

Annual Report 2008



Bureau of Economic Geology

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Director's Message



Many of the great challenges in earth science research today are complex, involving multiple types of data examined through the lens of different subdisciplines. Integrated studies provide a particular challenge for universities, where traditional faculty-student pairings offer a great depth of knowledge but, commonly, less collaborative breadth. Whereas energy companies have, for the most part, torn down the walls between subdisciplines such that geologists of various specialties—geophysicists, petrophysicists, geochemists, and engineers—together can tackle major applied problems, universities remain somewhat more “siloe” within departments and across schools. The advantage is that university researchers develop deep expertise and push the research boundaries of a particular subspecialty.

Most great teams have stars, utility players, depth on the bench, strong coaches and managers, and, most important, a “chemistry” such that each player is invested in the success of the team more than in his or her own performance. Give me a bunch of hard-working team players, and even if we do not outperform a group of superstars, we will have a lot more fun trying!

It is chemistry that makes building—and maintaining—great teams difficult because quite often rewards are based on individual metrics; in sports, batting average, points scored, passing yardage; in science, first-authored publications, individual citations, principal-investigator funding. These individual measures, if overstressed, can run counter to teamwork.

Such tension—expertise in a particular field versus thematic integration—has existed for centuries. There is no perfect solution, and as with most such challenges, a blend of both is useful, along with an ability to adapt.

Within these pages you will find a focus on programs that involve teamwork and integration. We are far from perfect, but we have developed an appreciation for what can result when we work together, to the point that we recognize team performance in our individual review processes.

I am proud of the Bureau teams and those who work together to press the limits of scientific exploration. It is this collaborative, community spirit that makes the Bureau family thrive.

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COVER:

The globe cover image may be found at http://earthobservatory.nasa.gov/images/imagerecords/8000/8108/ipcc_bluemarble_west_lrg.jpg.

Computerized digital images and associated databases are available from the National Aeronautics and Space Administration (NASA), <http://earthobservatory.nasa.gov/>.

Bureau Highlights

The Bureau Centennial Celebration

The Bureau is celebrating its centenary year, 2009, in a flurry of activity. August 6 and 7 will see the presentation of a Centennial Symposium, "Water and Energy: Vital Resources for a Sustainable Future." Nationally and internationally recognized experts will be on hand for the event to discuss the topic in the new AT&T Executive Education and Conference Center on the UT campus. A Distinguished Lecture series has been initiated, featuring the Bureau's most esteemed scientists. The lectures, free to those who host the event, are by invitation only. Scheduled speakers include **Lesli Wood, Bridget Scanlon, Steve Ruppel, Jerry Lucia, Bob Loucks, Steve Laubach, Charlie Kerans, Martin Jackson, Mike Hudec, Sue Hovorka, Bob Hardage, Sergey Fomel, and Shirley Dutton**. A Podcast series is also up and running and consists of an interviewer and an interviewee answering questions, revealing anecdotes, and sharing research (<http://podcast.beg.utexas.edu/>). The monthly series reviews historical contributions and personalities of the Bureau, as well as making connections between past, present, and future global impact (<http://podcast.beg.utexas.edu/>). Bureau historical information is being compiled for our website as well, including a timeline of key events and profiles of our directors, notes about alumni, group photos, and memorials. And finally, a Centennial Coffee Table Book is being edited. Large, full-color images and simple text will capture the natural beauty of the areas where Bureau folks have worked over the years, both within Texas and around the world. The Bureau is proud of its heritage and is celebrating!

**CENTENNIAL
SYMPOSIUM**

PODCAST SERIES
(<http://podcast.beg.utexas.edu/>)

**CENTENNIAL
COFFEE TABLE BOOK**

**DISTINGUISHED
LECTURE SERIES**



Farewell to Dean Barron

On Friday, June 6, the Bureau honored outgoing **JSG Dean Eric Barron** (right) with a reception and send-off. Hosted by **Bureau Director Scott Tinker** (left), the farewell was attended by more than 70 at the Bureau. Dean Barron departed to assume the role of Director, National Center for Atmospheric Research, Boulder, Colorado, after 2 years at the helm of the Jackson School of Geosciences.





Mudrock research will be facilitated by new or upgraded instruments, such as a field-emission-scanning electron microscope and an atomic-force microscope, and a new sample preparation technique—argon-ion milling.

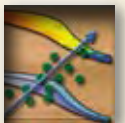


Bureau and ExxonMobil Forge an Alliance for Research on Unconventional Gas

The Bureau and ExxonMobil have joined forces in a 3-year collaborative study of shale-gas and tight-gas sandstone reservoir systems. The Jackson School and ExxonMobil's Exploration and Upstream Research Companies are funding the study, which is examining fundamental controls on the rock framework, fluid distribution, and flow behavior of these complex unconventional reservoir systems. A new study of mudrock (shale) attributes is under way that includes detrital and diagenetic mineralogy, microfabric, and nanometer-scale pore systems. The mudrock research will be facilitated by new or upgraded instruments, such as a field-emission-scanning electron microscope and an atomic-force microscope, and a new sample preparation technique—argon-ion milling. These new instruments were made possible largely by investments from the Jackson School. Natural fracture development in tight sandstones and mudstones and degradation of fracture permeability by mineral cements will also be major focuses of the collaboration. A novel aspect of the research involves the Bureau teaming with colleagues in UT's Petroleum and Geosystems Engineering Department, along with ExxonMobil researchers, to model gas-flow processes at the pore scale, at the natural fracture scale, and, ultimately, in propped-induced fractures. Finally, seismic imaging and detection methods will be developed for mapping favorable areas within unconventional gas plays. Bureau scientist **Bob Hardage** has been instrumental in the forging of this alliance.

RCRL Drills for Better Characterization of Ancient Carbonates

The **Reservoir Characterization Research Laboratory (RCRL)** has drilled three research wells and cored the upper section of a Cretaceous rudist buildup complex at Pipe Creek, Texas, as part of an NSF-funded project. These new wells, together with two existing ones, will be used to run flow experiments to assess the effective permeability of rudist-mound flank debris, which is a good analog to reservoir rocks in age-equivalent large Middle East oil fields. In the photo **Jerry Bellian** describes the use of laser imaging in mapping geological structures exposed on the surface to be used in computer simulation of subsurface rocks. This technique helps geologists reduce uncertainty in subsurface model property distribution and improve recovery prediction.



Bureau to Host Symposium on Submarine Mass Movements

The Bureau is set to host the 4th International Symposium on Submarine Mass Movements and Their Consequences, November 8–11, 2009. Part of an initiative of the International Geoscience Programme (project 511), a joint endeavor of UNESCO and the International Union of Geological Sciences, the main objective of this event is to present a world perspective on submarine mass movements and their consequences by assembling excellent contributions from active international researchers, academic institutions, and the oil and gas industry. More than 90 technical contributions have been submitted covering the 12 conference themes. Seven keynote speakers have confirmed their participation for the event. Early-bird registration is open through June 27 at <http://www.beg.utexas.edu/indassoc/dm2/Conference2009/registration.htm>

The Bureau's **Lorena Moscardelli** was instrumental in securing the event for the Jackson School of Geosciences and will serve as chair.



***"EXPLORATION
GEOPHYSICS
LABORATORY
will leverage our
technology to further
field-recording
techniques and
advance the
industry's ability to
image reservoirs
more effectively...."***

EGL Gets Donation

On April 25, Ascend Geo LLC, a leading provider of land-based, cable-free, seismic recording equipment, announced its donation of the Ultra G5TM System to the **Exploration Geophysics Laboratory (EGL)**, a research consortium at the Bureau. The cable-free recording system will be used to research three-component seismic data collection in acquisition projects undertaken by EGL as part of its research in seismic vector-wavefield technology. Ascend will participate as a member associate in EGL as a result of the donation. "We are excited to assist the EGL's research efforts by providing them with our cable-free seismic system. We view Dr. Hardage as a genuine thought leader in multi-component acquisition and processing, and we are quite confident that the EGL will leverage our technology to further field-recording techniques and advance the industry's ability to image reservoirs more effectively," said Larry Denver, Chairman and CEO of Ascend Geo, LLC. **Bob Hardage**, accepting the donation on behalf of EGL, said that "Cable-free technology is a flexible platform that will help to make 3C acquisition affordable, and we're proud to be one of the first to use the Ultra System to extend the EGL's acquisition concepts." EGL was established in 1997 at the Bureau to develop seismic vector-wavefield technology for improving reservoir characterization and prospect evaluation. EGL focuses on developing case histories and data examples that illustrate applications of multicomponent seismic data.





Bureau Stars in the Media



In December, **Director Scott Tinker** received word from the Office of External Relations, UT, that the *Future of Energy* episode of the PBS series *State of Tomorrow* (in which he is featured; see photo) had received a Lone Star EMMY® Award. Randa S. Safady, Vice Chancellor for External Relations thanked Scott for his contributions to the production and for participating in Phase II of the project, in which Scott is help in develop new *State of Tomorrow* programming. The plan is to bring the story to commercial television and major daily newspapers in 2009.



Texas Parks and Wildlife teamed up with the Jackson School of Geosciences and the Texas Cave Management Association to construct a 3D digital model of Devil's Sinkhole State Natural Area in Rocksprings, Texas. This impressive collapsed sinkhole is more than 300 feet deep and is home to a large seasonal population of Brazilian free-tail bats, as well as an endemic amphipod and a rare aquatic isopod. It is also a window into the Edwards aquifer, with ongoing research by Geary Schindel at the Edwards Aquifer Authority. Texas Parks and Wildlife aired show #1620 in February on PBS. Called *New Wave Cave*, the show was filmed and produced by Don Cash. The Bureau's **Jerry Bellian**, **Dallas Dunlap**, and **Reuben Reyes** were involved in the project.



Scott Tinker was asked to participate in the 41st Annual Chancellor's Council Meeting and Symposium at The University of Texas at Austin for The University of Texas System. Peabody Award-winner Elliott Forrest interviewed Scott about energy research and the current energy crisis. A portion of the *State of Tomorrow* episode was shown during the symposium as well. Scott and **Eric Potter** were both featured in a documentary produced by Trinity Films titled *Unconventional: the Story of the Barnett Shale*. Its premiere was broadcast on NBC 5/KXAS-TV, Dallas-Fort Worth.



Bureau scientists **Jeff Paine** and **Ramón Treviño** are featured in a 10-minute video compiled by a UT videographer, who followed them on the two GeoForce trips that they each led to Oregon and the Grand Canyon this past summer. To view the video, go to <http://www.utexas.edu/oncampus/2008/09/09/geoforce-the-next-generation-of-geoscientists/>. GeoForce is a Jackson School of Geosciences program for promoting interest in the earth sciences among middle school and high school students.

Bureau scientist **Sue Hovorka** was featured in the February 2008 issue of *Texas Monthly* as one of the "Top 35 People Who Will Shape Our Future" because of being in the forefront of sequestration of CO₂ in Texas. Sue is in the company of the likes of Lance Armstrong, George P. Bush, and Cat Osterman. Get the whole story, which includes an interview with Sue, at TexasMonthly.com. In March, Sue provided a short overview of geo-sequestration for a UT web interview as part of Explore UT, which is a series of "video snapshots" that can be accessed by clicking on its title, *Take Five*. In it, Sue explains the process and benefits of storing CO₂ underground. The site says that "her particular focus area is development of tools that will measure the movement of CO₂ once injected underground to assure that it is trapped for geologically long periods of time. She is committed to facilitating exchange between the applied scientists and citizens, focusing on middle school students." On August 3rd, a front-page story in the *Austin American Statesman* featured quotes by Sue and **Director Scott Tinker**. The story, "Could Texas Profit by Storing Carbon Dioxide Underground?: Officials Exploring How to Capture Power Plant Emissions, Inject Them beneath Gulf Coast, Oil-Rich Permian Basin," tells how carbon sequestration may play a crucial role in the battle against global warming. Sue, as Principal Investigator of the **Gulf Coast Carbon Center**, is quoted, describing where CO₂ would be trapped: "We're talking about the spaces between grains of sand. They're microscopic spaces, but they're nonetheless real." Scott Tinker's testimony in front of the State House Carbon Caucus in June, which focused on Texas' unique ability to generate and store CO₂, is mentioned as well.

On March 12, Bureau scientists **Steve Ruppel** and **Jerry Bellian** traveled to the Guadalupe Mountains National Park to help a BBC/Granada Television crew tape a segment for the National Geographic Channel's *Naked Science* series. The program, which aired in the fall, highlighted current research on the Earth's crust, with specific reference to new studies below the surface. In the segment, Steve and Jerry describe the importance of studying surface rock exposures for a better understanding of the crust, the Permian Basin in particular. They emphasize how outcrops can be used for us to better understand how and where oil is distributed in the subsurface and how these studies can lead to better methods of oil recovery. In the photo, Jerry Bellian describes the use of laser imaging in mapping geological structures exposed on the surface to be used in computer simulation of subsurface rocks. This technique helps geologists reduce uncertainty in subsurface model property distribution and improve recovery prediction.





Integration and Cooperation, Bureau-Style

ADVANCED ENERGY CONSORTIUM
is convinced that building on research in "smart dust," medical imaging, and nanofluidics will lead to breakthroughs in discovering oil and gas reservoirs.

Advanced Energy Consortium Collaboration

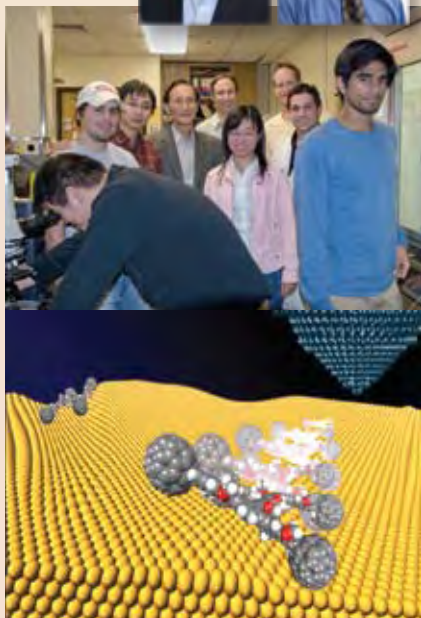
BY JAY KIPPER AND SEAN MURPHY

One of humanity's most critical challenges is producing enough energy to satisfy growing demand. And one of the Bureau's best examples of how to meet the challenge is the **Advanced Energy Consortium (AEC)**, a 10-member industrial group focused on applying nanotechnology to exploration and production of oil and gas. Consortium members are betting that research at the nanoscale, by locating and producing previously bypassed oil, will release billions of barrels of additional oil from existing reservoirs.



Since officially opening in 2008, AEC has facilitated several workshops in which oil and gas industry experts challenged nanoscale materials, electronics, and mechanical engineers to develop interwell subsurface sensors and materials to locate bypassed oil and improve recovery efficiency. More than \$6 million has been invested in a portfolio of projects, including leading research universities such as Rice, UT, Penn State, Harvard, MIT, Boston University, California Institute of Technology, and the University of California, Berkeley.

AEC-funded research is taking shape at UT in a project exemplifying the interdisciplinary collaboration that will be necessary to successfully develop nanoscale solutions to reservoir-size problems. Three different engineering teams are working together and bringing their expertise to the project: Principal Investigator (PI) Chun Huh and Co-PI Steve Bryant manage a group of students in Petroleum and Geosystems Engineering (PGE), Professor Keith Johnston is managing a team in Chemical Engineering (next door), and Professor Tom Milner and student(s) are working in Biomedical Engineering (across the street). Titled "Determination of Oil Saturation in Reservoir Rock Using Paramagnetic Nanoparticles and Magnetic Field," this project aims at synthesizing custom paramagnetic nanoparticles that will absorb preferentially to the oil-water interface and that can be detected remotely (using a novel technique). Johnston's group (Pavan Kumar and Kenny Yu) are synthesizing iron-oxide nanoparticles with special surface coatings to



control adsorption at the oil-water interface. Seung Yup Ryoo (with Dr. Milner) is studying particle responses to high-energy electromagnetic fields. Petroleum Engineering students (Haiyang Yu, Federico Caldelas, and Matt Roberts) are investigating aqueous transport of these paramagnetic nanoparticles through different reservoir rocks and their adsorption on the oil-water menisci. Finally, research associate (PGE) Dr. Masa Prodanovic's theoretical modeling is linking laboratory measurements and field-scale observations. If successful, this novel sensing technique could determine fluid saturations in the reservoir rock with much greater penetration than MRI or NMR (commonly used by industry today).

State of Texas Advanced Resource Recovery Project in Texas—STARRs of Multidisciplinary Success

BY URSULA HAMMES, BOB LOUCKS, AND BILL AMBROSE
(CO-PRINCIPAL INVESTIGATORS)

The State of Texas Advanced Resource Recovery (STARR) project has been successfully generating revenue for the State of Texas Public for the past 13 years. Under **Bob Loucks'** direction, the STARR team has grown from 4 geologists in the early stages of the program to a select group of 18 researchers hailing from a variety of disciplines and has tripled its funding from the State of Texas. This project is built on teamwork—every member is expected to interact with operators, develop research ideas, publish papers, and generate new drilling opportunities for industry partners. Project STARR's success is measured by its income to the State every 2 years, which is based on additional income from successful wells and projects completed by STARR's operating partners. This biennium, STARR's partners generated revenue to the State that was 6 times the funding STARR received from the State during 2007–2008.

The STARR team is composed of geologists, geophysicists, petrophysicists, and engineers who conduct anywhere from four to eight concurrent research projects. A monthly meeting is held to discuss projects and research. Often, other Bureau groups seek interaction with STARR because of the team's expertise, as well as its computing power. In fact, with advice and encouragement from the IT group, a room in the STARR work area was converted into a visualization center (see p. 13), where partners meet or scientific reviews are conducted. The STARR group also interacts with the Deep Shelf Gas Plays project headed by **Shirley Dutton** and the Quantitative Clastics Laboratory led by **Lesli Wood**. These groups provide insight into some of the scientific questions that STARR encounters, as well as an exchange of ideas in Gulf Coast stratigraphy and clastic sedimentary processes.

**STATE OF TEXAS
ADVANCED
RESOURCE
RECOVERY**
*is composed
of geologists,
geophysicists,
petrophysicists,
and engineers that
generate new drilling
opportunities for
industry partners.*





The team's strength lies in its ability to interact with industry partners to serve as advisors, strategists, and/or data interpreters, or simply as sounding boards for ideas and insights. For example, STARR recently interpreted a 3D seismic survey, identifying leads and new exploration plays for a Gulf Coast operator. Another operator recently asked for STARR's help identifying new reservoir potential through detailed sequence stratigraphic log correlations.



STARR integration pays. During the last biennium its reservoir characterization group worked with five different operators, interpreting seismic surveys, performing seismic modeling, conducting wireline-log correlations, and developing exploration concepts displayed by depositional environmental maps and cross sections. STARR's unconventional resource team leads in shale-gas reservoir research, such as Barnett, Woodford, and Haynesville shales in Texas, and several publications on nanoporosity and fracture patterns in these shales have increased the understanding of shale-gas reservoirs. STARR's New Venture regional studies group is actively investigating the Woodbine Sandstone in East Texas, the Frio Formation in the Gulf Coast, and the Bone Springs Formation in West Texas.

Integration and Teamwork in Fracture Research

BY STEPHEN E. LAUBACH

Finding new methods to explain and successfully predict, characterize, and simulate reservoir-scale structures is a hallmark of the **Fracture Research and Application Consortium (FRAC)**. We seek fundamental understanding of fractures and fracture processes with the aim of improving prediction and diagnosis of fracture attributes in the subsurface. But the project also has the goal of taking these fundamental insights and turning them into practical tools that can be deployed in petroleum exploration and development. To these ends we test methods on real industry data sets on timetables set by typical industrial operations. And we rigorously evaluate the quality, timeliness, and economic value of our results. FRAC researchers work on fractured carbonate rocks, mudstone systems, and deep and unconventional sandstone reservoirs, and we combine geoscience and engineering approaches. We work over a wide range of scales, from minute fluid inclusions to micron-scale imaging (using our unique scanning-electron-microscope automated cathodoluminescence system), to core and interwell bore, to regional-scale basin and outcrop studies that may span hundreds of kilometers.



With these aims and challenges, teamwork and integration of results from many disciplines are essential to the success of our endeavor. The consortium is based on an alliance among scientists at the Bureau and the Departments of Geological Sciences and Petroleum & Geosystems Engineering (P&GE). Scientists from these units offer unique and complementary approaches. Students interested in energy economics are involved because scientists from the Bureau and P&GE also serve on the Energy & Earth Resources faculty. Early in the development of the project, we discovered that understanding the links among mechanical and chemical processes is crucial to more accurate predictions and characterizations of the attributes of fractures. This discovery led to a research alliance between the consortium and leaders in the field of diagenetic modeling, which was supported by a grant from the U.S. Department of Energy, Office of Basic Energy Sciences, which in turn led to important breakthroughs in our understanding of the timing and rate of fracture growth in sedimentary rocks.

Societal needs for efficient and effective scientists developing unconventional hydrocarbon resources or contributing to a future CO₂ disposal industry will require a large cadre of geoscientists and engineers that have our cross-disciplinary perspective built in through their graduate training. The FRAC consortium supports systematic student training in structural diagenesis; we promote a merger of these disciplines and a new training paradigm in sedimentary geochemistry and structural geology. Consortium researchers have contributed to the understanding of fracture systematics in fractured carbonate rocks, sandstones, and mudrock systems—contributions made possible partly through a deliberate effort to build research teams that cross disciplines. Integration means making connections, and teamwork implies attaining a goal collectively and collaboratively. In a scientific context, both of these qualities further imply an open-mindedness that has the added benefit of making colleagues fun to be around, as well as sources of technical inspiration.

Integrated Evaluation of Deep Shelf Gas Plays

BY SHIRLEY DUTTON, BOB LOUCKS, AND ANGELA MC DONNELL

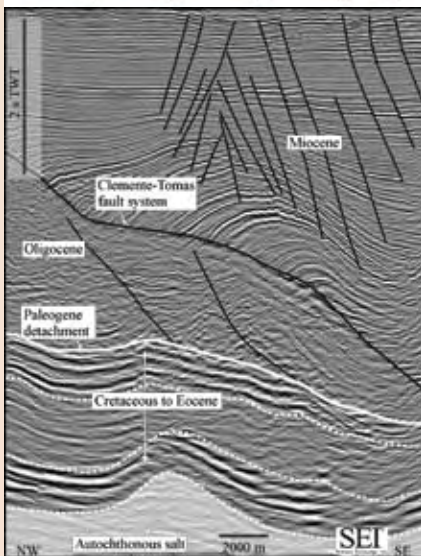
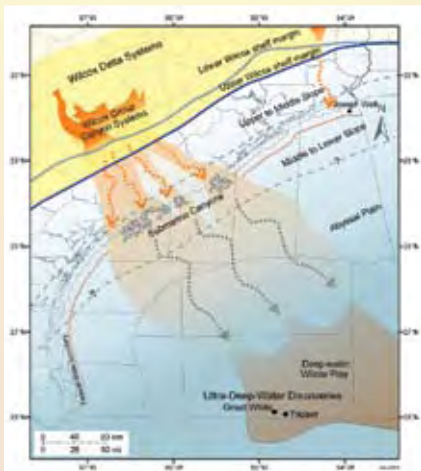
The Bureau's Stratigraphic/Structural Architecture and Sandstone Reservoir Quality in Deep Shelf Gas Plays project provides concepts and data that can be used to forecast reservoir quality, reservoir architecture, and associated risk factors when deep to ultradeep (15,000–35,000 ft) targets are being drilled beneath the Gulf of Mexico shelf and coastal

FRAC researchers work on fractured carbonate rocks, mudstone systems, and deep and unconventional sandstone reservoirs and we combine geoscience and engineering approaches.





DEEP SHELF GAS PLAYS project provides valuable updip regional knowledge to companies focused on downdip deep-water exploration.



zone. The project also provides valuable updip regional knowledge to companies focused on downdip deepwater exploration. Researchers working on this project integrate results from two very different scales. The seismic scale (2D and 3D seismic data) allows mapping of structural and stratigraphic architecture and delineation of deep to ultradeep depocenters, whereas the pore scale employs petrographic and petrophysical analysis to explain diagenetic controls on deep to ultradeep reservoir quality. Wireline-log analysis and burial-history modeling bridge these two scales, allowing a comprehensive study of the geology of the deep Gulf of Mexico shelf and coastal zone. The project is made up of three phases—in Phases 1 and 2 (completed) the upper and lower Texas Gulf Coast were studied, and Phase 3 will focus on the Louisiana Gulf Coast so that the eastward nature of trends in structure, stratigraphy, sandstone composition, and diagenesis that were developed for the Texas coast can be examined. The final report for each phase provides an integrated summary of research results.

Results so far have contributed important new insights into early Tertiary structural, stratigraphic, and diagenetic evolution of the Texas margin. The project team's integrated approach focuses on (1) mapping of the deep structural and stratigraphic architecture, (2) isochron mapping of deep sedimentary packages, (3) seismic facies analysis of these packages, (4) burial-history modeling, (5) petrographic analysis of rock samples, (6) statistical analysis of porosity/permeability relationships to controlling parameters, and (7) wireline-log analysis of porosity. Further, the GIS project allows results to be integrated with independent studies. Databases produced by the Deep Shelf Gas Plays project include

- *Catalog of photomicrographs*
- *Burial-history models of key wells*
- *Databases of sandstone mineralogy*
- *Interactive online database of sandstone porosity and permeability*
- *Capillary-pressure data*
- *Databases of porosity values calculated from wireline logs*

The Deep Shelf Gas Plays team comprises **Shirley P. Dutton** (diagenesis and reservoir quality), **Robert G. Loucks** (reservoir quality and stratigraphy), **Angela McDonnell** (seismic interpretation), **Caroline Breton** (GIS), and **Ruarri Day-Stirrat** (burial-history modeling), assisted by **Sumiyyah Ahmed** and **Jessica Schilling**.

Expansion of Bureau Water-Resources Research Program to Developing Countries

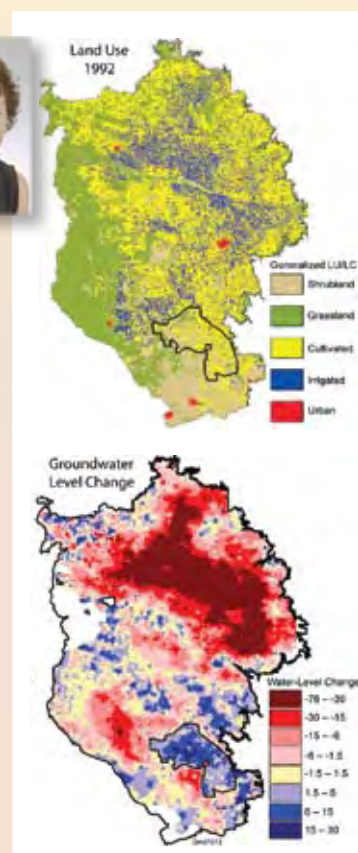
BY BRIDGET SCANLON

Satellite-based estimation of evapotranspiration (ET) is being proposed by the World Bank and other groups as the primary approach to monitoring consumptive water use for food, fiber, feed, and biofuel production. And the Bureau Water-Resources Research (WRR) is at the forefront in quantifying uncertainties in this approach and developing a methodology for ground-referencing satellite-based estimates of ET. Our research is currently using satellite, airborne, and ground-based data to join forces with Prasanna Gowda at the U.S. Department of Agriculture in order to quantify ET—a collaboration to assess satellite-based estimation of ET in different land-use settings.

The Gravity Recovery and Climate Experiment (GRACE) project—this time a collaboration with U.T. Department of Geosciences (DGS) Professor Clark Wilson—examines monitoring temporal variability in groundwater storage. Because groundwater-storage changes are not visible (and monitoring networks limited, particularly in developing countries), a satellite-based approach is valuable. Monthly variability in the Earth's gravity field is controlled primarily by variations in water distribution near the land surface. Preliminary evaluation of GRACE for monitoring groundwater storage in the High Plains aquifer was conducted using funding from the Jackson School and Postdoc Gil Strassberg. This analysis provided data for a proposal to NASA, and currently we have a joint proposal funded by NASA for Bureau and U.T. DGS collaboration and new Postdoc **Laurent Longuevergne**. This work should expand the capabilities of GRACE in monitoring groundwater storage by increasing spatial and temporal resolution and in evaluating regions in India and China, where ground-based monitoring networks are limited.

Although WRR emphasizes impacts of climate variability and change on the water cycle, land-use change also drives change in water resources. Our studies have quantified changes in water partitioning at the land surface in response to changes from natural to agricultural ecosystems in the Texas High Plains, with marked increases in groundwater recharge in areas of rain-fed agriculture. Results from irrigated areas show that increased irrigation efficiency leads to soil salinization. We are now assessing impacts of (1) land-use change on China's Loess Plateau (**John Gates**) and (2) irrigation in the North China Plain (**Robert Reedy**) and near Lake Chad, Niger (with IRD), as well as impacts of cultivation on groundwater salinization in Australia (with CISRO) and agriculture on water resources in Rajasthan, India (**Abhijit Mukherjee**). These studies help us understand impacts of land-use change on water resources by examining the archival record provided by distribution of environmental tracers in the subsurface.

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EARTH SCIENTISTS have a responsibility to apply their unique knowledge and skills to major geologic events affecting the people of Texas.



Collaborative Response to Texas Geohazards: Sinkholes and Storms

BY JEFFREY G. PAINE

One of the most visible and societally relevant venues for earth scientists is geohazards, by which we mean sudden geologic events that impact people, infrastructure, and ecosystems. In 2008, Bureau scientists teamed with State agencies, industry, and individuals from other universities and organizations to respond to two major events in Texas: collapse of the Daisetta sinkhole and landfall of Hurricane Ike. Although the scale of the two events differed greatly, both occurrences changed lives, damaged infrastructure, and received nationwide attention. Government officials charged with responding to these geo-events look to earth scientists for guidance on the continuing threats posed by sinkhole collapse and the assessment of damage and prospects for recovery from Ike.

In early 2008, Bureau researchers (including **Jeff Paine**, **Eddie Collins**, and **Seay Nance**) began a collaboration with individuals from the Center for Space Research at The University of Texas at Austin, The University of Texas of the Permian Basin, and the U.S. Geological Survey to better understand public safety risks associated with sinkhole formation near the community of Wink, Texas. This area has been subject to two recent episodes of sinkhole collapse: Wink Sink 1 formed in 1980, and Wink Sink 2 collapsed in 2002. Techniques being applied at these sinkholes included quantifying recent rates of ground subsidence through analysis of satellite-based, interferometric synthetic aperture radar (InSAR) data and detecting shallow mass deficits through microgravity surveys. These same methods were employed following the Daisetta collapse in May to determine the likelihood of further expansion of the sinkhole and to identify other areas around the city where shallow mass deficits might exist. These findings helped officials make decisions on road and school closures.

Hurricane Ike, a massive storm that made landfall on the upper Texas coast in September, produced widespread flooding and damage to beaches, dunes, and structures far in excess of those typically associated with a storm ranking at Category 2 on the Saffir/Simpson wind-speed scale. Bureau researchers **Tiffany Caudle**, **Sojan Mathew**, Jeff Paine, and **Jeff Vincent** worked with the coastal team at the General Land Office and investigators at the Harte Research Institute at Texas A&M Corpus Christi and UT's Center for Space Research to examine effects of the storm on the beach and dune systems, quantify storm damage through airborne lidar topographic surveys, and monitor the long-term recovery process following this major meteorological and geologic event.

Earth scientists have a responsibility to apply their unique knowledge and skills to major geologic events affecting the people of Texas. The Bureau of Economic Geology, by virtue of its longstanding role as the State Geological Survey and the diverse geologic and geophysical expertise of its staff, continues to be a prime responder to these events.

IT-STARR Integration

BY DALLAS DUNLAP

The Information Technology (IT) workforce integrates well Bureauwide, but perhaps most happily with the State of Texas Advanced Resource Recovery (STARR) project. Project STARR was developed to increase royalty income to Texas through working with operators of State Land leases to increase production of oil and gas by using the latest reservoir characterization technology (see separate story, p. 7). The project has been concentrating on two mature resource areas—the Gulf Coast and the Permian Basin—where innovative, cost-effective strategies can best be deployed to stem production decline.

To achieve these high-yield results, Project STARR uses high-performance computing, best-in-class geologic and geophysical software, and an integrated 3D stereo visualization and interpretation room. This visualization room has two regular high-resolution projectors for 2D display and two 3D stereo projectors (with 10 pairs of 3D glasses). One of the ultra-high-performance computer workstations is a 16-processor, 128-gigabyte memory system that gives STARR the ability to visualize four times the data previously possible on earlier computers. **Dr. Hammes'** note to the Director after an early tryout of this room shows what IT-STARR integration means:

- *We already had a working meeting with one of our industry partners, at which time we presented our work on the big screen in 3D and had discussions in 2D, switching back and forth between Seisworks and Geoprobe. We are also able to hook up a laptop for PowerPoint displays.*

This awesome, relatively inexpensive setup (<\$20K) would not have been possible without the diligent work of Reuben [Reyes], Joseph [Yeh], and Dallas [Dunlap]. These guys organized and orchestrated the setup, build out, made adjustments, tweaked, and researched the best and most cost-effective solutions for our visualization center. It's a big enough room for smaller meetings, work meetings, and presentations for a smaller crowd. It's interactive and fun. Anybody who has data to display on the UNIX can check with STARR team members for availability.

The INFORMATION TECHNOLOGY (IT) workforce integrates well Bureauwide.

To achieve high-yield results, researchers use high-performance computing, best-in-class geologic and geophysical software, and an integrated 3D stereo visualization and interpretation room.





Gulf Coast Carbon Center: Integrating Teamwork and Know-How

SUE HOVORKA AND IAN DUNCAN

After the GULF COAST CARBON CENTER (GCCC) was founded in 2003, the Bureau began working closely with industry partners to develop CO₂ sequestration as a viable approach to mitigating atmospheric CO₂.

Understanding the issues of CO₂ sequestration requires integrating knowledge of oil and coal (sources of carbon), hydrology (for injection), and petrophysics (for multiphase effects), as well as a range of legal and policy issues. In 1998 Bureau research into CO₂ sequestration began as a resource assessment by assessing the storage potential for CO₂ in deep-brine reservoirs. These studies also examined the potential of oil fields as sinks for CO₂. After the **Gulf Coast Carbon Center (GCCC)** was founded in 2003, the Bureau began working closely with industry partners to develop CO₂ sequestration as a viable approach to mitigating atmospheric CO₂. After 5 years GCCC corporate membership now stands at 13, and small projects have blossomed into the current research program, which, on a \$40+ million budget over the next 10 years, now conducts large-scale projects involving commercial-scale injection of CO₂.

The GCCC research team has also grown from 3 to a group of 18 researchers having a variety of backgrounds, experience, and training. This team diversity allows GCCC to tackle an array of issues that can affect successful development of a sequestration industry. But GCCC's progress in understanding CO₂ sequestration would have been impossible without help from other Bureau researchers.


Assessing storage permanence in the subsurface begins with reservoir characterization and ends with numerical simulation of the fate of CO₂ in the subsurface. Bureau geophysicists **Hongliu Zeng** and **Bob Hardage**, as well as partners at the University of Pittsburgh, Los Alamos National Labs, and Lawrence Berkeley National Labs, use seismic tools to examine rock and fluid properties. Bureau scientists **Bill Ambrose**, **Tip Meckel**, **Jiemin Lu**, and visiting scholar **Masoumeh Kordi** examine cores, porosity-permeability crossplots, thin sections, and wireline logs to create reservoir models. Reservoir performance using compositional simulators is being studied by Bureau researchers **J.-P. Nicot**, **Jong-Won Choi**, **Woodong Jung**, and **Kyung Won Chang**, as well as partners at national labs and UT. Geologic sequestration on a basin scale requires upscaling and assessment of reservoir seals as confining systems, not no-flow boundaries. J.-P. Nicot has merged compositional simulation for the two-phase area using the groundwater modeling tool MODFLOW, which can uncover basin-scale and water-table effects.

Ensuring that reservoirs perform correctly requires tools to track change in the environment, typically wireline and seismic tools, but fluid samples as well. **Sue Hovorka** has integrated a team of researchers from national labs and USGS to transfer standard and novel oil-field



tools to environmental applications. Other cross-discipline approaches are needed near the surface to examine two-phase and gas-dissolution effects where there are two possible sources of CO₂—deep leakage or shallow biologic source. **Rebecca Smyth**, **Katherine Romanak**, and **Changbing Yang** come from environmental-monitoring backgrounds but are integrating the system vertically—from soil gas through groundwater to injection-zone depths—to study rock-water-gas interaction and attempt to separate these signals.

Final integration is what connects geotechnical findings to economic policy issues and decision makers at state and national levels. Sue Hovorka has led this research program since its inception, becoming a world-renowned leader in CO₂ sequestration. **Bureau Associate Director Ian Duncan** and **Director Scott Tinker** have been leading figures as well, bringing the technical knowledge to lawmakers. GCCC members have also assisted EPA and four nongovernmental environment organizations with geotechnical advice. Visiting scholar **Joseph Essandoh-Yeddu**, intern **Eamon Briggs**, Bureau scientist **Carey King**, and CEE's **Gürcan Gülen** have completed policy and economic analyses, uniting subsurface conditions with surface sources via pipeline.



*The Bureau's
MEDIA GROUP
work closely
with the author,
to make Bureau
scientists the
most-read authors
in their fields!*

Media Services—Geophysics Collaboration

BY JOEL LARDON AND BOB HARDAGE

The Media Group at the Bureau of Economic Geology led by **Joel L. Lardon** houses the services of **Lana Dieterich** (editing), **Jamie H. Coggin** (graphic design), **Scott Rodgers** (web resources and visualization), **David M. Stephens** (photography and image editing), and **John T. Ames**, **Paula Beard**, and **Jana S. Robinson** (graphic illustration). Research staff members can utilize these services to complement their project work—a luxury not often found in similar institutions. The Bureau publishes printed maps, reports of investigations, and a variety of public-oriented circulars and brochures.

Bob Hardage, one of the most published researchers at the Bureau, is a regular collaborator with the Media Group. Bob readily acknowledges the unique approach he takes to writing a monograph, report, or article. He submits a steady flow of graphical work to the Media Group in order to summarize research procedures and findings and uses the output from the group to create a series of story boards around which narratives are written for specific publication objectives. It's a procedure much like Disney Studios uses to create their animated films. To quote Bob, "I have to see the story before I can write the story."





The Bureau's research staff members can utilize the services of the MEDIA GROUP to complement their project work—a luxury not often found in similar institutions.

Bob lays out hardcopy displays of Media Group graphics, arranges several of them in one sequence to emphasize a principle, and then replaces a few illustrations or reorganizes the sequence to tell another story. When he reaches a point where there is no graphic to explain a data-analysis step or a research finding, he submits another work request to the Media Group and waits for their output before continuing to construct the publication. He sees graphic images first, and then he allows the written work to take form around the photograph, seismic printout, or line drawing. Once the paper is written, then others of the group add the final touches so that the paper is ready to submit via hardcopy or digital file, which can be e-mailed or burnt onto a CD. Thus, in Bob's case, the Media Group work closely with the author—from the early stages of the creative process through to the finished product. However, in Bob's opinion, graphics are more important in a published article than is the text. He says, "I, like many colleagues, flip through an article and look only at the graphics to decide if I want to take the time to read the publication a little more slowly and thoughtfully. If the graphics do not impress me, I often ignore the article." The goal of the Bureau's Media Group is to make Bureau scientists the most-read authors in their fields!



International Travel

Bureau Director Scott Tinker has been traveling around the globe—from England, Germany, Russia, and Poland; to Bahrain, Oman, and Nigeria; to South Africa, Malaysia, Indonesia, China, and Singapore. Being President of AAPG has its perks!

Michelle Michot Foss of CEE spoke in January at two high-level seminars on energy security for Algerian energy, interior, and defense officials and personnel. The Energy Infrastructure Security Seminar was sponsored by ANHAM, LLC, a leading infrastructure and risk management contracting firm based in Dubai. Michot Foss addressed "Strategic Priorities for Energy Infrastructure Security" on a panel led by Admiral James Loy, The Cohen Group (former deputy secretary, Homeland Security, and administrator, Transportation Security Administration). The conference took place in Algiers January 14–15.

Paul Ching and **Sean Murphy** of the Advanced Energy Consortium (AEC) joined 90 other technologists representing the oil and gas and nanotechnology disciplines February 3–6 in Dubai, UAE. The SPE-sponsored workshop focused on using nanotechnology in upstream energy exploration and production. Paul was the featured speaker at the event's highlight dinner, and Sean spoke on technology roadmapping—a talk that set up a breakout session on drilling, exploration, and reservoir and production applications using nanotechnology. Rice University (the Bureau's technical partner) was represented by Wade Adams (who served as a session chairman and member of the steering committee), Howard Schmidt (AEC's Chief Scientist) and Andreas Lutge. With strong participation by corporate partners, AEC had 16 members in attendance.



Dr. Fares Howari, Middle East Regional Coordinator of The University of Texas at Austin Center for International Energy and Environmental Policy (CIEEP)—and Bureau scientist—made a presentation this year at a first-of-its-kind conference. CIEEP held the First Conference on Water Policy and Associated Technological Challenges in Arid Dynamic Environments: The Special Case of Arabian Gulf Countries. The meeting was hosted by the American University of Kuwait and co-sponsored by Schlumberger Water Services. The conference was attended by prominent scholars and policy makers in the field of water resources from around the world, focusing on the Gulf region. Featured presentations demonstrated how natural rainfalls, increased frequencies of drought, water salinization, and flash floods increase the challenge of supplying enough water to some of the most arid countries in the world.



Martin Jackson was in Alps de Haute Provence (France) June 4 to 7 collaborating on fieldwork with structural geologists from Hess's London and Houston offices. The work, led by Rod Graham, shed light on the role of salt tectonics before and during Alpine folding.



RCRL scientists **Xavier Janson** and Charlie Kerans each gave keynote addresses at the 2008 SEPM Conference held in Kilkee, Ireland—Outcrops Revitalized: Tools, Techniques, and Application. They addressed a gathering of 65 attendees on the application of 3D outcrop-based models developed by the RCRL to reservoir characterization and the seismic signature of carbonates. The photos, taken by Christopher G. St. C. Kendall, show Charlie and Xav on a field trip, with the spectacular carboniferous deep-water sand of the Irish coast as a backdrop (detail at right).





Public Outreach & Education

Explore UT: the Biggest Open House in Texas

- Explore UT is a campuswide program in Austin to inform the public about the university's mission—teaching, research, and public service. Both adults and kids of all ages have a chance to explore the academic community and the diversity and rich resources of the school. It's an awesome experience for K–12 students from around the state to visit the UT System's flagship university.
- Planning for this event is a massive undertaking because 50,000 students and visitors really do explore UT in more than 370 activities for all ages. This influx virtually doubles UT's population for a day.
- In cooperation with the Jackson School, Bureau staff and scientists participate annually. At the 2008 Explore UT event, Bureau activities included 3D geology, pet rocks, panning for gold, and rock identification at the geology department's rock garden. BEG participants included **Sigrid Clift, Sue Hovorka, Jay Kipper, Scott Rodgers, Bridget Scanlon, and Becky Smyth.**
- The 2009 Explore UT was held on Saturday, March 7th, on the UT campus in Austin. For more information, visit the Explore UT website at <http://www.utexas.edu/events/exploreut/>.



Image courtesy of Marsha Miller, UT Office of Public Affairs

Texas Regional Collaboratives Workshop at the Bureau

Texas Regional Collaboratives (TRC) is an award-winning program at the U.T. Austin College of Education that provides intensive professional development to K–12 teachers of science and mathematics. The Bureau organized a workshop for TRC that was held on June 10th. More than 30 teachers visited the Bureau to broaden their knowledge about the Bureau's cutting-edge scientific research. The teachers went to work in areas throughout the Bureau to learn how scientists use computers and other instruments to conduct research on environmental, coastal, energy, and water issues. **Scott Tinker, Bridget Scanlon, Sue Hovorka, Jeff Vincent, Tiffany Caudle, Ursula Hammes, Lesli Wood, Cari Breton, Bill Ambrose, Ian Duncan, and Tip Meckel** gave presentations at the event. The teachers came away from the workshop armed with tools that they can now employ in their classrooms in the study of geoscience.

Bureau Hosts Scientific Software Day

The Second Annual Scientific Software Days, organized jointly by the Texas Advanced Computing Center (TACC) and the Jackson School of Geosciences, took place May 15–16. The event attracted more than 60 participants for 1 day of technical presentations and 1 day of tutorials and was co-organized by Victor Eijkhout (TACC), **Sergey Fomel** (BEG), and Michael Tobis (UTIG/BEG). Sergey gave a presentation titled “Reproducible Computational Experiments Using the Madagascar Software Package.”

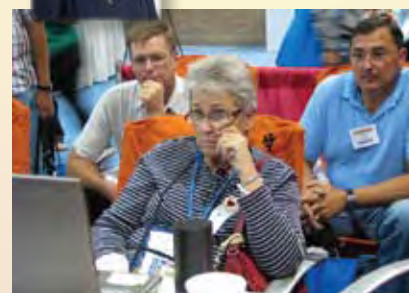
Annual CAST Science Teachers’ Conference

The Conference for the Advancement of Science Teaching (CAST) is the largest state science conference in the country, and for more than 50 years, the Science Teachers Association of Texas (STAT) has hosted this event. The 2008 3-day event, held at the Fort Worth Convention Center, was attended by more than 6,500 teachers from around the state. Texas teachers must accrue 150 hours of professional development every 5 years to retain their certification, and this year CAST offered almost 600 workshops, field trips, and short courses to help teachers reach their certification goals.

Teachers watched *Texas: the Underground Story*, a DVD on the geologic history of the Texas Gulf Coast with 3D animation, allowing paleogeographic changes and major geologic events to be visualized. Discussions on the geology that led to vast petroleum supplies and issues related to petroleum use and the environment are included. Each teacher received a copy of the 7-minute video and reviewed activities designed to assist with curriculum material required by Texas.

CAST also sponsored a large exhibit hall with more than 400 displays. The Bureau manages the Jackson School exhibit, and this year **Jennifer Logan** and **Sigrid Clift** provided hands-on activities on energy and the environment to hundreds of teachers during the event.

CAST 2009 will be held at Galveston on November 5–7. For more information about this important event and how you can participate, visit the STAT website at <http://www.statweb.org/index.php>.





Texas High School Coastal Monitoring Program



The Texas High School Coastal Monitoring Program (THSCMP) is an ongoing Bureau project designed to help coastal residents develop a better understanding of dune and beach dynamics on the Texas coast. Bureau researchers (with Bureau scientist **Tiffany Caudle** as the moving force behind the project) work with high school and middle school students and teachers, showing them how to measure topography, map vegetation lines and shorelines using Global Positioning Systems (GPS), and observe weather and wave conditions. As participants in an actual research project, students enhance their science education and provide coastal communities with valuable data on the changing shoreline.

The THSCMP is currently in its eleventh year of operation. Participating schools are Port Isabel High School in South Texas (10 years in the program), Port Aransas High School on Mustang Island (10 years), Van Vleck Middle and High Schools (4 years), Palacios High School (3 years), and students participating in the Spanish Science Club at Tidehaven Middle School (4 years). Ball High School on Galveston Island (11 years) will remain active in the program but may not collect data during the 2008–09 academic year. Because of impacts of Hurricane Ike, Ball High School study sites were destroyed or made inaccessible. Hopefully by the 2009–2010 academic year, conditions will be safe enough for the students to return to collecting field data.

THSCMP is a unique educational program in that students collect real-world data that are used by working scientists to address coastal issues. Students understand that they are working on a real research project and are collecting scientifically valid data that will eventually appear in a scientific publication. This fact is a major point that makes this program different from other field trips or laboratory exercises. Asking students to conduct experiments that have real consequences seems to make a difference to them, and it probably improves the quality of the data.

Benefits from this project accrue to coastal communities that are directly affected by beach erosion and beach-erosion public policy. Data from this project are accessible through the THSCMP website, CMP project reports, and scientific journal articles. For more information, please visit the program's website at <http://coastal.beg.utexas.edu/thscmp/>.

We are currently creating an interactive 3D virtual reality model that will enable us to bring the coastal environment into the classroom. This will allow us to work with students and teachers who do not have access to the Texas coast but want to learn about and explore this dynamic environment.



Awards and Honors



At its April meeting, the Austin Geological Society

awarded Bureau scientists **Sigrid Clift** and **Steve Ruppel** AGS Public Service Awards for their volunteer work. Sigrid was cited for her "continued efforts in outreach and education at all levels of the public" and for her "efforts to realize one of the purposes of the society—educating the public about the geosciences." Steve was recognized for managing the publication of AGS field guidebooks for many years. "Those publications serve as a wealth of geologic knowledge and a source of revenue for the society," the AGS website says, later adding "Thanks Steve for all your work!"



CO₂ sequestration pioneer, **Dr. Sue Hovorka**, won a Division of Environmental

Sciences Research Award from the American Association of Petroleum Geologists, awarded at AAPG's 2008 annual meeting in San Antonio, Texas. The award recognizes "outstanding contributions to understanding and communication of efforts to produce energy, minerals, and water with minimal impact

on the environment and for contributions to public understanding of our professional responsibility."



Bureau scientist **Bob Hardage** recently accepted an invitation from Secretary of Energy

Samuel Bodman to serve on the Department of Energy's Unconventional Resources Technology Advisory Committee (URTAC) as a Special Government Employee. The committee was established in 2006 to advise the Secretary on development and implementation of activities related to unconventional natural gas and other petroleum resources. Bob will provide the committee with his expertise in these areas. He will serve through 2010. Bob also made a presentation at the 50th Anniversary Celebration of the Research Institute of Petroleum Exploration and Development (RIPEd) in Beijing, China, on October 24–25. The event, titled Academician's Forum: Future of Petroleum E&P Technology, included invitees from around the world. Bob spoke on "Emerging Seismic Technologies." Former Director William Fisher also presented, and current **Director Scott Tinker** delivered opening remarks on October 23.



Bureau scientists **Tim Dooley**, **Mike Hudec**, and **Martin Jackson** won the Jules Braunstein Memorial Award (in a tie) for Best Poster at the AAPG Annual Convention in San Antonio in April. The poster, titled "Dismembered Sutures Formed



during Asymmetric Salt-Sheet Collision," was selected from 600+ posters from around the world.



Bob Hardage was also named First Vice President of the Society of Exploration Geophysicists (SEG) for 2008–2009. SEG, with more than 30,000 members residing in 130 countries, is the leading international organization of applied geophysics, its annual meeting long being unrivaled as the world's premiere showplace for state-of-the-art geophysics.



Sergey Fomel was elected to SEG's Council (the legislative branch of SEG) as one of the district representatives. District 3 includes all southeast states.



BUREAU OF ECONOMIC GEOLOGY



Martin Jackson, head of the Bureau's Applied Geodynamics Laboratory (AGL),

received the 2007–2008 Jackson School Service Award. Dean Barron enumerated Martin's service on committees to formulate the Charter of the Jackson School, JSG external appointments, search committees, and the JSG Strategic Planning Council. Dean Barron said "Martin has participated in the key enterprises that help us all be more successful. He has invested an incredible amount of time in improving the collective."



Steve Laubach is now a member of the Petroleum Group Committee of the Geological Society

of London, which, among other things, sponsors GSL's petroleum-related conferences and publications (some in collaboration with AAPG and SPE). Although Steve appeared in person for a committee meeting in February in London, he'll be able to participate in most committee activities via conference call.



One of three 2007–2008 Jackson School Research Awards went to Bureau scientist **Bob Loucks**. The man who for years has been the moving force behind the

State of Texas Advanced Resource Recovery (STARR) program was presented this coveted award by Dean Barron "for impact which can be summarized in one simple sentence: Bob has been honored nearly 20 times with best paper or best talk awards by professional societies."



Bureau scientist **Bridget Scanlon** won the 2007–2008 Jackson School's Joseph C. Walter Jr.

Excellence Award. The Walter award is the most prestigious internal award in the school. In his presentation speech to Bridget, Dean Barron cited Bridget's "external research, publications, prominent role in important advisory committees, and the [GSA 2007 Birdsall-Dreiss] distinguished lecturer role," all of which contributed to her schoolwide recognition.

Hongliu Zeng, Bob Loucks, and Uschi Hammes were



recipients of Honorable Mention in the category of Best Poster Paper Presented at the SEG 2007 Annual Meeting. The paper is titled "Linear Amplitude Patterns in Corpus Christi Bay Frio Subbasins, South Texas: Artifacts or Depositional Features?"



Sergey Fomel was also a recipient of Honorable Mention in the category of Best Poster Paper

Presented at the SEG 2007 Annual Meeting for his paper "Applications of Nonstationary Regression." That the Bureau was recognized twice in this category, out of a field of 150 papers, is a high achievement indeed!



Lesli Wood, head of the Bureau's Quantitative Clastics Laboratory (QCL), received Honorable

Mention, Best Paper in the *Journal of Sedimentary Research*, for her paper "Quantitative Seismic Geomorphology of Pliocene and Pleistocene Fluvial Systems in the Northern Gulf of Mexico."



One of **Lesli Wood's** students, **Brian Kiel**, received a 2008 NSF Graduate Research Fellowship—a

highly competitive, fully funded award. In his proposal, Brian argues for utilizing the seismic geomorphologic approach to calculating flow and drainage volumes in Pleistocene channels of the Indonesian archipelago in a way that could impact the climate community's understanding of historical monsoon proxies.

The Quantitative Clastics Laboratory (QCL), headed up by Lesli Wood, announced several of its students as recipients of awards—both inside the Jackson School and outside. Receiving an outside award (in addition to **Brian Kiel** mentioned in



the previous story) is **Vishal Maharaj**, who received a GCAGS Fellowship for Research. Inside the School, Vishal received the Michael Bruce Duchin Centennial Memorial Endowed Presidential Scholarship and a Marathon Fellowship;



Kurtus Woolf received the Devon Fellowship for Research;



Nysha Chaderton received the Hess Fellowship;



Sean Sullivan received a ConocoPhillips Fellowship;



Tiffany Hedayati, **Darrin Burton**, and **Tricia Alvarez** each received a Chevron Fellowship for Research; and Brian Kiel received a University Preemptive Fellowship and a ConocoPhillips Fellowship.



Beatriz Garcia-Fresca, RCRL Ph.D. student, along with her co-authors and advisors, Charlie Kerans (UT Department of Geological Sciences), **Jerry**



Lucia (Bureau), and Jack Sharp (UT Department of Geological Sciences), was informed that SEPM awarded them the 2008 Excellence of Poster Presentation (in a tie). Their poster, titled "Numerical Model of Reflux Circulation during the Deposition of the Permian San Andres Formation, Guadalupe Formation and Algerita Escarpment," was presented at the San Antonio AAPG-SEPM Meeting in April. The award will be bestowed at the SEPM meeting in Denver in June 2009.

FRAC graduate students **Peter Hargrove**, **Magdalena Ellis**, and **Juan Inigo** are recipients



of fellowships from the GDL Foundation for their research on the structural diagenesis of petroleum reservoirs and reservoir analogs. Other fellowship recipients in this competition are from Yale,

Harvard, and Stanford. Ellis and Hargrove study fractures in tight gas sandstone analogs in Scotland and in cores from the western United States. Inigo is working on fractured sandstones in Bolivia.

Director Scott Tinker's Executive Assistant, **Wanda LaPlante** was the surprised 2007–2008 Jackson School Staff Excellence Award winner. Wanda has served in many



capacities at the Bureau through the years, but perhaps her hardest job was to become the brand-new Director's new right hand. No small feat. One nominator wrote: "She maintains the director's presence even when he travels the world I often think if she were not here leaving the lamp burning in the watch that Scott would not be able to find his way home."



Bureau Transitions

New Research Staff



Bruce Cutright, a newly hired Research Associate working in water research, has a B.S. and an M.S. in Geology from the University of Florida, Gainesville. Bruce excels in management and technical leadership of complex groundwater flow and contamination-related projects; aquifer storage and recovery in water-resource development, supply enhancement, and stabilization; sustainable water-resource development and management; water needs for power generation facilities, environmental compliance, and siting investigations; agricultural water supplies in developing countries and low maintenance/low technology water-supply systems; and low-impact communities and sustainable design of communities in urban settings.



Qilong Fu is a new Bureau Research Associate who holds degrees from the Chinese Academy of Sciences, Beijing, China (M.Sc.), and the University of Regina, Saskatchewan, Canada (Ph.D.). Qilong has worked as a Petroleum Geologist

for AGAT Laboratories Ltd., Calgary, and Canada Capital Energy Corporation, Regina, Saskatchewan. His interests include sedimentology and stratigraphy, carbonate deposition and diagenesis, sedimentary geochemistry, and reservoir characterization and petroleum geology.



Farzam Javadpour, Research Associate, received his B.Sc. with distinction in petroleum engineering from the Petroleum University of Technology (Iran), and M.Sc. and Ph.D. degrees in chemical and petroleum engineering from the University of Calgary. He serves as a member of the Editorial Review Board for the *Journal of Canadian Petroleum Technology* (JCPT) and was Issue Coordinator of the August issue. He is currently establishing a nanotechnology lab for the study of mud rock/shale gas systems. Farzam worked as Research Scientist/Engineer at the Alberta Research Council, where he was involved in CO₂ injection and shale gas research and field pilot design. Farzam was also an instructor

at the University of Calgary from 2003 through 2008. He has worked as a reservoir engineer in the National Oil Company of Iran for 7 years. Farzam has presented and published 30+ technical papers on topics related to transport in porous media.



The STARR group recently added **Brandon Johnson**, Research Scientist Associate, to its fold. A 2006 graduate of UT in Geophysics, Brandon is a seismic interpreter with a unique background that combines seismic processing and oil and gas exploration. He is adept at utilizing a variety of geological and geophysical data to generate and document prospects. Currently Brandon is interpreting seismic data for geophysical modeling and reservoir characterization and applying advanced imaging techniques and seismic attribute analysis for sequence stratigraphic modeling and prospectivity assessment.



Kitty Milliken, former researcher in the Department of Geological Sciences on campus, has

joined the Bureau. Kitty's list of credentials is impressive. A holder of Master's and Ph.D. degrees in Geology from UT, she has been named an AAPG Distinguished Lecturer, a Fellow of the Geological Society of America, and two-time winner of the Bronze Award for "Teaching with Technology" (IITAP Program, UT). Kitty is a Senior Research Scientist involved in the deep-burial diagenesis project. Her areas of expertise include combining petrographic and geochemical methods to decipher histories of chemical modification in sedimentary rocks; petrographic methods of conventional light microscopy, statistical analysis of detrital and authigenic components, and electron microbeam imaging techniques; and geochemical methods of electron microprobe analysis and stable isotopes. One of Kitty's new roles will be managing the Bureau's expanding microbeam laboratory.



Another Research Associate joining the Bureau ranks this year is **Katherine Romanak**, who is a geochemist working with **Sue Hovorka**. Katherine graduated from UT Austin

with a Ph.D. in Geology, having received a Master's in Geology from UT Arlington. Katherine's research focuses on geochemistry and isotope systematics of carbon cycling in the vadose zone and in freshwater aquifers, soil-gas monitoring and surface gas flux measurements at CO₂ sequestration sites, microbial influences on carbon geochemistry in the shallow subsurface, and fate and transport of organic contaminants. Earlier in her career, Katherine was a staff scientist with the Smithsonian Institution, Global Volcanism Program, Washington, D.C.



Changbing Yang is a new Research Associate at the Bureau working as a geomechanical fluid flow engineer. His areas of expertise include numerical modeling of multiphase flow and contaminant transport in both saturated and unsaturated zones, geochemical modeling and reactive transport, inverse modeling of nonisothermal flow and biogeochemical reactive transport modeling, numerical modeling of soil organic carbon dynamics, soil thermal properties and water flux measurements using heat-pulse techniques, and

multiobjective optimization models for management and sustainable use of water resources. Changbing holds an M.S. and a Ph.D. in Hydrogeology from Changchun College of Geology (Jilin University), Changchun, China, and the University of La Coruña, La Coruña, Spain, respectively. He did postdoctoral research at Utah State University and Indiana University at Bloomington.



Tongwei Zhang, a new Research Associate, comes to us by way of China and California.

Tongwei received his Master's and doctoral degrees from the Chinese Academy of Sciences in Petroleum Geochemistry and Isotope Geochemistry, respectively. He later did postdoctoral work in chemistry at the California Institute of Technology. Tongwei's research interests include gas geochemistry and isotope geochemistry, petroleum and gas generation kinetics and basin modeling, fluid transport processes in basins and reservoirs, organic-inorganic interactions, unconventional gas reservoir characterization, and CO₂ sequestration and H₂S risk prediction.



BUREAU OF ECONOMIC GEOLOGY



Sami Akasheh recently signed on as a Bureau Postdoctoral Fellow. Sami has Master's and Bachelor's degrees in Soil and Irrigation Science from the University of Jordan and a Ph.D. in Irrigation Engineering from Utah State University in Logan. Sami's areas of expertise include irrigation engineering, remote sensing applications for resources planning, geographic information system (GIS), water and land resources management, land-atmosphere interaction, and hydrology and hydraulics. Sami has had training and certification in water harvesting designs in arid regions, color photography and videography in resource assessment, and radiation protection.



Jong-Won Choi is another new Postdoctoral Fellow at the Bureau. Jong-Won has two Master's degrees—one in Geotechnical Engineering from Korea University and one in Civil Engineering from Georgia Institute of Technology. His doctorate is in Civil Engineering as well, which he received (along with a minor in Applied Mathematics) from Georgia Institute of Technology. Jong-Won's areas of expertise are in CO₂ sequestration and modeling reservoir behavior after CO₂ injection using fluid flow codes and finite element/finite difference codes.



A new researcher working on research of the Piceance Basin with the FRAC team is **András Fall**, Postdoctoral Fellow. András lists as his research interests fluids in the Earth, fluid inclusion techniques, thermal history reconstruction based on fluid inclusions, and CO₂-rich fluid inclusions. He holds a Ph.D. in Geosciences from Virginia Tech, as well as two Masters' of Science—one in Geosciences from Virginia Tech and one in Geology from the University of Bucharest, Romania. András is also a recipient of a teaching excellence award from Virginia Tech's Department of Geosciences.



Svetlana Ikonnikova is a new Postdoc who lists applied game theory, industrial organization, contract theory, public policy, energy market design and regulation, environmental policy, economics, and geopolitics as her research interests. After receiving her M.A. in Applied Physics and Mathematics at the Moscow Institute of Physics and Technology in 2003, Svetlana received her Ph.D. in Economics and Management Science at the Humboldt University of Berlin in Germany in 2007. Before arriving at the Bureau, Svetlana was a Postdoctoral Fellow and Teaching Assistant at the Catholic University of Leuven in Belgium.



Woodong Jung is a new Bureau Postdoctoral Fellow, whose research interests include sequestration of supercritical carbon dioxide in depleted oil or gas reservoirs, carbon sequestration in hydrocarbon-derived, authigenic carbonate rock, methane hydrate formation and dissociation in porous media, and multiphase flow in pipe. Having received an M.S. in Mechanical Engineering from Chungang University, Korea, in 1987, Woodong was also awarded an M.S. in Petroleum Engineering at Texas A&M in 2002. And this year he received a Ph.D. in Geology from A&M as well. Woodong's former job titles range from Laboratory Technician to Scientist/Organic Geochemist on board a USGS research vessel.



Laurent Longuevergne, a new Postdoctoral Fellow at the Bureau, is a graduate of the University Pierre et Marie Curie, France, in Geophysics. His research interests include measuring terrestrial water storage using geodetic instruments (GRACE satellite, superconducting gravimeter, hydrostatic tiltmeter), modeling terrestrial water storage, and developing physical tools to measure the environment (including applied geophysics). Laurent worked for a time as an engineer for the French Office for Geologic and Mining Resources in Strasbourg, as well as a civil volunteer for the French Antarctic Survey on Kerguelen Island.



Jiemin Lu is a new Bureau Postdoctoral Fellow interested in geochemistry of fluids in porous sedimentary rocks, diagenesis of sedimentary basins, CO₂ interactions with aquifer and seal, and geology, geochemistry, and basin modeling related to CO₂ geological storage. Jiemin holds an M.S. degree in Tectonics from Peking University in China and a Ph.D. in Geology from Edinburgh University, Scotland.

New Support Staff

Mark Andrews is the Bureau's new GeoMechanics Lab Manager. Mark will pursue instrument development and provide technical support to **Dr. Peter Flemings** and the new GeoMechanics Lab. After receiving a B.A. in Geology from Texas A&M, Mark signed on at A&M's Cyclotron Institute as an Accelerator Technician. Over the years Mark has gained both professional and personal experience designing and building electrical equipment, mechanical devices, and data acquisition systems. On his own, he built a seismometer and used it to detect earthquakes as far away as the Philippines. He also assisted his father in building a two-seat, single-engine airplane.

Kenneth Edwards is our new Stores Clerk I, who works for **Nathan Ivicic** at the Bureau's Core Research Center. Kenneth moved to Austin this past June after a stint at the University of North Texas.

Beth Ellison is the new Financial Analyst at the Bureau. Beth brings a vast amount of UT accounting and financial experience to the Bureau. She comes to us from the UT Center for American History, where she was responsible for financial operations of its seven units for the past 3 years. Before that Beth was Business Administrator with the Center for Distance Learning Research at Texas A&M.

Stephaine Lane is **Ian Duncan's** Administrative Associate. Stephaine helps coordinate activities for Ian, maintaining his calendar, handling his travel, etc. She also provides the Director with daily updates on oil and gas news. After attending the University of Houston, where she studied nutrition, psychology, and public health education, Stephaine worked at M. D. Anderson Cancer Center in the Department of Epidemiology managing grants and later the Department of Treasury Services supporting its Director.

Caryn Mills is the Bureau's new Human Resources Coordinator. After receiving her Bachelor's in Government from UT, Caryn began her career in Human Resources Management at the Texas Commission on Environmental Quality. Three years later she became a Human Resources Specialist for Lutheran Social Services of the South, Inc. And after nearly a decade there, Caryn has arrived at the Bureau.

Sheila Phillips is a new assistant to **Michelle Foss** and her team at the **Center for Energy Economics** in Houston, bringing 25+ years of administrative and accounting experience to the role. Sheila's prior experience includes 15 years in the commercial construction industry in capacities of support to principal management, and earlier background in oil-field equipment-related companies.



Hasta La Vista, Jerry!

In September the Bureau bade a fond farewell to **Jerry Lucia**, researcher, author, mentor, and leader. Jerry arrived at the Bureau after putting in 30 years at Shell Oil Company as a Geological Engineer in research and operations, and he gave the Bureau another 23 as a Research Scientist. Here is a man who loves his geology! At home in the field or in the classroom, Jerry has technical expertise that includes carbonate sedimentation, origin and distribution of dolomite, and relationships between carbonate rock fabrics and petrophysical properties. And as an expert in carbonate reservoir geology, reservoir characterization, and carbonate petrophysics, Jerry cofounded the **Reservoir Characterization Research Laboratory (RCRL)**, alongside Charlie Kerans, remaining a co-PI of RCRL right up until he retired. Jerry is a member of AAPG, GSA, SEPM, SPE, and the Austin Geological Society. Awards include the Distinguished Service Award from the West Texas Geological Society in 1993, back-to-back AAPG Wallace E. Pratt Memorial Awards for Best Paper in 1994 and 1995, and Honorary Lifetime Membership in SEPM, Permian Basin Section. More recently, Jerry served as an AAPG Distinguished Lecturer in 2000. His 1999 book, *Carbonate Reservoir Characterization*, already a classic, is in its second printing. Jerry is now working part time after a little R&R touring around the state.





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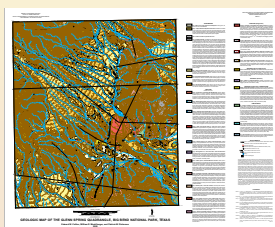
The Bureau produced five new publications in 2008.



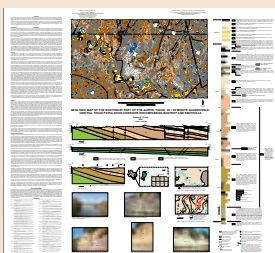
Leaning Forward: A Memoir (SR0016), is by Dr. William L. Fisher, professor in the Department of Geological Sciences. This autobiography chronicles Dr. Fisher's lifelong journey as student, geologist, longest serving Director of both the Bureau of Economic Geology and the UT Geology Foundation, Assistant Secretary of Energy and Minerals under President Gerald Ford, first Dean of the Jackson School, teacher, writer, mentor, and friend to earth scientists around the globe. The foreword to the book is by **Director Scott Tinker**. Soft-cover copies of the 424-page volume can be purchased through Publication Sales.



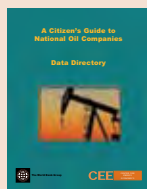
Sequence Stratigraphy and Depositional Systems of the Woodbine Group in East Texas Field: PTTC Texas/Southern New Mexico Region Workshop, Sequence Stratigraphy and Depositional Systems of the Woodbine Group in East Texas Field (SW0018), by **William A. Ambrose, Tucker F. Hentz, Florence Bonnaffe, Robert G. Loucks, Eric C. Potter, and Sigrid J. Clift**, summarizes a joint BEG-PTTC workshop, including an in-depth study of Woodbine sequence stratigraphy, depositional systems, and petrography in East Texas field, that is based on detailed analysis of more than 1,000 logs and 30 cores. It demonstrates that the depositional framework of the Woodbine Group in East Texas field is more complex than described from previous studies, with implications for incompletely swept, bypassed, and deeper pay in the field. The publication reviews Woodbine sequence stratigraphy and depositional systems, followed by an in-depth geological review of two pilot study areas in the north and south parts of the field. A CD-ROM of workshop presentations from the workshop is also provided.



Geologic Map of the Glenn Spring Quadrangle, Big Bend National Park, Texas, (MISCELLANEOUS MAP 46), by **Edward W. Collins** continues the Bureau's long map-making tradition. This geologic map, which includes cross sections and photographs of selected geologic features, was constructed as part of the National Park System's effort to produce an updated parkwide geologic map. The Glenn Spring area is a frequently visited back-road area containing many spectacular sites of geologic interest. The unique rocks, sediments, and landscape of the Glenn Spring area record a relatively long, complex history of geologic events.



Geologic Map of the Southeast Part of the Austin, Texas, 30 x 60 Minute Quadrangle: Central Texas Population Corridor Encompassing Bastrop and Smithville (MISCELLANEOUS MAP 47), by **Edward W. Collins**, is the second map published by the Bureau this year. This geologic map of the southeast Austin corridor in Central Texas has been constructed by digital compilation of eight 1:24,000-scale open-file geologic maps. The map is intended to be used by professionals and laypersons as a source of general geologic information that relates to land and resource use and management. Geology of the area consists mostly of Paleocene through Eocene mud- and sand-rich units. Minor Upper Cretaceous marine marl and calcareous mud deposits are in the western study area. Quaternary high-gravel deposits and well-defined terrace deposits of the Colorado River also occur. Bedrock units typically exhibit eastward regional dips of less than 2°. In the west and east parts of the study area, northeast-striking normal faults cut strata. Aquifer units include the Carrizo-Wilcox, Queen City, Sparta, and Yegua. Resources include sand, gravel, clay, lignite, and oil.



Citizen's Guide to National Oil Companies, Parts A & B, by Silvana Tordo, **Michelle Michot Foss, Gürcan Gülen, Miranda L. Wainberg, Ruzanna Makaryan, Dmitry Volkov, Mariano E. Gurfinkel, Omar Valdez, Jim Starr, Bhamy Shenoy, Alfred Boulow, Jonathan Stern, Javier Estrada, and Ernesto Marcos**, **Center for Energy Economics**, presents the results of a survey intended to provide input for the selection of a sample of representative National Oil Companies (NOC's) to be fully analyzed within the *Study on National Oil Companies and Value Creation*. The guide, co-published by the World Bank—Oil, Gas, Mining, & Chemical Division—provides a preliminary analysis and possible interpretation of data on 49 NOC's and their home countries. The data directory was created using publicly available information drawn from various sources, including NOC publications and websites, country ministries, and regulatory bodies. Go to <http://www.beg.utexas.edu/energyecon/nocs/>.

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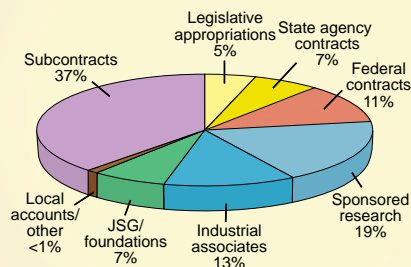
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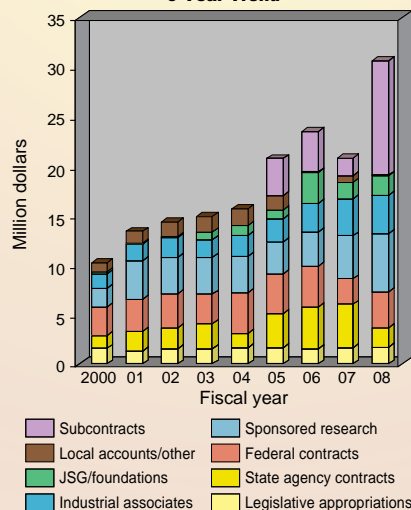
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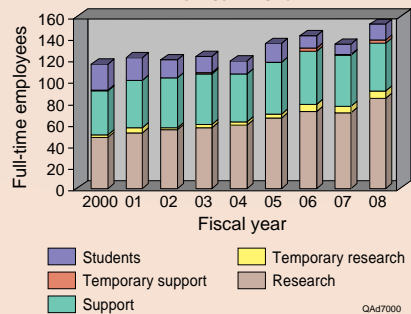
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