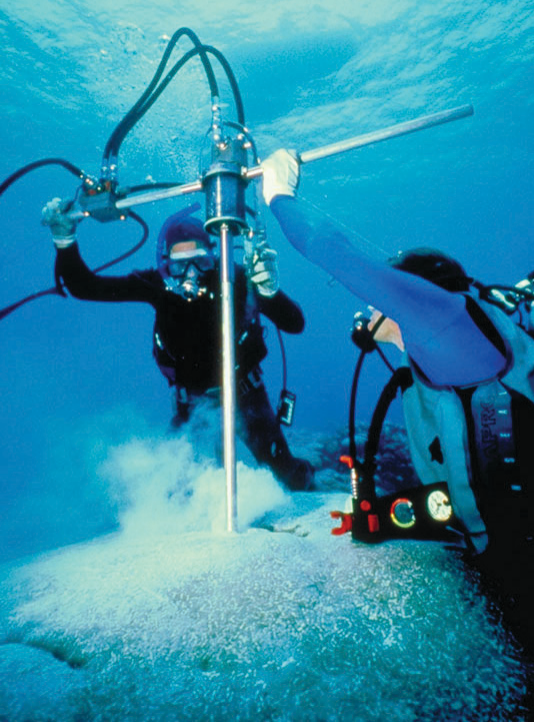
FACULTY & RESEARCHERS

Group Chair:
Sean Gulick

Mead Allison
Jamie Austin
Nathan Bangs
Gail Christeson
Ian Dalziel
Peter Flemings

Cliff Frohlich
Craig Fulthorpe
Bill Galloway
John Goff
Sean Gulick
Nick Hayman
Matt Hornbach
Brian Horton
Luc Lavier
Larry Lawver
Paul Mann

Kirk McIntosh
David Mohrig
Yosio Nakamura
Ian Norton
Jeff Paine
Terry Quinn
Mrinal Sen
Ron Steel
Tom Shipley
Harm van Avendonk



*Left: Extracting core with hydraulic drill on a *Porites lobata* colony, Clipperton Atoll (NOAA/ Maris Kazmers). Right: Participants from 2008 MG&G field course, l to r: Gail Christeson and Anatoliy Mironov (Institute for Geophysics), Beatrice Magnani (University of Memphis).*

also have the opportunity to participate in sea-going expeditions for their own data acquisition or for educational enrichment and to travel to national and international conferences to present their research results.

FACILITIES

The MG&G program within the Jackson School of Geosciences boasts a number of cutting edge facilities including the laboratories at the University of Texas Institute for Geophysics (UTIG) located on the Pickle Research Campus in north Austin. The UTIG facility includes fully accessible personal computers and workstations, and geophysical software for data processing, interpretation, and visualization, all maintained by outstanding support staff. UTIG also operates, and makes available to students, high-resolution geologic and geophysical equipment for at-sea research, a small coastal research vessel (the R/V Itasca), and an active Ocean Bottom Seismometer program with a long history of deployments around the world. We also host a Seismic Data Center that ensures data collected over multiple projects throughout the years is accessible by the community.

MARINE GEOLOGY & GEOPHYSICS FIELD COURSE

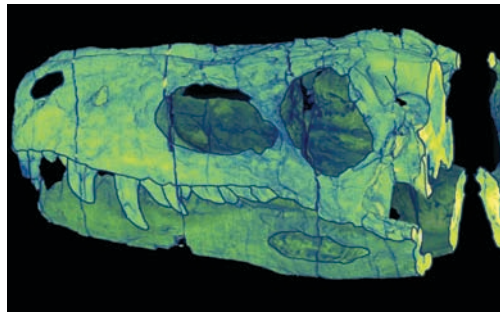
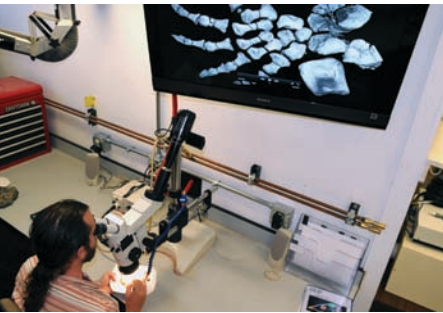
The Jackson School offers a marine geology and geophysics (MG&G) field course for graduate and undergraduate students. “More science classes should be taught this way,” wrote Kelley Brumley, a graduate student from the University of Alaska who participated in the 2008 course sailing out of Galveston. Perhaps the most valuable thing students learn, said field course instructor Sean Gulick, is whether collecting MG&G data is something they’d like to do for a career. “You either like going to sea or don’t,” he said.

RELATED JSG & UT AUSTIN RESOURCES

- [Marine High-Res Geophysics Center](#)
- [Ocean-Botton-Seismometer Program](#)
- [Marine Seismic Data Center](#)
- [Research Vessel Itasca](#)
- [Marine Science Institute](#)

3.7 PALEONTOLOGY

This page, left to right: Guided by CT data, Matt Brown prepares the first fully articulated foot ever found from a Tritylodontid, a close relative of mammals; Quetzalcoatlus, discovered by UT Austin graduate student Doug Lawson in 1971; This Herrerasaurus skull was scanned at the university's world renowned CT lab, revealing details of the dinosaur's brain digitally without actually cutting open the fossil. Opposite page: Graduate students carry a jacketed specimen of a new species of dinosaur in northern Arizona.



Jackson School paleontologists and their students collect field specimens at sites around the world, including the Southwestern U.S., South America, Australia, Antarctica and Asia. The university is home to the world's premier CT scanning facility for fossils and other natural history specimens, as well as one of the nation's seven largest paleontology collections.

The program has a long history. In the past century, the university has graduated more than 400 master's and Ph.D. students in paleontology. Endowed funds enable students to lead their own field research. Graduates of the program have gone on to an array of academic and non-academic appointments including faculty positions at such institutions as the University of California at Berkeley, the University of Iowa, and Oklahoma State University.

Paleontological research at the Jackson School is motivated by several overarching questions: What were the causes and mechanisms for change in major lineages represented in the fossil record? What is the evolutionary history of lineages such as echinoderms, birds and other dinosaurs, mammals, lizards and snakes? How can we use the fossil record and phylogenetic hypotheses to test current theories, and make predictions about potential consequences of current global-change phenomena?

Vertebrate paleontologists in the Jackson School focus on the evolutionary morphology of vertebrates, evolutionary ecology (recent and ancient), phylogenetic systematics, and the evolution of development. The program's three vertebrate faculty members and two emeritus professors focus on mammals, reptiles, amphibians, birds and other dinosaurs. One research thrust involves identifying major innovations in the evolution of flight, the shape and color of feathers, and the co-option of the aerial flight stroke for wing-propelled diving in birds. Other projects focus on how changes in climate during the Quaternary affected the evolution, diversity and distribution of mammals, amphibians and reptiles. Still other research projects center on the evolution of sensory systems.

FACULTY & RESEARCHERS

Group Chair:
Timothy Rowe

Chris Bell
Julia Clarke
Ann Molineux
James Sprinkle

TO LEARN MORE ONLINE, VISIT:

- [Non-Vertebrate Paleontology Laboratory](#)
- [Vertebrate Paleontology Laboratory](#)
- [High-Resolution X-ray Computed Tomography Facility](#)
- [Texas Natural Science Center](#)
- [Digital Library of Vertebrate Morphology \(DigiMorph\)](#)



The school's invertebrate paleontology program focuses on the development of early Paleozoic echinoderms and Mesozoic rudists. This research includes trying to determine the origin, early evolutionary history, paleoecology and closest relatives of the earliest crinoids in the Early Ordovician based on new collections from the Rocky Mountains. Researchers are also looking at the expansion of all types of echinoderms during the Cambrian Explosion and the Great Ordovician Biodiversification Event. Other research projects explore the connections between changes in major reef-building organisms through time to better understand how conditions in the global ocean changed.

FACILITIES & EQUIPMENT

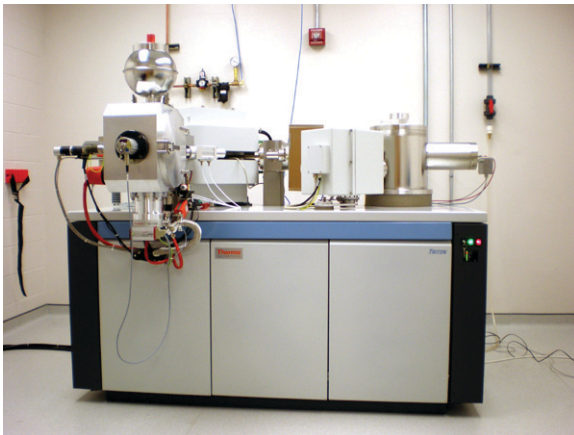
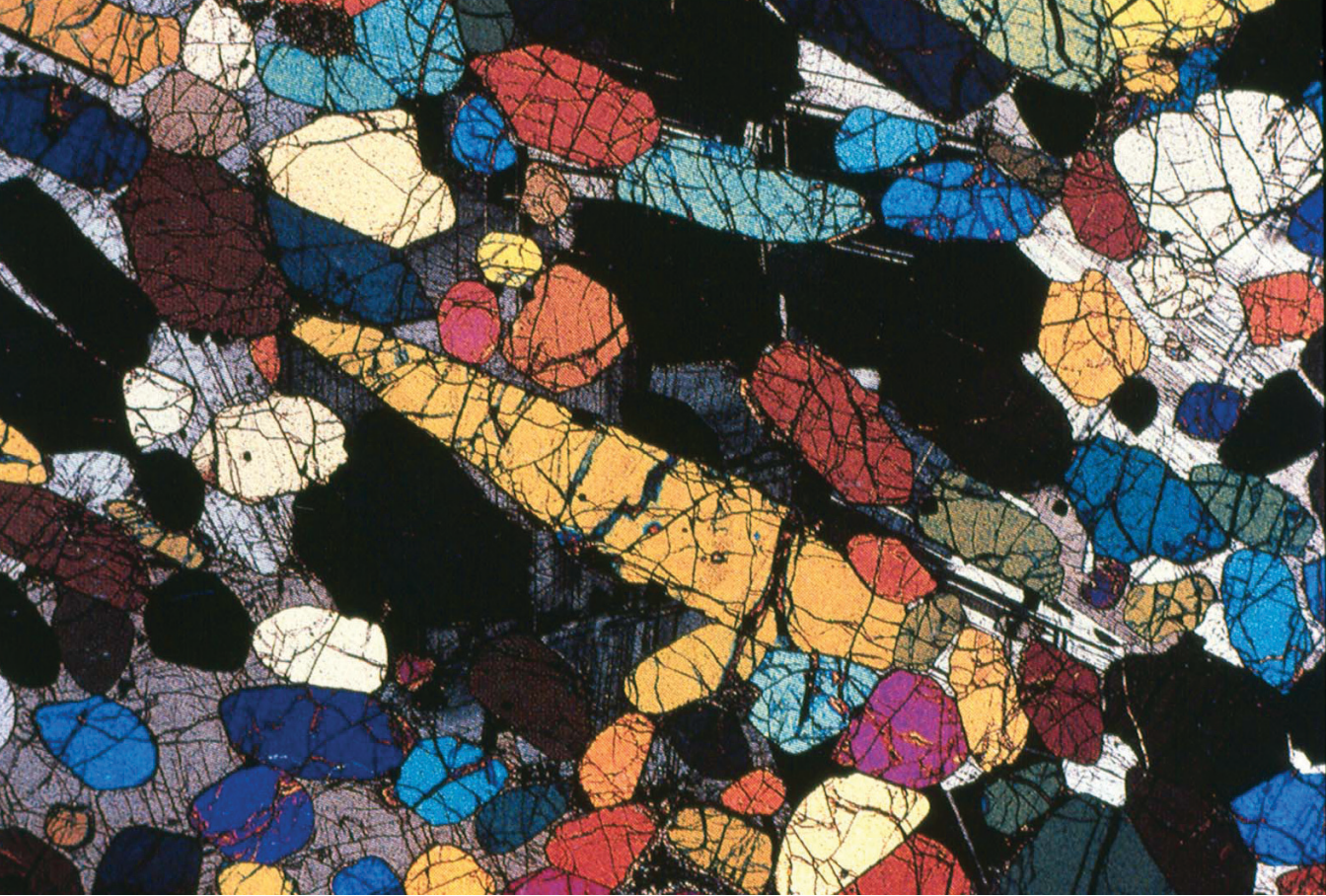
The Jackson School operates the first High Resolution X-ray Computed Tomography facility ever deployed in an academic setting, and it remains the world's most respected scanning facility and a global leader in technological innovation. The CT scanner is used to create 2D and 3D visualizations of the internal and external structure of living and extinct vertebrates, and a growing number of non-vertebrates. These visualizations are freely available online through the Digital Library of Vertebrate Morphology (www.DigiMorph.org), an NSF-funded initiative with more than 100 collaborating scientists worldwide. DigiMorph visualizations are now in use in classrooms and research labs around the world and can be seen in a growing number of museum exhibition halls.

The university has one of the largest paleontology collections in the country, including 4.5 million non-vertebrate specimens and 1 million vertebrate specimens. The collections are global in scope but are especially strong in the American Southwest. The collection also includes approximately 10,000 skeletons of recently living vertebrates for comparative studies. The fossil preparation laboratory was extensively renovated in 2009 to integrate cutting edge teaching and CT-imagery based preparation tools.

Other significant facilities include: the Vertebrate and Non-vertebrate Paleontology Laboratories; a Paleomagnetic Laboratory; an SEM Microscopy Laboratory; a skeleton preparation facility capable of handling the largest vertebrates; and a facility for preparing cleared and stained skeletal specimens.

*Right: Julia Clarke and her colleagues have mapped for the first time ever the colors and color patterns of an entire dinosaur, *Anchiornis huxleyi*. Illustration: Michael DiGiorgio.*





Researchers and students in petrology and geochemistry have access to a vast array of equipment including: an electron microprobe, a high-resolution X-ray CT scanner, two scanning electron microscopes, two inductively coupled plasma mass spectrometers, two thermal ionization mass spectrometers (TIMS), a Thermo Electron 6700 Fourier Transform Infrared (FTIR) spectrometer and IR microscope, Raman spectrometer and Brillouin Light Scattering system, and an X-ray diffractometer. The new TRITON TIMS delivers the most precise and accurate isotope ratios ever achieved with TIMS for positive and negative ions.

FACULTY & RESEARCHERS

Group Chair:
James Gardner

Jaime Barnes
William Carlson
Liz Catlos
Rich Ketcham

J. Richard Kyle
Nathan Miller
John Lassiter
Afu Lin
Leon Long
Donggao Zhao

TO LEARN MORE ONLINE, VISIT:

- Isotope Geochemistry
- Thermal Ionization Mass Spectrometry (TIMS) Lab
- Mineral Physics Laboratory
- Electron Microbeam Laboratories
- High-resolution X-ray Computed Tomography Facility
- ICP Mass Spectrometry Facility

3.8 PETROLOGY & GEOCHEMISTRY

The petrology and geochemistry group at the Jackson School explores mantle geochemistry; volcanic eruption dynamics; metamorphic textures and reactions; lithospheric dynamics; fluid migration in the crust and mantle; and formation of ore deposits. Graduate students at the Jackson School can explore a wide range of processes from theoretical, experimental, and applied perspectives, and greatly benefit from the diverse studies in the group and one of the best equipped research groups in the country.

Jaime Barnes' research focuses on using stable isotopes as geochemical tracers of fluids in various tectonic settings, to decipher fluid-rock interactions and metasomatism at high temperature (including serpentinization processes), relationships between metamorphic processes and deformation, and volatile transport in subduction zones to aid in quantifying geochemical cycles.

Bill Carlson's research focuses on developing a quantitative understanding of the rates and mechanisms of metamorphic processes, such as quantitatively analyzing primary metamorphic microstructures, linked to numerical simulations of their development, to understand fundamental processes of recrystallization. The greatest novelty in this work is the use of high-resolution X-ray computed tomography (HR X-ray CT) to reveal the sizes, shapes and disposition of crystals within a rock.

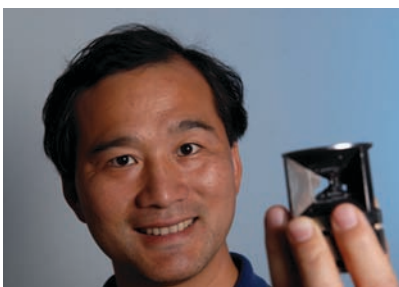
Elizabeth Catlos' research focuses on applying geochemical techniques to the study of lithosphere dynamics in order to understand the broader tectonic history of regions in Turkey, the Himalayas (India and Nepal), and south India (Tamil Nadu). Her interests include the geochemistry of igneous and metamorphic rocks, geochronology of a variety of minerals, applying mineral equilibria to estimate environmental conditions, and novel petrographic imaging techniques.

Jim Gardner's research focuses on the physical and chemical aspects of volcanic eruptions and magmatic processes through field studies of active volcanic centers, as well as using experimental petrology to study pre-eruption contents of volatiles in magmas and the degassing of those volatiles during eruption.

John Lassiter's and Jung-Fu "Afu" Lin's research focuses on the geochemistry and mineral physics of deep-Earth materials to understand how melts are generated in the mantle, how subduction of crust and sediments has affected the long-term chemical and physical evolution of the Earth's interior, and how properties of earth materials are affected by extreme pressures and temperatures. Geochemical research includes projects examining the nature and origin of mantle plumes and the global cycling of volatiles in the Earth. Research on mineral physics emphasizes an understanding of the interiors of the Earth and other planets through direct examination of the properties of materials under high pressure-temperature conditions.

Rich Ketcham's research focuses on theory, calibration, and inversion approaches for extracting thermal history information from various isotopic systems, primarily fission-track and (U-Th)/He. He is setting up a cutting-edge fission-track laboratory. Rich also focuses on high-resolution X-ray computed tomography, including developing techniques in data acquisition, optimization, and processing to extract information for studies in petrology, economic geology, paleontology, hydrogeology, and meteoritics.

Rich Kyle's research on hydrothermal systems integrates mineralization into a broad framework involving fluid and isotope geochemistry, petrology, tectonics, and geochronology. Long-term studies include pluton- and wallrock-hosted Cu-Au mineralization. Exciting new perspectives are coming from quantitative X-ray computed tomography study of three-dimensional distribution of gold in ores.



The National Science Foundation and Department of Energy recently awarded Assistant Professor Jung-Fu "Afu" Lin research grants to conduct high-pressure experiments investigating how the properties of Earth materials are affected by extreme pressures and temperatures, and how novel materials in extreme environments can help address the nation's energy issues.

3.9 SEDIMENTOLOGY & STRATIGRAPHY

The Jackson School of Geosciences is home to one of the largest and most diverse sedimentology & stratigraphy faculties in the nation. When *U.S. News & World Report* last ranked sedimentology & stratigraphy graduate programs, UT Austin was No. 1. The program has a long tradition of excellence. It is the birthplace of depositional systems analysis, a fundamental approach for relating the spatial distribution of sedimentary rocks to their environments of deposition and a school of thought that has been widely influential in both academia and industry.

Major advances in the petrology and diagenesis of sedimentary rocks can also be tied to the program. Marine geology and geophysics has become an equally strong component through expertise across the Jackson School. The program was among the first to use multichannel seismic reflection techniques to understand the geologic history of continental margins around the world, and has pioneered the academic use of 3D seismic imaging for a variety of applications, from basin history and evolution to reservoir assessment. The program is currently focused in the areas of global change, geochemistry and diagenesis, sequence stratigraphy, seismic stratigraphy and geomorphology, surficial processes and sedimentary process modeling, and pore-scale to full field reservoir characterization.

The sedimentology/stratigraphy research community at JSG includes over 30 Ph.D. faculty, research scientists, and senior research scientists spread across the Department of Geological Sciences, Bureau of Economic Geology, and Institute for Geophysics. This group provides as wide a range of areas of research specialization as any similar program in the nation.

The Department of Geological Sciences group has core areas in seismic and sequence stratigraphic analysis of both clastic and carbonate systems, diagenesis and geochemistry of carbonates and clastics including extensive stable and radiogenic isotope labs, physical and numerical modeling of eolian, fluvial, and shallow to deep marine transport systems with an emphasis on the construction of sedimentary deposits, petrology, basin analysis, and the application of field, petrologic, chemical, and isotopic methods for studying chemical evolution of groundwater and ancient oceans.

The Institute for Geophysics is focused on large multidisciplinary research programs looking at 2D and 3D geophysical studies of stratigraphic evolution of marine and lacustrine basins worldwide. The sedimentology/stratigraphy group at the Institute makes use of a wide range of geophysical tools and datasets to attack problems of global geodynamics and climate change.

The Bureau of Economic Geology has research efforts in clastic and carbonate sequence stratigraphy, diagenesis and reservoir characterization, as well as seismic geomorphologic analysis of 3D seismic data, visualization of subsurface systems, mudrock depositional systems, basin-forming processes, and classic and digital outcrop analysis. They are working on basins and outcrop areas all over the world to answer questions concerning the fundamental processes that act to control rock properties in the subsurface.

FACULTY & RESEARCHERS

Group Chair: Brian Horton

Jamie Austin
Jay Banner
Shirley Dutton
William Fisher
Peter Flemings
Qilong Fu
Craig Fulthorpe

Charles Groat
Sean Gulick
Ursula Hammes
Brian Horton
Susan Hovorka
Xavier Janson
James Jennings
Joel Johnson
Charles Kerans
Wonsuck Kim
Gary Kocurek
Bob Loucks

F. Jerry Lucia
Paul Mann
Angela McDonnell
Kitty Milliken
David Mohrig
Terrence Quinn
Stephen Ruppel
Ronald Steel
Scott Tinker
Mark Tomasso
Lesli Wood
Wayne Wright



Strong industry ties create many opportunities for Jackson School students, such as this 2007 field course to study modern carbonate depositional environments of the Caicos Platform, sponsored by ConocoPhillips and co-led by Professor Charlie Kerans (left) and Steve Bachtel, a carbonate reservoir specialist with ConocoPhillips.

ACADEMIC COMMUNITY

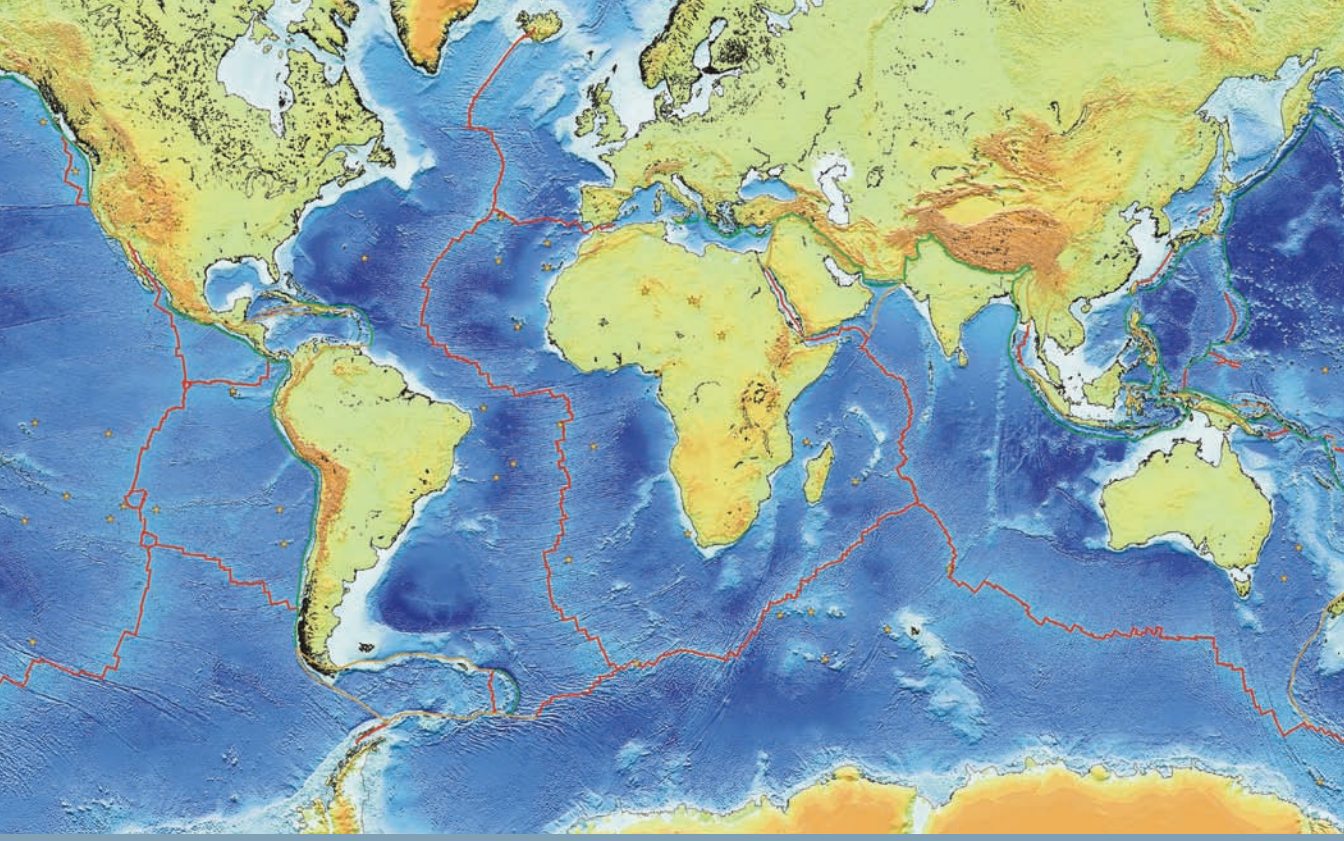
To further its top ranking in the areas of sedimentology and stratigraphy among U.S. universities, the Jackson School has added over five new faculty in the past several years in the areas of sedimentation and basin evolution, clastic and carbonate sedimentology and sequence stratigraphy, process modeling of clastic systems, and isotope geochemistry and paleoclimatology. When combined with the strong group of active scientists and educators at the university, the Jackson School “soft rock” community has established a critical mass of geoscientists that together are tackling some of the most challenging issues in sedimentary geology. The proximity of the Jackson School to the large petroleum geoscience community in Houston further augments its stature. Numerous cooperative research and research funding opportunities exist for motivated students.

SUPPORT & OPPORTUNITIES

Jackson School researchers and students in sedimentology and stratigraphy routinely work in the Gulf of Mexico, Rocky Mountains, Alaska, Texas, Caribbean, South America, Australia, North Sea, East Asia, and Middle East. Research and support opportunities come from research and education projects funded by federal, state, and industry programs. Student research funded in these programs includes studies of modern and ancient carbonate and clastic systems, subsurface analysis, carbon sequestration, ocean drilling and seismic acquisition, and physical and computer modeling of depositional processes. Students have high visibility to international academic researchers and energy industry professionals in many of these studies and are encouraged to publish in peer-reviewed journals.

TO LEARN MORE ONLINE ABOUT IN-DEPTH OPPORTUNITIES AT THE JACKSON SCHOOL, VISIT:

- Fossil Energy Research at the Bureau of Economic Geology
- Quantitative Clastics Laboratory
- Reservoir Characterization Research Laboratory
- JSG Structural Diagenesis Initiative
- Natural Resource Exploration Projects at the Institute for Geophysics
- Aqueous and Microbial Geochemistry
- Isotope Geochemistry
- Sedimentary Petrology Research



Above: Topography and bathymetry of the world (after Smith and Sandwell, 1997) with present-day plate boundaries added by the PLATES project at JSG's Institute for Geophysics using GMT (Wessel and Smith, 1991). PLATES is a program of research into plate tectonic and geologic reconstructions. Left: Bremer Bay, Western Australia, a decameter scale boudin formed during lower crustal extension during the Grenville age orogeny recorded in the Albany-Fraser belt, photographed on a graduate student field trip led by Professors Rich Kyle and Sharon Mosher. The formation is part of current Ph.D candidate Miriam Barquero-Molina's dissertation research.

FACULTY & RESEARCHERS

Group Chair:
Mark Cloos

Nathan Bangs
Gail Christeson
Mark Cloos
Ian Dalziel
Tim Dooley

Peter Eichhubl
Julia Gale
Sean Gulick
Jack Holt
Brian Horton
Michael Hudec
Martin Jackson
Stephen Laubach
Luc Lavier
Lawrence Lawver
Paul Mann

Randall Marrett
Kirk McIntosh
Timothy Meckel
Kitty Milliken
Sharon Mosher
Tom Shipley
Frederick Taylor
Harm Van Avendonk
Christopher Zahm

3.10 STRUCTURAL GEOLOGY & TECTONICS

Structural Geology and Tectonics draws on all geoscience disciplines to address fundamental questions about plate tectonic and deformation processes. In recent years, there has been an explosion of new technologies which allow scientists to answer questions that were once beyond their reach. This research not only leads to advances in basic research, but is also relevant to society, through the exploration for natural resources and understanding of natural hazards.

Structural Geology and Tectonics research at the Jackson School spans the entire spectrum from continental to oceanic and upper crustal to mantle tectonics. Only a handful of programs in the country cover such a wide range. Researchers investigate processes at all scales using field and marine geophysical-based observations; laboratory-based petrologic, geochronological, structural and geochemical analyses; and theoretical and physical modeling.

Tectonically-focused research addresses processes at active and ancient plate boundaries. At convergent margins, research topics range from subduction zone processes to continental collision, mountain uplift, and basin evolution. Extensional tectonic processes under investigation range from continental extension in the deep to shallow crust to evolution of passive margins, spreading ridges, and oceanic crust. Other research concentrates on the evolution of transitional plate boundaries as well as transform boundaries.

Other major research areas focus on deformation processes including thin-skinned fold and thrust belt processes and associated fluid flow; formation of salients; salt tectonics; and strain partitioning in extensional and contractional shear zones. Another major research focus is on understanding fracturing, fracture processes, fractured reservoirs, and relationships to diagenesis and fluid flow.

FORMULA FOR SUCCESS

Students in this program receive mentoring in all aspects of becoming a professional in Structural Geology and Tectonics, including conducting research, publishing in peer reviewed journals, presenting at national and international meetings, and teaching. Students leaving the program are well prepared for work in academia, research labs, and industry.

SUPPORT & OPPORTUNITIES

Jackson School researchers and students in structural geology and tectonics have recently worked in the western U.S., Mexico, Antarctica, South America, Australia, Indonesia, Caribbean, Greenland, Labrador, Scandinavia, and Scotland.

Research opportunities are great in the JSG because of the Institute for Geophysics and the Bureau of Economic Geology, the latter of which functions as the state geological survey. These institutions house, for example, the PLATES (Plate Tectonics) research group, a fractures group, and a salt tectonics group.

Students in this area have the opportunity to do research in a broad range of field settings, including modern and ancient mountain belts around the world and aboard ocean-going research cruises to conduct marine geophysical investigations of active plate boundaries. Students also investigate tectonic and deformation processes in the laboratory using state of the art tools for geochronology, geothermobarometry, 3D imaging and physical modeling.



4

RESOURCES

- 4.1 Research Programs & Centers
- 4.2 Facilities
- 4.3 Research University
- 4.4 Austin

M.S. '09 Liz Dunn complemented her paleoclimate research on coral reefs working with Ann Molineux at the Nonvertebrate Paleontology Lab, part of the university's Texas Natural Science Center. The lab holds four million specimens representing most time periods on Earth.

As part of its strategic plan, the Jackson School is pioneering rapid response research, getting scientists in the field quickly after geohazards to take vital measurements. Just 10 days after a major tsunami struck the Solomon Islands in 2007, Fred Taylor (foreground) of the Institute for Geophysics was on the scene with scientists from the Solomon Islands collecting data.



4.1 RESEARCH PROGRAMS & CENTERS

SOMETHING FOR EVERYONE. The Jackson School's faculty and scientists pursue 200 active projects a year bringing in annually about \$55 million in research funding. Research is often collaborative across the three main scientific units (the Department of Geological Sciences, Institute for Geophysics and Bureau of Economic Geology) and interdisciplinary with other departments at The University of Texas at Austin. Much of that research occurs in 25 research programs and centers:

CLIMATE

- Land, Environment, and Atmospheric Dynamics (LEAD)

COMPUTATIONAL GEOSCIENCES

- Center for Computational Geosciences

ENERGY ECONOMICS

- Center for Energy Economics

ENERGY & ENVIRONMENTAL POLICY

- Center for International Energy & Environmental Policy
- Latin American Forum on Energy & the Environment

FOSSIL ENERGY

- Advanced Energy Consortium (Nanotechnology)
- Fluid-Rock-Seismic Technology
- Quantitative Clastics Laboratory
- State of Texas Advanced Oil & Gas Resource Recovery
- University Lands
- Also see below, Worldwide Bureau Research

GEOPHYSICS

- Airborne Geophysics
- Caribbean Basins, Tectonics, and Hydrocarbons
- Geo-Clutter
- Gulf Basin Depositional Synthesis
- Network for Earthquake Engineering Simulation
- Ocean-Bottom Seismometer Program

GEOSCIENCE/ENVIRONMENTAL STUDIES

- Environmental Science Institute
- Environmental Quality Research
- Texas Gulf Coast Carbon Center

PALEONTOLOGY

- Non-vertebrate Paleontology Laboratory
- Vertebrate Paleontology Laboratory

TECTONICS

- PLATES

WORLDWIDE BUREAU RESEARCH

- Applied Geodynamics
- Exploration Geophysics
- Fracture Research and Application Consortium
- Laser-Assisted Analogs of Siliciclastic Reservoirs
- Quantitative Clastics Laboratory
- Reservoir Characterization Research

In addition to the research programs listed above, Jackson School scientists lead sponsored projects in scores of additional areas. Students find opportunities at the Bureau across the spectrum of fossil energy subjects, and in a wide range of environmental topics: coastal studies, desalination, groundwater & groundwater contaminants, remote sensing, lidar and imagery, and the vadose zone. The Institute for Geophysics employs students in polar studies, ice and the ice-covered lithosphere, sea-level fluctuation, gas hydrates, quantitative geophysics, and planetary geophysics.



Top four pictures, clockwise from top left: Paleomagnetism Lab, TIMS Lab, Walter Geology Library, Associate Professor Rich Ketcham inside the X-Ray CT scanner.



Senior Research Scientist Kitty Milliken sits in front of the JEOL 8200 Electron Microprobe. The Bureau of Economic Geology has two additional microbeam instruments, making six available to Jackson School students.

“I AM CONDUCTING RESEARCH IN OFFSHORE TRINIDAD AND VENEZUELA WORKING WITH MORE THAN 10,000 SQ KM OF 3-D SEISMIC DATA. AT THE BUREAU I HAVE ALL THE RESOURCES I NEED TO MANIPULATE THAT HUGE DATA SET. THIS CAPACITY IS SOMETHING YOU WILL FIND IN ONLY A FEW PLACES, AND THE JACKSON SCHOOL IS ONE OF THOSE PLACES.”
—LORENA MOSCARDELLI, PH.D. ‘07

4.2 FACILITIES

INTERNATIONALLY RENOWNED, LOCALLY AVAILABLE. Few programs have an array of analytical instruments as comprehensive as the Jackson School. All facilities and equipment are available for student research. Experience with best-in-class equipment and software gives Jackson School students an edge over their peers and keeps them on the leading edge of their disciplines.

SAMPLE OF JACKSON SCHOOL FACILITIES

For a complete and extensive list, see the “Facilities” section of the Jackson School Web site.

ELECTRON MICROBEAM LABORATORIES

Four major instruments provide microscale imaging and chemical analysis of a wide range of earth materials: a Scanning Electron Microscope, an Environmental Scanning Electron Microscope, an Electron Microprobe, and an X-Ray Diffractometer.

PALEOMAGNETICS LABORATORY

The Jackson School is one of six university locations at the forefront of paleomagnetic instrumentation through membership in RAPID (Rock And Paleomagnetism Instrument Development), a consortium devoted to improving the speed and precision of paleomagnetic and rock magnetic measurements.

GEOPHYSICS FACILITIES

Landmark and Gequest software is used for 3-D Seismic Data. Proficiency in these industry-standard software packages is an outstanding calling card for Jackson School students.

HIGH-RESOLUTION X-RAY CT

An industrial Computed Tomography (CT) scanner adapted from medical CAT scanners, the high-resolution X-ray CT Facility is an NSF-supported multi-user facility. The CT lab offers researchers across the biological, earth, and engineering sciences access to a completely non-destructive technique for visualizing features in the interior of opaque solid objects, and for obtaining digital information on their 3D geometries and properties.

ISOTOPE GEOCHEMISTRY

The school houses an outstanding range of equipment in three areas: Inductively-Coupled Plasma Mass Spectrometry, Thermal Ionization Mass Spectrometry, and Stable Isotope Ratio Mass Spectrometry. The Department of Geological Sciences houses three clean-room laboratories supplied with HEPA-filtered class 100 air for sample preparation and ion-exchange chromatography for isotopic analysis under ultra-clean conditions. The Department has two other laboratories with HEPA-filtered work stations for sample preparation and ion-exchange chromatography.

WALTER GEOLOGY LIBRARY

The primary research collections of the library include more than 100,000 book and journal volumes and 46,000 geologic maps, among them the publications of the U.S. Geological Survey, most state geological surveys, and many foreign countries. Regional emphasis is on the Southwestern United States, Texas, and Mexico.

OCEAN-BOTTOM SEISMOMETER

Investigators at the Institute for Geophysics apply seismic refraction surveying to a wide range of problems. To carry out seismic refraction work on the seafloor, UTIG developed a specialized ocean-bottom seismometer, a microprocessor-controlled instrument placed on the seafloor to record seismic signals generated by seismic sources.



Environmental Scanning Electron Microscope.



Ocean-Bottom Seismometer.



Top: Main Tower, The University of Texas at Austin. Below, left to right: McDonald Observatory; Bob Woodward and Carl Bernstein announcing donation of Watergate papers; the Samsung Solorean, UT Engineering's solar car.

4.3 RESEARCH UNIVERSITY

WHAT STARTS HERE CHANGES THE WORLD. The University of Texas at Austin has strength across all major disciplines, particularly in areas of science, engineering, and business that are closely related to the geosciences.

U.S. NEWS & WORLD REPORT RANKINGS* OF SELECT GRADUATE PROGRAMS AT UT AUSTIN

EARTH SCIENCES OVERALL	No. 9	PETROLEUM & GEOSYSTEMS ENGINEERING**	No. 1
<i>EARTH SCIENCE SPECIALTIES:</i>		COMPUTER SCIENCE	No. 8
GEOLOGY	No. 3	ENGINEERING	No. 9
GEOPHYSICS & SEISMOLOGY	No. 6	CHEMISTRY	No. 12
SEDIMENTOLOGY & STRATIGRAPHY	No. 1**	MATHEMATICS	No. 14
HYDROGEOLOGY	No. 6**	PHYSICS	No. 16
TECTONICS/STRUCTURE	No. 6**	BUSINESS	No. 16

* From the 2010 edition of *America's Best Graduate Schools*.

** U.S. News no longer ranks this specialization so we have included the prior ranking.

4.4 AUSTIN

CITY OF IDEAS. Austin used to be the great surprise for graduate students relocating to Texas, but the secret has been out for many years now. The “Live Music Capital of the World” has become one of America’s most popular cities with an international reputation for business, green energy, its creative sector and outdoor lifestyle.

No. 5 MOST EDUCATED CITY IN THE U.S.
—*America’s Best Places*, 2010

No. 1 CITY FOR A FRESH START
—*Relocation.com*, 2009

No. 1 MOST “DIGITAL SAVVY” CITY
—*Scarborough Research*, 2008

TOP TEN GREENEST CITIES IN THE U.S.
—*MSN City Guides*, 2008

No. 1 U.S. CITY FOR JOB GROWTH
—*U.S. Bureau of Labor Statistics*, 2009

TOP 10 BEST AMERICAN CITIES FOR THE OUTDOORS
—*Forbes*, 2009

No. 1 CITY FOR DATING
—*Spelling’s Best Places*, 2010

No. 3 MOST RECESSION-PROOF CITY
—*Forbes*, 2008

No. 1 AMERICA’S BEST BANG FOR THE BUCK CITIES
—*Forbes*, 2009

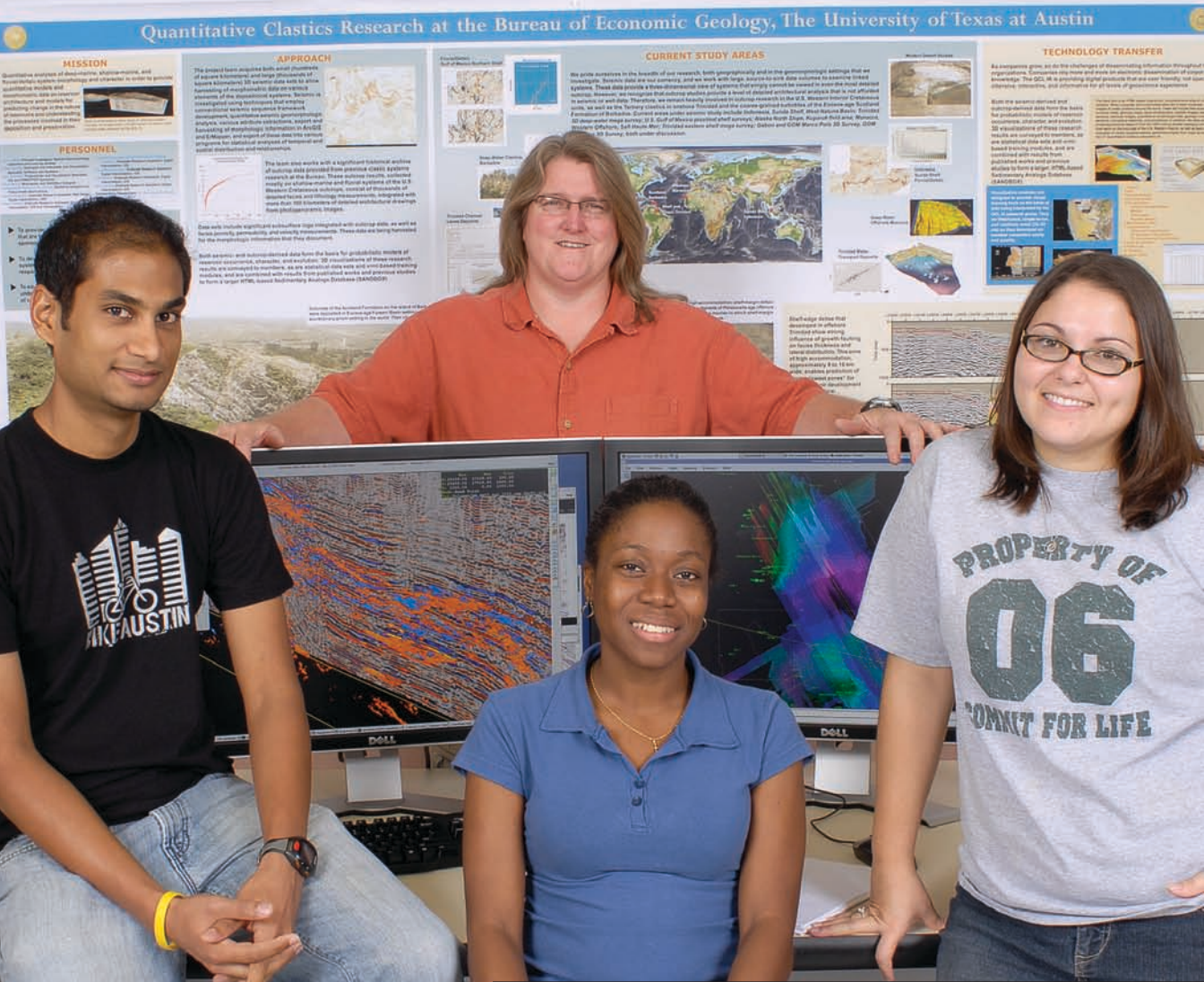
No. 1 U.S. CITY TO LIVE, WORK & MAKE MOVIES
—*MovieMaker*, 2008

No. 1, UTILITY GREEN POWER PROGRAM
—*National Renewable Energy Laboratory*, 2010

Top: David Byrne performs at the Austin City Limits Music Festival. Photo by Jay Janner/Austin American-Statesman. Bottom: Tom Miller Dam forms Lake Austin, one of the two lakes within Austin’s City Limits.



Senior Research Scientist Lesli Wood (standing), a clastic stratigrapher, is one of many research staff at the Bureau of Economic Geology who regularly mentors and employs graduate students offering them challenging opportunities that are highly relevant to their careers.



5

SUPPORT & OPPORTUNITIES

- 5.1 Support Packages
- 5.2 Internships & Careers
- 5.3 Academic Careers
- 5.4 Alumni & Friends Network

5.1 SUPPORT PACKAGES

WE'VE GOT YOU COVERED. The Jackson School offers some of the best financial support packages in the country for graduate students in the earth sciences.

The American Geological Institute (AGI), which collects information on earth science graduate programs, looked at financial support from the top 16 programs in the *U.S. News & World Report* graduate rankings. AGI's data showed Jackson School support was on average 18 percent higher than support from the other top-ranked program. And this analysis did not include benefits, which are another major plus for Jackson School students.

Some key points about Jackson School support:

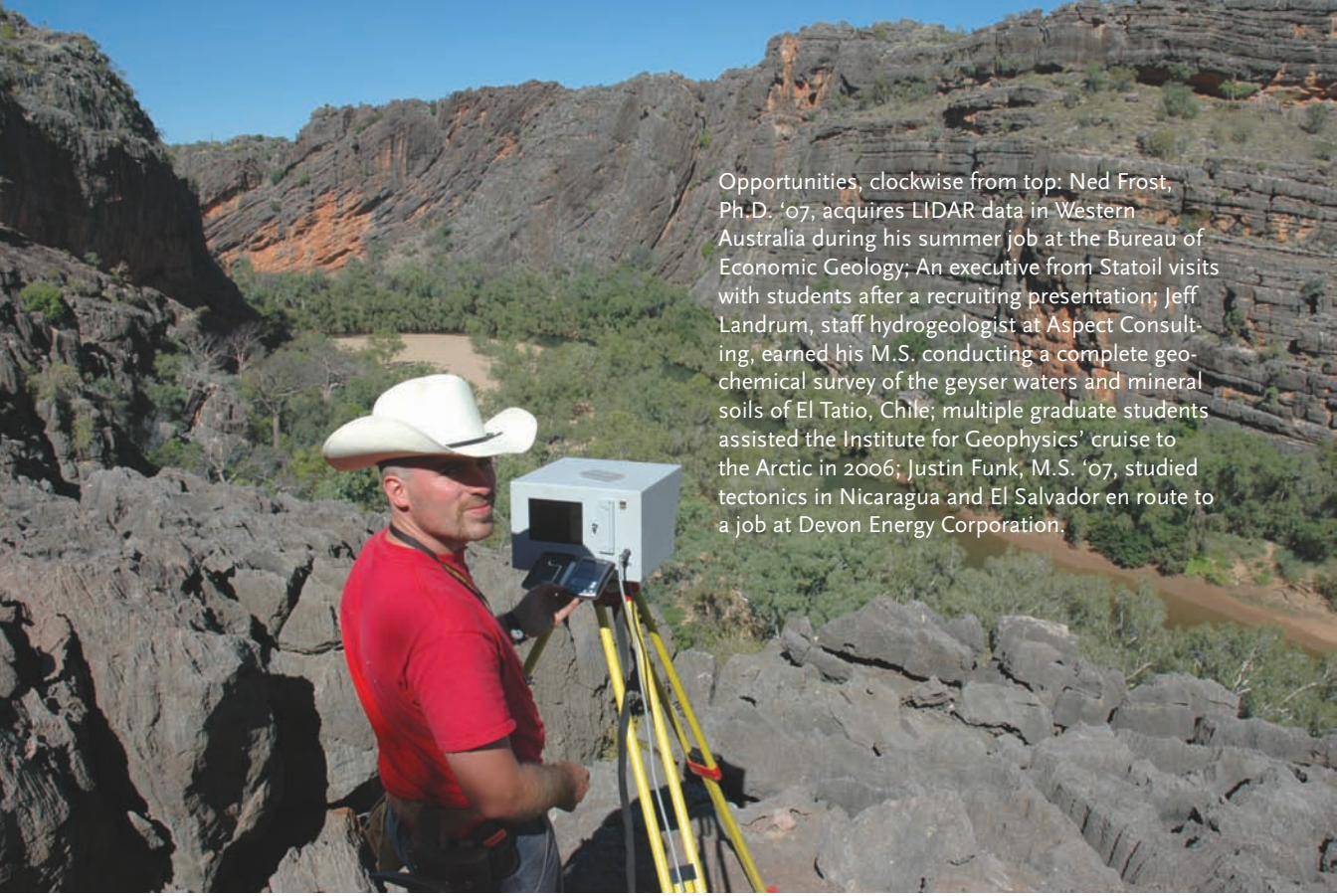
- **JSG SUPPORT IS GUARANTEED** throughout graduate school (two years for master's degrees, five years for doctoral candidates), for students making satisfactory academic and work progress.
- **JSG SUPPORT INCLUDES OUTSTANDING HEALTH BENEFITS**, an added expense often costly at other schools. These benefits are automatically included for TA and RA positions.
- **JSG STUDENTS LIVE IN AFFORDABLE AUSTIN**, the 16th-largest U.S. city with a cost-of-living index below the national average.

To ask about specific levels of support, contact the graduate coordinator at the Department of Geological Sciences.



“I CAME TO UT PRIMARILY TO WORK WITH MY SUPERVISOR, DR. LESLI WOOD, WHO HAS DONE EXTENSIVE RESEARCH IN THE SOUTHEASTERN CARIBBEAN REGION. HOWEVER, THE JACKSON SCHOOL’S SUPPORT PACKAGE WAS A BIG PART OF THE DECISION BECAUSE AS AN INTERNATIONAL STUDENT IT IS OFTEN DIFFICULT TO GET SUPPORT FOR GRADUATE STUDIES.”

— NYSHA CHADERTON, PH.D. ‘09, GEOLOGY



Opportunities, clockwise from top: Ned Frost, Ph.D. '07, acquires LIDAR data in Western Australia during his summer job at the Bureau of Economic Geology; An executive from Statoil visits with students after a recruiting presentation; Jeff Landrum, staff hydrogeologist at Aspect Consulting, earned his M.S. conducting a complete geochemical survey of the geyser waters and mineral soils of El Tatio, Chile; multiple graduate students assisted the Institute for Geophysics' cruise to the Arctic in 2006; Justin Funk, M.S. '07, studied tectonics in Nicaragua and El Salvador en route to a job at Devon Energy Corporation.



5.2 INTERNSHIPS & CAREERS

Year in and year out, the Jackson School attracts the largest pool of on-campus recruiters of any earth science program in the U.S. The school's strong ties to industry stem from its large size, excellent faculty, and successful alumni. The school's size, breadth, and depth make it especially appealing to recruiters in the core fields of geoscience employment, such as geophysics, energy geosciences, and environmental geosciences. The school also has an outstanding record placing students in academic, government, and non-traditional careers.

Before and during the career exploration process, students can benefit from a number of services offered by the Jackson School Career Center. The center holds regular workshops to assist students with creating résumés, writing cover letters, interviewing, and preparing for the annual career fair. One-on-one assistance is available, both from career center staff and geoscience professionals (often alumni) who donate time to help JSG students prepare for interviews. Throughout each semester, the center hosts corporate and public sector employers for on-campus recruiting sessions in the Jackson Geosciences Building. Each fall, the school also hosts its own career fair where companies showcase opportunities and meet students before on-campus recruiting begins.

During job interviews, many Jackson School students have the opportunity to describe the significant professional experiences gained working with scientists at the Bureau of Economic Geology and the Institute for Geophysics.

Many Jackson School graduate students also work at other university units, like the Vertebrate and Non-vertebrate paleontology labs, which are closely affiliated with the Department of Geological Sciences. The breadth and depth of opportunities expands options and helps students choose the career path that will be right for them.

REPRESENTATIVE LIST OF RECRUITERS

Following is a representative but partial list of employers who recruit at the Jackson School.

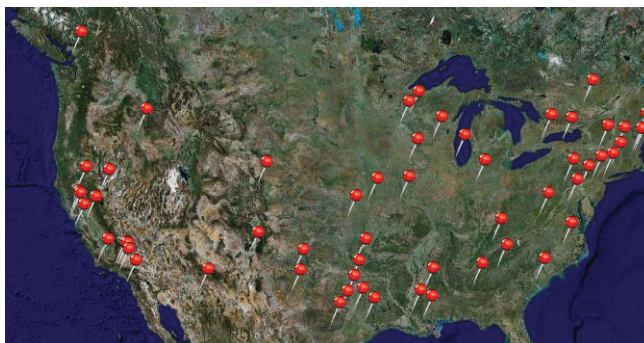
Apache Corporation	Newfield Exploration
AOA Geophysics	Nexen Petroleum
Anadarko Petroleum Corporation	Noble Energy
BP	Occidental Petroleum
BHP Billiton	Pastor, Behling & Wheeler LLC
Baker Hughes	PBS&J
Brigham Exploration Company	Petroleum Geo-Services (PGS)
CH2M Hill	PetroTel
Cabot Oil & Gas Corporation	Pioneer Natural Resources
Chevron Corporation	Quicksilver Resources
Cimarex Energy	Questar Corporation
Citation Oil & Gas	RMT, Inc.
ConocoPhillips	Sandia National Laboratories
Core Laboratories	Schlumberger
Devon Energy	Shaw Environmental
El Paso Corporation	Southwestern Energy
Encana	Sperry Drilling (Halliburton)
EOG Resources	StatoilHydro
ERM	Swift Energy
ExxonMobil	Texas Commission on Environmental Quality
GX Technology	Total
Hunt Petroleum	TGS-NOPEC Geophysical
Hess Corporation	URS Corporation
Landmark Graphics	CGG Veritas
Maersk Oil	UR-Energy, Inc.
Marathon Oil Company	Weston Solutions, Inc.



5.3 ACADEMIC CAREERS

With alumni working as earth science academics around the world, the Jackson School has an excellent record and reputation for placing doctoral students in academic careers. JSG alumni teach at universities from Tripoli to Rio, Bangkok to Bonn. Within the United States, JSG alumni teach at universities all across the country, including peer institutions in the geosciences such as Harvard, Princeton, Cal Tech, Stanford, Berkeley, and Columbia.

PARTIAL MAP OF U.S. UNIVERSITY LOCATIONS WHERE JSG GRADUATES ARE TEACHING



“BOTH MY FORMER AND PRESENT POSITIONS HAVE REQUIRED A BROAD UNDERSTANDING OF SCIENCE ACROSS MANY DISCIPLINES, AND MY GEOLOGICAL BACKGROUND HAS BEEN IDEAL IN THIS REGARD, HAVING BEEN INTERDISCIPLINARY IN NATURE. THE JACKSON SCHOOL, WITH ITS MANY RESOURCES AND OPPORTUNITIES, WAS AN IDEAL PLACE FOR ME TO GAIN THIS EXPERIENCE.”

—ROBERT BURGER, PH.D. '02, ASSISTANT PROVOST FOR SCIENCE AND TECHNOLOGY, YALE UNIVERSITY

5.4 FRIENDS & ALUMNI NETWORK

The University of Texas at Austin has the largest extended geoscience community attached to any university in the world. The Jackson School Friends and Alumni Network (JSG FANs) leverages this community by developing programs, events, and relationships that enrich the careers and lives of JSG alumni and promote the progress of the Jackson School. Our network includes leaders at all levels—presidents, CEOs, and chairs of major energy, mining, exploration, and environmental geosciences companies; leaders in government science, basic and collaborative research; current and former presidents of the major geological societies; directors of exploration and production for oil firms in just about every global region; young professionals who will lead industry through the next generation. Few if any academic geoscience institutions can match the value of our network.

The FANs network has global reach. Historically, the Jackson School has educated geoscience leaders around the world, from the first oil minister of Saudi Arabia to the current head of exploration and production for Brazil's national oil company. Graduate programs like Energy & Earth Resources draw foreign nationals who become leaders in their own countries, while the Latin American Forum annually unites industry leaders with energy and environment ministers from across the Americas for regional problem-solving. New programs in Africa are further widening the scope of the school's global leadership.

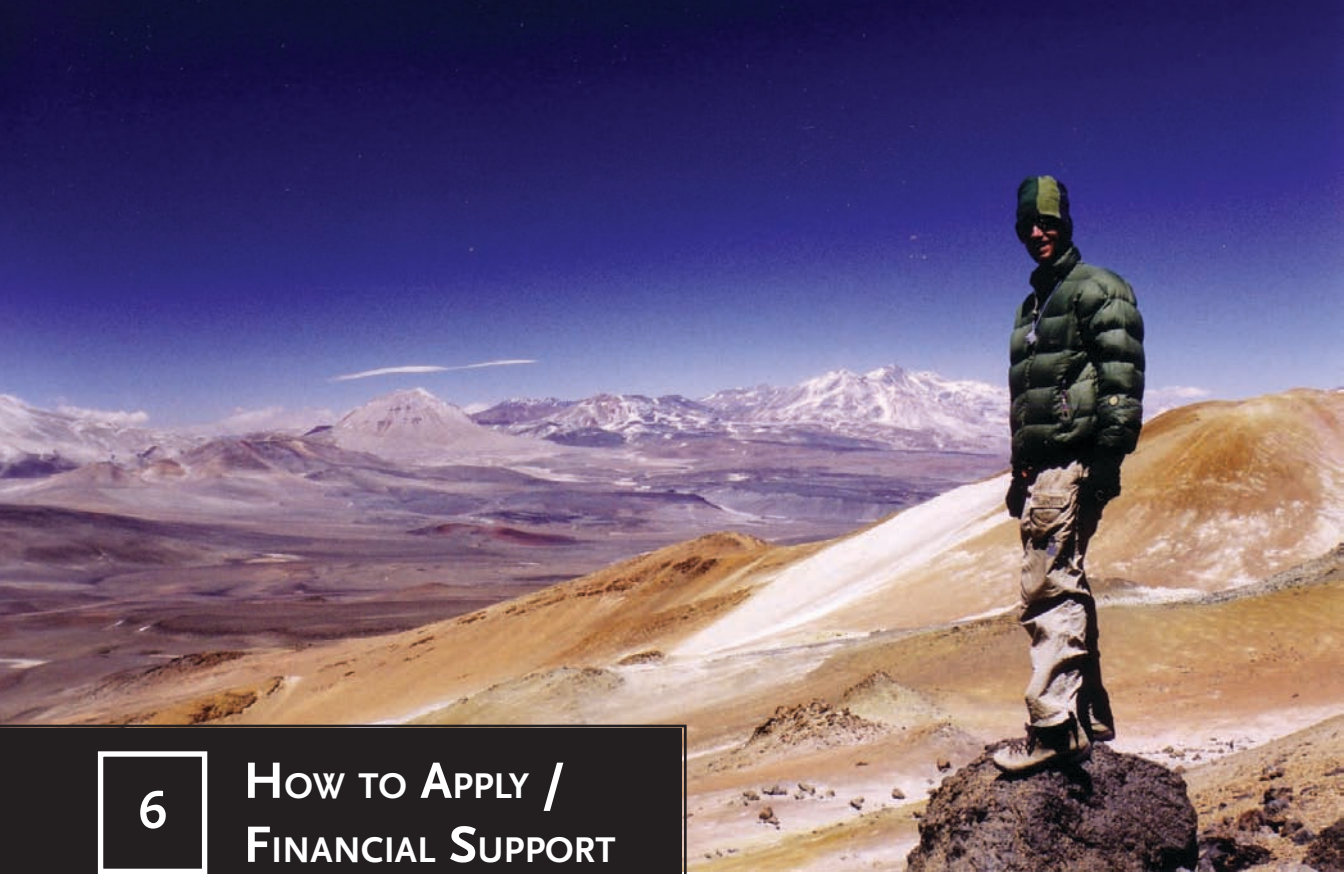
JACKSON

SCHOOL OF GEOSCIENCES

FRIENDS & ALUMNI NETWORK



Friends in high places, left to right: Advisory Council Member Denise Butler, Discipline Chief, Geosciences - Upstream Americas, Shell Exploration & Production; Robbie Gries, M.A. '70, founder and president, Priority Oil & Gas LLC; Robert Burger, Ph.D. '02, Assistant Provost for Science and Technology, Yale University; Thomas Barrow, B.S. '45, M.A. '49, former vice chairman, Standard Oil Company (Ohio), former chairman and CEO, Kennecott; Chuck Williamson, Ph.D. '78, former CEO, Unocal.



6

HOW TO APPLY / FINANCIAL SUPPORT



6.1 HOW TO APPLY / FINANCIAL SUPPORT

The deadlines for fall applications are:

DECEMBER 1 for fellowship consideration

JANUARY 1 for all applications

If you miss the December 1 deadline but meet the January 1 deadline you will still be considered for other forms of financial support.

The URL for the online application is:

http://www.geo.utexas.edu/grad/application_procedure.html.

Applications must be received in the Graduate and International Admissions Center (GIAC) by the appropriate deadline (see online application). Applications received after these priority deadlines will be considered on a less favorable basis.

You are strongly encouraged to complete the online application well in advance of the actual deadline. Once submitted online, the application can still take up to two weeks to reach the department, so you should not wait until the deadline to apply.

The online application includes the statement of purpose and electronic letters of reference. NOTE: Do NOT send official transcripts intended for the Graduate and International Admissions Center (GIAC) to the department. They will not be forwarded to GIAC, and this can seriously delay your application, even causing it to be late. All items are submitted online or directly to GIAC. The statement of purpose and letters of reference are submitted online. Test scores must arrive directly from the testing agency. College transcripts should be the only items submitted on paper, although some schools will have the ability to send these electronically.

Applicants are strongly encouraged to contact members of the Department of Geological Sciences in their field of interest, as all students are admitted to the graduate program on the recommendation of one or more faculty members or research scientists.

The procedures may vary if the applicant is not a US citizen/resident, or is a former UT student applying for readmission. See GIAC for full information. Applicants to our graduate program are expected to have completed a minimum of two college level courses in calculus, physics, and chemistry, with a grade of C or better, as well as courses in geological sciences, including field training appropriate for the subject of interest. Specific programs may require additional prerequisite coursework. Any deficiencies in these areas must be addressed early in a student's program. Other areas of study that are identified by a student's mentor and examining committee as deficient should also be addressed early in a student's program.

For additional information contact:

PHILIP GUERRERO, GRADUATE PROGRAM COORDINATOR

Phone: 512-471-6098

Fax: 512-471-9425

Email: geograd@maestro.geo.utexas.edu

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