With this geological time machine, Dr. Franco Marcantonio explores ancient worlds of the deep geological past to gain insight into Earth’s future.

Birth of a Lab and a Legacy

The R. Ken Williams ’45 Radiogenic Isotope Geosciences Laboratory
Howdy!

The past four years that I have had the opportunity and privilege to steer the directions of the College of Geosciences have been a period of profound change at Texas A&M University and globally. Concepts central to geosciences such as climate change, the environment, energy, and water resources have always been important societal issues but have never been in such a need of prioritization as they are today.

The College is now larger than ever before. With 38 new faculty members hired in the past four years, we now have 110 tenured and tenure-track faculty. This growth was spurred by two University initiatives—the Faculty Reinvestment Program from Vision 2020 and the IODP-related ODASES faculty hiring in support of scientific ocean drilling. We should soon see this growth in numbers correspond to increased research, new programs, and an ultimate growth in excellence.

Faculty growth has rejuvenated the College and has concentrated tremendous research expertise in climate change across the departments. Complementing that growth is the new R. Ken Williams '45 Radiogenic Isotope Geosciences Laboratory, our recently completed showcase facility in support of climate change research on a variety of geological time scales made possible by the generous donations of R. Ken and Jane Williams of Midland, Texas.

As for an environmental focus, the College has formalized the Environmental Geosciences and Environmental Studies Programs, with participating faculty members from each of the four departments, new bylaws, a Program Director, and a new Program office to be occupied in late 2008. The Environmental Programs have seen the greatest growth in undergraduate students in the College during the past four years. I expect the Programs to continue to grow and mature in years to come.

Thus, as a College, we have done quite well in focusing attention on both climate change and environmental research and associated academic issues. The new challenges for us are in the arenas of energy and water resources. As a nation we missed the opportunity in 1974 to respond meaningfully to the energy crisis and prepare for the future. With ever increasing global demands on energy, a new crisis has indeed emerged. The College of Geosciences must position itself at the forefront of energy issues—fossil fuels, wind, geothermal, nuclear, ocean, and solar—with new programs and research proposals. We must embrace the challenge to respond to state, national and global needs and develop our capabilities to play a significant role on the national energy stage. Similarly, water is also a major global issue. The offerings at Texas A&M between the colleges of Geosciences, Agriculture and Engineering need to be coordinated, focused, and implemented with vision and directed resources. Our College will articulate and prioritize our course offerings in water resources and promote faculty engagement in hydrological research.

The Integrated Ocean Drilling Program (IODP) is the research program of greatest impact and reputation for Texas A&M University. IODP is funded by the National Science Foundation at $0.5 billion for the current 10-year contract. We are already preparing a new vision for the program to position Texas A&M to seek renewal for scientific ocean drilling from 2013 to 2023. The drill ship, the JOIDES Resolution, is currently undergoing a major 2-year conversion project and at the end of the year will be ready for renewed drilling with significantly improved science capabilities. With a transformed state-of-the-art drillship and a dynamic vision and structure for the program crafted by new leadership at IODP and within the USIO Alliance, we are excited and confident that we will meet the challenges before us and move forward into the next era of scientific ocean drilling.

I am very pleased to report that our College Advisory Committee was reconstituted this past year and has embraced the mission and priorities of the College. We are working together to move the College forward strategically. We are excited by the enthusiastic involvement of the council and appreciative for their help and advice with development and planning. We are seeing the same level of engagement by the advisory councils in Geology & Geophysics and Oceanography. It is obvious that the council members care deeply about the College and their departments and want to contribute to future successes.

The mission of the College of Geosciences is to encourage and sustain excellence in the geosciences by balancing scholarship, cutting-edge research, innovative teaching, student mentoring, and quality service; to strive for a holistic approach to earth science systems understanding through broad interdisciplinary research and education in the Geosciences; and to train global leaders in the Geosciences through traditional education offerings and innovative research-based learning, learning communities, international exposure, and diverse cross-cultural experiences. I hope this issue of Geoconnections illustrates the many exciting programs and opportunities being undertaken in pursuit of this mission.

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Björn Kjerfve, Dean
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Anyone who has ever built a home knows what a tremendous undertaking it is. After months or years of selecting plans and arranging financing, construction finally begins. Then, specifications change, costs go up, and completion dates are pushed back. For many, it is one of the most frustrating but ultimately fulfilling experiences in life.

Building the R. Ken Williams ’45 Radiogenic Isotope Geosciences Laboratory was quite similar, only planning and financing were much more complex, construction costs grew by 400%, and the “appliances” cost well over $1 million!

After four years of planning, six months of construction, and another six months installing equipment and calibrating instrumentation, the lab is expected to be fully operational by the end of this year.

That’s when the handful of individuals who made the dream a reality will truly celebrate this world-class geochemistry laboratory in the College of Geosciences.

One of those individuals is Mr. R. Ken Williams ’45 whose financial support was key. Williams committed over $2 million toward creation of the lab.

Dr. Debbie Thomas is one of the three principal investigators overseeing lab operations.
The radiogenic isotope lab, located on the third floor of Halbouty, will be used for interdisciplinary research and teaching in marine geology and global tectonics. It will support cutting-edge work in geochronology, environmental and climate change research.

“This lab is vastly different from what was originally proposed,” said Interim Vice Provost Luis Cifuentes who was the College’s associate dean for research at the time. “When the faculty were asked to suggest new signature programs in response to President Gates’ faculty reinvestment plan in 2003, one proposal made by Ethan Grossman for the Department of Geology & Geophysics was for a geochemistry program.”

According to Cifuentes, he, then Interim Dean Mary Jo Richardson, and Associate Dean for Academics Vatche Tchakerian liked the idea and pushed it forward. “We thought it made sense since it would bridge the focus on oceans, climate, and the environment.”

The lab took more concrete form after Assistant Professors Debbie Thomas and Brent Miller were hired in 2004 and 2005, respectively. “Debbie and Brent helped solidify the idea,” Cifuentes said. “Then when Björn (Kjerfve) came in as dean, he strongly supported it although costs had ballooned. He recognized the true value of such a lab to the College.”

It was at that point when the cavalry—in the form of Midland oilman Ken Williams—came charging to the rescue.

Philosophers, physicists, and astronomers all weigh in on their view of time, often comparing the flow of time to water down a stream—an irretrievable past, a fleeting present, and an unknowable future. “But the past is not entirely erased from existence; it is in some cryptic ways preserved on the Earth in the form of rocks,” said Miller, associate professor of Geology & Geophysics. “All we need are tools to determine the amount of time represented by the rocks and a way to decode the subtle chemical stories contained within the rock record.”

High-tech analytical instruments like thermal ionization mass spectrometers play a key role in revealing those stories. This instrument can detect minute differences in the sub-atomic makeup of many different elements.

“The basic principle behind the mass spectrometer is quite simple and elegant,” claimed Marcantonio, who is an associate professor in Geology & Geophysics. “Atoms of the same element have the same number of protons in

Ken and Jane Williams of Midland, Texas, have established a legacy at Texas A&M through their support of the Radiogenic Isotope Geosciences Laboratory.

and he continues to contribute annually to this endowment.

“This lab could not have happened without a private donor like Ken,” said Dean of Geosciences Björn Kjerfve. “His commitment to this project has allowed us to take a tremendous step forward. We expect this lab to elevate geochemistry at Texas A&M into the top tier of U.S. universities.”

Like something from the classic H.G. Wells novel The Time Machine, a high-precision thermal ionization mass spectrometer will help Texas A&M University geoscientists Franco Marcantonio, Brent Miller and Debbie Thomas explore the ancient worlds of the deep geological past. The mass spectrometer will allow these researchers to determine the ages of rocks that are millions to billions of years old and provide insight into past climates and oceanic circulation patterns.

The thermal ionization mass spectrometer is a key component in the College of Geosciences’ new R. Ken Williams ‘45 Radiogenic Isotope Geosciences Laboratory.

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“The College’s development director at that time, Greg Willems, suggested we meet with Ken because he had made a cash gift to the College and Greg thought he might be willing to redirect other planned giving to support a project like this,” Cifuentes said. “That was a critical juncture point. If we had not made the connection with Ken, this thing would never have happened.”

With funding issues resolved, Cifuentes said the project progressed rapidly due to the commitment and leadership provided by Grossman, Thomas, Miller, and Associate Professor Franco Marcantonio who was hired in 2006. Marcantonio, Miller and Thomas are the principal investigators for the lab and oversee lab operations, maintenance, training and safety.

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Last but not least, Cifuentes credits College Facilities Coordinator Maureen Reap for getting the job done. “Maureen’s coordination of this project really kept things on track and moving along,” Cifuentes said. “She dotted the i’s and crossed the t’s.”

The R. Ken Williams ‘45 Radiogenic Isotope Geosciences Laboratory contains clean and ultra clean chemistry laboratories categorized as class 1000 and class 100 respectively, a mass spectrometry lab, a sample preparation lab, a work room and offices. The chemistry labs allow contamination-free chemical preparation of samples for analyses of heavy isotopes. The mass spectrometry lab houses a new Thermo Scientific Triton thermal ionization mass spectrometer (TIMS) and one of only seven high-resolution, inductively-coupled plasma mass spectrometers (HR-ICPMS) in the U.S. The lab instrumentation will serve the research needs of a broad range of disciplines, including tectonics, geochronology, paleoceanography, climate change and environmental geochemistry.

The facility will be used by the three principal investigators with at least five or six of their students working in it. It can accommodate at least five or six other faculty for occasional use.

The lab has begun to pay dividends even before being completely operational. Among the three principal investigators and five other College faculty, over $1 million has been awarded for research to be completed in the lab, and the National Science Foundation has awarded a $450,000 grant for additional instrumentation.

Grossman said that the College plans to make graduate and undergraduate education an indispensable part of the lab. “This state-of-the-art facility will attract outstanding faculty, postdoctoral fellows, and graduate students to the College,” Grossman said, “and will put us on par with some of the best geochemistry programs in the country.”

Each neodymium sample is so small that, in the form of a solid metal particle, 6000 samples could fit on the head of a pin. Moreover, the mass spectrometer is so sensitive that each sample is plenty for a precise analysis.

Thomas and her students use these measurements to discern ocean circulation patterns from the past when those patterns were driven by differences in climate and in the plate tectonic configuration of the ocean basins. “By understanding past ocean circulation, we can better understand what factors affect or are affected by the oceans, and in doing so gain insight into what may lie ahead as the global climate evolves,” said Thomas.

Marcantonio and his students are also examining circulation patterns, including changes in circulation within the atmosphere. The distribution of radioactive elements and their stable by-products in sediments of the deep oceans and shallow coastal regions form a large part of Marcantonio’s research. By studying changes in the
Marcantonio and his students are able to use the data provided by thermal ionization mass spectrometry to trace changing patterns of atmospheric circulation through time. According to Marcantonio, “Marine sedimentary deposits play an important role in shedding light on past climate change and its effects on past oceanographic and atmospheric processes.”

Miller focuses his research on using the mineral zircon to determine the ages of rocks. Zircons are nature’s tiny time capsules, acting as a type of clock, faithfully ticking away from the time they are formed until their ratios of radioactive uranium to radiogenic lead are finally measured in a mass spectrometer. Zircons are found in rocks like granite, formed by the crystallization of magma bodies deep in the Earth’s crust, and in volcanic ash deposits, erupted from volcanoes like Mt. St. Helens. The former rock type can be used to test ideas about the formation of Earth’s great mountain ranges like the Himalayas or the Rockies. The latter is often found interlayered with fossil-bearing sedimentary rocks and can constrain the ages of exotic and extinct life forms.

“Geology is a historical science,” said Miller. “It is crucial that we be able to not only put geological events in their correct relative order, but that we can also determine the absolute time spans and rates of those geological events.” According to Miller, the new mass spectrometer will allow him to do that.

In contrast to the main character in Well’s novel who traveled time to explore past worlds, Marcantonio, Miller, and Thomas travel the world to explore past times as preserved in rocks and sediments. Those collected samples may reveal different stories but they share the same destiny—chemical separation and purification in the R. Ken Williams ‘45 Radiogenic Isotope Geosciences Laboratory followed by precise analysis in the thermal ionization mass spectrometer. All will surely propel these researchers and their students a step closer to answering the primal question—How did the Earth work in the deep geological past?

An elaborate air handling system is required for the clean and ultra clean chemistry laboratories that are an essential element of the Radiogenic Isotope Geosciences Lab. Principle Investigators Franco Marcantonio and Brent Miller examine progress during construction in early April.
Mapping a Rainforest

Hacking paths through the jungle with machetes. Dragging heavy surveying equipment up and down steep slopes with uncertain footing. Coping with high heat, higher humidity, frequent rain, and the occasional poisonous snake. This wouldn’t be the spring break trip of choice for most college students, but for six Geography graduate students who spent a week last March doing all this and more, it was a dream vacation!

“Mapping a rainforest is no easy undertaking,” said Doug Sherman, Head of the Department of Geography. “It’s hard work, and these students worked really hard at it.”

The Geography Department is blazing new trails at the Texas A&M University Research and Education Center in Costa Rica. Sherman has led two expeditions of graduate students there in the past two years. Their mission: to create detailed topographical maps of the 250-acre rainforest known as the “Casa Verde Reserve.” These maps will be used to develop a trail system and to locate long-term monitoring sites.

The idea for the Center started in 2005 when Charles Soltis ’55 and his associate, Curt Clemenson, approached Texas A&M and offered this rainforest in north central Costa Rica to Texas A&M University. The gift includes an adjacent 40-acre site on which Soltis is constructing a research and education facility. When completed in December, the facility will include a 7,500 square foot academic building and eight bungalows to house students and researchers. The gift will not be officially accepted until the buildings are ready. The first wave of Aggies to use the complex will arrive Spring semester 2009.

The College of Geosciences is one of several colleges participating in development of the Soltis Research and Education Center. The University has established this center as a model for collaborative teaching and research, both in its development and in its future use. Students and faculty in architecture, construction science, landscape architecture and urban planning evaluated the site and participated in the initial planning and design. The research and educational agenda for the facility is being set by a University-wide committee and will allow many departments to conduct classes and research there. From the College of Geosciences, the Geography Department plans to continue the mapping project and do long-term geomorphology and biogeographic studies, and researchers in Atmospheric Sciences are hoping to use the facility for atmospheric aerosol and climate studies.
The College of Geosciences will co-sponsor a visit by several of the world’s foremost authorities on the polar regions to the Brazos Valley in November, where together with local faculty experts in polar research, they will present “Polar Palooza: Stories from a Changing Planet.”

Aggie Polar Palooza will include a program for middle and high school students at 10 a.m. and an evening program for the general public at 7 p.m. in Rudder Auditorium on November 5, 2008.

Polar Palooza features the most current information available on the polar regions. Incorporating high definition videos, authentic polar artifacts, and personal anecdotes and stories, the program engages the mind and the imagination. Sponsored by the National Science Foundation and NASA, Aggie Polar Palooza will be hosted by Texas A&M University, Sigma Xi Scientific Research Society, the Bryan Museum of Natural History, the George Bush Presidential Library and Museum, and the Colleges of Geosciences and Science.

Polar Palooza is an official activity of the International Polar Year 2007-2008, an unprecedented collaboration between scientists and organizations from across the globe who are dedicated to learning more about the Earth’s most rugged and isolated terrain. College Station is one of only three Texas cities chosen to host the event. For more information contact Michelle Sullens, special events coordinator, at MSullens@vprmail.tamu.edu or go to the Aggie Polar Palooza web site at http://aggiepaloosa.tamu.edu/.

According to Sherman, site development is progressing rapidly. A key improvement from his perspective was construction of a road into the property. During their first mapping trip in January 2007, the team had to hike in each day with their gear and survey equipment. This trip, the team still stayed off site, but at least getting in and out was a little easier. Accompanying Sherman in March were Geography Assistant Professor Chris Houser, and students Eugene Farrell, Luciana Hunt, Sandra Metoyer, Michael Potts, Nikki Williams, and Amanda Young.

With the help of local laborers who cut paths through the vegetation, the students shot laser beams through the forest using state-of-the-art surveying equipment to record the measurements needed to create accurate topographical maps of the area. Efforts were made to minimize the width of the cut so as not to destroy more vegetation than necessary.

“The forest is so dense that you can’t see very far because of all the leaves, so it’s easy to get disoriented,” Sherman said. “We could see some trails that we cut for surveying last year, but for the most part they were already overgrown.”

Sherman estimates that due to the rugged terrain and dense forestation only about 10 percent of the 250 acre tract has been mapped. “Mapping the entire area is probably about a 10 year project,” he added. The Geography Department plans to continue the surveying as funds and time allows, but until then, efforts will focus on producing maps from the collected data.
Research with A Chance of Rain

The typical life of a college student involves spending hours reading textbooks, sitting through lectures, and studying for exams. But for 30 meteorology students, college life isn’t typical. The Student Operational ADRAD Project (SOAP), established in 2006, gets these meteorology students out of the classroom and into a field setting.

Despite the occasional long hours and late nights, the popularity of this field experience continues to grow. In 2007, student demand to participate in SOAP was so high that the program was expanded to allow for 30 undergraduates, instead of 25, and there was still a waiting list to register. The unique, hands-on experience the students receive with radar and forecasting, which is usually only available after graduation or through an internship, has also resulted in a high re-enrollment rate for the program. In fact, half of the students in SOAP this past year were returning participants.

SOAP is funded by the National Science Foundation through a CAREER Grant awarded to Department of Atmospheric Sciences Assistant Professor Dr. Courtney Schumacher. The ultimate goal of SOAP is to better understand the way storms interact with the larger scale circulation in Southeast Texas. The program uses the Aggie Doppler Radar (ADRAD) on the

Meteorology majors Aaron Ferrel (left) and Collin Lawrence (center) consult with SOAP graduate assistant Larry Hopper during a cloud observation session in the weather observatory at the top of the 15-story Eller O&M Building.
roof of the Eller O&M building every spring and occasionally during other seasons, to collect a climatology of storms. SOAP will continue collecting data through 2010 on storm systems and their environment.

Schumacher said she started SOAP because she wanted to make the most of ADRAD, both in terms of education and her own research. “My work involves long time series of radar data and it takes quite a bit of effort to collect research-quality data sets,” Schumacher said. “Our undergraduates provide the ideal manpower to do this and, at the same time, they get hands-on experience with an S-band radar system as well as all the other weather-related tasks associated with the project.”

In order to complete the numerous tasks associated with SOAP, the students are divided into five groups of six and assigned a day of the week during which they are responsible for morning and afternoon forecast discussions and cloud observations, historical storm type classifications, and monitoring the region for rain. If rain occurs within the radar domain during their shift, the students are responsible for running the radar and writing a precipitation summary. To account for any sudden changes in weather, students are on call on their day during the school week between 8 am and 10 pm and, under special circumstances, after 10 pm and on weekends.

Schumacher said that she and her graduate students are constantly thinking of new ways to help the SOAP undergraduates feel more comfortable using the radar and advanced forecasting tools. Since SOAP began, the program has made great strides in improving the efficiency of opera-

SOAP participants pose with the group’s unofficial mascot “Rossby” in front of the Aggie Doppler Radar (ADRAD) on the roof of Eller O&M. The mascot is named for Carl-Gustaf Rossby who first identified large-scale meanders of the mid-latitude jet stream, now known as Rossby waves.

R

ecent meteorology graduate Dianne Boothby ’07 was involved with the Student Operational ADRAD Project (SOAP) since its inception three years ago. She thinks that involvement was invaluable.

“You can go to class and learn all this information, but you’re not really applying it,” Boothby said. “With SOAP, you’re learning while getting to do hands-on activities with radar and working with teams, which is more like what you would do in an actual job.”

After transferring to Texas A&M from Texas Lutheran University in 2005, Boothby joined the Texas A&M Student Chapter of the American Meteorological Society (TAMSCAMS), an organization that provides educational and social opportunities for students interested in meteorology. During her first semester as a member of TAMSCAMS, she learned about SOAP, a program that offers unique, hands-on meteorology experience to undergraduate students.

Boothby decided to join SOAP that same year and stayed with the pro-
tions, even with additional daily tasks, and has provided extensive data that is already being used by participants to conduct their own research.

“In terms of science, we now have a set of long-term observations that we have begun to analyze for patterns,” Schumacher said. “We are beginning to answer questions like what synoptic settings and storm types are most important to rain production in southeast Texas and how these storms feed back on the large-scale circulation via variations in wind divergence.”

Last year, SOAP implemented a new fall program that allows undergraduates, usually juniors and seniors, to work on more advanced research projects that are intended to produce publication-quality work. This year, students also underwent special training in preparation of SOAP’s first-ever series of weather balloon launches. The weather balloons were launched every evening for two weeks in April by undergraduates involved in the program. Once released, the balloons ascend into the atmosphere, measuring temperature, humidity, and wind direction until they reach as high as 100,000 feet. The 4-foot balloons gradually expand to 14-18 feet in diameter before popping. The transmitter attached to each balloon is equipped with a parachute that allows it to drift back to Earth, though these instruments are not usually recovered.

Opportunities like these keep students coming back to SOAP year after year and will continue to attract more attention and interest as the program develops. With funding set to expire in 2010, the long-term future of SOAP is uncertain. However, it is clear that this program has provided a number of meteorology students excellent preparation for graduate school or future careers in meteorology.

“Taking on the president’s role definitely helped me develop a lot of leadership characteristics, including time management and organizational skills,” said Boothby.

Somewhere in her busy schedule, Boothby also found time to participate in SOAP’s new fall semester program conducting extensive collaborative research involving climatology and storm systems using data collected in previous years. Boothby and her partner, Aaron Ferrel, presented their research on “Variations in Sub-Tropical Storm Types and Their Contribution to Rainfall in Southeast Texas” at Student Research Week in March. They won the Session Award and First Place in the Earth Science taxonomy, which included a $300 prize.

Boothby had to leave SOAP behind when she graduated in May and began looking for a job. But with the knowledge and experience gained from the program and her degree in meteorology, Boothby soon found a position as an aviation forecaster and now works for Air Routing International in Houston.
With growing public awareness of global warming, the term “greenhouse effect” has practically become a household word. Although they may not be able to give a textbook definition, most people know that the greenhouse effect involves greenhouse gases like carbon dioxide, ozone, and water vapor.

To better understand the greenhouse effect, Dr. Kenneth Bowman, head of the Department of Atmospheric Sciences, logged over 13 flight hours in the nation’s most advanced research aircraft last spring, flying a roller coaster-like path through a region of the atmosphere called the tropopause.

Bowman is one of three principal investigators for a National Science Foundation funded study known as START08 for Stratosphere-Troposphere Analyses of Regional Transport. He spent two years creating the study with Dr. Elliot Atlas of the University of Miami and Dr. Laura Pan of the National Center for Atmospheric Research. Atmospheric Sciences associate professor Dr. Fuqing Zhang is one of 15 co-investigators.

The START08 research project is studying the distribution of greenhouse gases in the upper troposphere (the layer nearest the Earth where most weather happens), the lower stratosphere (the layer above that contains the Earth’s protective ozone shield), and the boundary between the two that is called the tropopause. Current models show that greenhouse gases in the upper troposphere play a significant role in climate forcing (global warming), but there are relatively few detailed measurements available to better understand what is going on in the tropopause region.

“There’s a lot we don’t know about what controls greenhouse gases in the upper atmosphere, so this study is looking at both chemistry and meteorology,” Bowman said. “We’re interested in how ozone gets down into the troposphere and how water vapor gets up into the upper troposphere. During the flights, we measured those gases and a number of others in order to better understand the meteorology that produced the distribution.”

“There’s not much data to document what is going on in this region because you can’t just go out and measure things in place,” Bowman added. “But we know that things change very sharply when you cross the tropopause, and we need to have good measurements to help us test the computer models that are used to predict future changes.”
The tropopause is too high to observe with instruments from the ground, and too low for satellites to view in great detail. To study it the group used a cutting-edge aircraft—the NSF/NCAR Gulfstream-V jet based in Boulder, Colorado. This jet has the capabilities the investigators needed to collect data from a range of altitudes. It has a maximum certified altitude of 51,000 feet and a single flight range of 6000 nautical miles. During the 6-week study, the jet flew different flight patterns at altitudes between 200 and 47,000 feet over the central United States for approximately 7 hours/day, 3 days/week.

Bowman and Zhang were meteorologists for the project, tracking weather conditions, preparing forecasts, and determining when and where to fly the airplane. They also collected meteorological data onboard during the flights and analyzed it in order to put the chemical measurements in context. Their ultimate goal is to use these findings to create more accurate computer models of the atmosphere that can help predict how the buildup of greenhouse gases may change global climate in the future.

To learn more about START08, visit the project website or Dr. Bowman’s faculty profile.
www.acd.ucar.edu/start
atmo/tamu.edu/profi le/KBowman

This figure shows a stratospheric intrusion that occurred over the central United States during the START08 flight on April 28, 2008. This three-dimensional view from the south shows the Rocky Mountains on the left and Lake Michigan in blue on the right. The purple surface is the tropopause, the approximate boundary between the stratosphere and troposphere. The intrusion, also known as a tropopause fold, extends downward deeply into the troposphere, bringing dry, high-ozone air from the stratosphere with it. The intrusion is associated with a strong jet stream. The region inside the blue surface had winds in excess of 130 mph. The thin line shows the path the aircraft flew through the intrusion and tropopause, measuring ozone, water vapor, and other chemicals. High ozone values are shown in red and yellow, low ozone values are in blue. As the aircraft flew through the tropopause, the ozone levels changed from low (blue) in the troposphere to high (red and yellow) in the stratosphere. High ozone air (red) can be seen deep in the troposphere near the fold in the center of the picture. These aircraft measurements will be combined with meteorological data to estimate how much ozone was transported into the troposphere by this intrusion.
The air is hot and muggy, cool breezes are rare, and the freeways are packed with cars—a typical summer afternoon in Houston, and all combine to make air in the Houston metropolitan area some of the most polluted in the country.

Luckily for residents, efforts are being made to improve Houston’s air quality, including research by Dr. Gunnar Schade of the Department of Atmospheric Sciences. Schade is using a 300-foot-tall communications tower owned by Yellow Cab to mount instruments that measure winds and air pollutants around the clock.

Since even slight inaccuracies in data inputs can throw off the extensive models that predict air quality, the scientifically precise measurements that Schade collects are crucial.

“There are a multitude of scientific questions that we can ask with this kind of setup,” Schade said. “Our research currently serves the state by providing much-needed input data for air quality modeling and real-world traffic emissions.”

The fact that the instruments are in urban Houston adds to their value. The search for a company that owned a tower and would donate the space Schade needed seemed futile until he found Yellow Cab.

“Yellow Cab immediately voiced its interest to collaborate,” Schade said. “We operate under a Memorandum of Understanding that allows us to use their facilities at no cost except utilities.”

Funded partially by the Texas Air Research Center at Lamar University, Dr. Schade’s research is unique because of its urban setting, and the large amount of data being collected.

Last spring, about a year after the initial setup, Schade had collected enough data to begin analyzing an important target parameter of this study. According to Schade, different types of data are collected for certain objectives, and only some of the measurements are useful depending on the objective.

“Out of 24 hours sampled during a typical day, there may only be about two hours of data that we can use for a certain analysis,” Schade said. “You have to take measurements for many months to get good statistics for all wind directions.”

Schade’s two graduate students, Ph.D. student Chang Hyoun Park and M.S. student Ian Boedeker, play an important role in this research.

“They travel to Houston every five to ten days, with me or alone, to maintain measurements and calibrate instruments,” Schade said. “They also download and inspect the data, and do preliminary computations. Their major research projects will be to analyze parts of the data to answer specific questions.”

The trio has also set up a website so that anybody with an internet connection can view measurements, which are updated every twenty minutes, and learn about why they are important to residents of Houston.

To learn more about the project visit the website or see Dr. Schade’s faculty profile.

atmo.tamu.edu/yellowcabtower/
atmo/tamu.edu/profile/GSchade

by Justin Bailey
When Hurricane Rita raged through southeast Texas in September of 2005, those who hadn’t evacuated braved the fourth strongest Atlantic hurricane ever observed. The hurricane and its winds, as high as 180 miles/hour, ripped trees from the ground and destroyed homes. In the devastation left by the hurricane, however, Geography Professor Andrew Millington and Associate Professor Charles Lafon saw a rare opportunity to study storm-damaged areas of Big Thicket National Preserve.

“What we wanted to do was actually look at how the hurricane impacted the ecological functioning of the forests,” Millington said.

As people in the area began to repair their damaged homes and property in the days and weeks after the hurricane hit, Millington and Lafon made the three-hour drive to Big Thicket to initiate a research study that is still ongoing. Through this study they hope to provide valuable data that will help minimize hurricane damage from tree falls in the future, in addition to increasing fundamental ecological knowledge of Gulf Coast forests.

“This study has applications in terms of transportation networks, rail lines, roads, and houses. Hurricane damage is an important economic issue; there is no doubt about that,” Millington said.

According to Millington, the Big Thicket National Preserve was a prime area for this study because the National Park Service by policy does not clear damage from storms. “So whereas the commercial forestry lands were cleared quickly, the evidence of the storm is still there in the National Park because they don’t intervene.”

Able to take their time and be very thorough, the two geographers and a dedicated geography graduate student, Daehyun Kim, began the tedious task of mapping each and every tree in the area they had chosen to study.

“The thing that has taken so much time is that we’ve located the x y coordinates of all these trees to less than half a meter, more than 900 trees of many different species,” Lafon said.

Kim worked tirelessly to complete the mapping so that the geographers could move on to the true purpose of their study—looking for patterns in the damage.

“One of the things ecologists have written in the past is that damage from hurricanes is random,” Millington explained. “Some have called it ‘scrambled’—just a mess. There are trees, branches, and leaves down all over the place. But I guess that as geographers, in the back of our minds was the idea that that was unlikely. There are usually patterns in nature.”

So once they had mapped the trees in the area they were studying, the two professors weren’t surprised to see that a pattern did in fact exist.

“Hurricanes are very organized; mainly because the winds are very directional,” Millington said, “so it wasn’t surpris-
ing when we noticed that the trees that fell in the area we were studying were almost all orientated towards the south. We hadn’t seen anything in the literature that suggests that that’s been recognized specifically.”

“I think a lot of people just kind of intuitively assumed that,” Lafon said, “but we’re interested in finding out what it means for the forests. This is highly scientific in an academic ecological sense, and it certainly means something about the ecology and the structure and function of these forest ecosystems. In some environmental parameters in the forest there must be footprints that are essentially north-south in direction. These may be in the trees, the understory plants, or in the soil. That’s where we want to go with this.”

The two are also hoping to determine specific characteristics associated with trees that fall during hurricanes which will lead to more practical applications for their research.

“We want to have good knowledge so that we can know which trees are highly susceptible to damage from hurricanes. Then we’ll be able to advise which trees to consider as candidates for cutting in order to prevent serious damage to infrastructure to National Park land in the next big storm,” Millington said. Millington and Lafon are working with Dr. Steven Quiring of the Department of Geography, and Dr. Seth Guikema, an environmental engineer from Johns Hopkins University on this aspect of their research.

This in-depth, hands-on research has also been a positive for geography students. Lafon taught a class in 2006 in which graduate students spent a weekend at the Big Thicket Research Station, and other graduate students have helped with field work. The students took ecological measurements, evaluated and recorded tree damage, and mapped tree locations. He plans to do the same when he teaches the class again this fall.

“It’s a great field resource,” Millington said. “Part of the deal with the National Park Service is to develop a relationship where our students learn something about plant ecology with a field component, while at the same time we’re generating results that help the National Park Service actually manage the forest and understand it better. It’s a win-win situation.”

See these websites for more information on the biogeography research of Drs. Lafon and Millington.

geography.tamu.edu/Biogeography.html
geography.tamu.edu/profile/CLafon
geography.tamu.edu/profile/AMillington

by Justin Bailey
After tearing through the Caribbean with deadly force in September 2004, Hurricane Ivan made landfall on the northern coast of the Gulf of Mexico and wreaked havoc, claiming hundreds of lives and billions in damage. The sandy barrier island of Santa Rosa, which runs along the coast between Pensacola and Panama City in Northwest Florida, felt the full impact of the storm.

Shortly after Ivan, the National Park Service, which governs the Gulf Islands National Seashore on Santa Rosa, decided to fund a study to better understand how the island is impacted by and recovers from hurricanes. Their goal was to determine how to rebuild the coastal infrastructure of the island to better resist storm damage. The person they hired for the job was Geography Department Assistant Professor Dr. Chris Houser.

At that time, Houser was a new assistant professor at the University of West Florida and had only lived in the state for a few months. When he heard that a major hurricane was heading his way, he collected pre-storm data and photographs of Santa Rosa Island in anticipation of the potential damage that might occur.

Although hurricanes are devastating, they also provide important research opportunities. Santa Rosa experienced the wrath of three hurricanes and two tropical storms during that one-year period between 2004 and 2005. It has shown only limited recovery since. To study the response and recovery of Santa Rosa Island, Houser and colleagues Cheryl Hapke of the US Geological Survey and Stuart Hamilton of the University of West Florida used a mapping technology called Light Detection and Ranging (LIDAR) to collect accurate topographical data of the island both before and immediately after each storm, as well as after one year of recovery.

In analyzing the data, Houser noticed that the amount of dune development on the island before the storms correlated with the extent of damage to the island structure. On the wider areas of the island where larger dunes were formed, the damage was less extensive than in the narrower areas of the island where the dunes were much smaller. Some of the narrow areas were completely washed away by storm surges.

Houser saw a regular pattern in the impact of hurricanes on the island and in the rate and type of recovery occurring. To explain the pattern, he conducted a series of bathymetric surveys of the ocean floor to determine if the inner shelf morphology near the island had been affected by the hurricanes. He found a series of transverse ridges on the seafloor running perpendicular to the island. Houser said that analysis of the geometry of the island and offshore bathymetry suggests that the storm surges are channeled into certain parts of the island, causing less dune development follow-

Damage to County Road 399 through the Gulf Islands National Seashore following Hurricane Dennis. This is in a narrow section of the island where the storm surge was not stopped by large and continuous dunes.
18 Geography

the primary access road on Santa Rosa should be built to best withstand future storms but not interfere with island recovery and important habitat.

Other research has sprouted from this work. While discussing his results with a lifeguard at Pensacola Beach, Houser learned that rip currents were common in the areas between the ridges he had found. With funding from Florida Sea-Grant, he is now examining how the rip currents are driven by the transverse ridges. He is also completing another Park Service study to identify what the ridges are made of, where they come from, why they are so regular, and how they relate to the island.

Houser also began a similar project last spring at Eglin Air Force Base which encompasses part of Santa Rosa Island. He is attempting to identify how and why their access roads were damaged by the storms and how different road designs will survive future storms and maintain national security.

Houser’s work on Santa Rosa has stimulated interest in predicting the impact of hurricanes on other barrier islands. The results of his studies—past, present and future—will provide better understanding of hurricane damage and the recovery process that follows for barrier islands. With the expectation of increased hurricane and tropical storm activity due to global warming, demand for Houser’s expertise may keep him very busy for some time to come.

“The study really showed that the pattern of barrier island response and recovery to storms can be predicted to some level of confidence,” said Houser, “but that they also tend to be very much forced by the geologic structure of the island.”

When he joined the Geography Department at Texas A&M University in 2007, Houser continued his work for the National Park Service, helping them determine how and where a storm and, thus, more hurricane damage in those areas during subsequent storms.

“Health Geography isn’t a new field, but there’s been a new infusion of interest due to more emphasis on public health issues and using GIS and spatial analysis in public health.”

Williams decided to pursue her doctorate at A&M because she was impressed with the pesticide exposure work being done by Dr. Kai Elgethun,
Rise of the Citizen Geographer

Collective Wisdom through the Power of Crowds

What do Angelina Jolie’s tattoos, Barbara Streisand’s backyard, and Dr. Daniel Sui’s graduate class in GIScience have in common? Quite a lot, as it turns out. Sui cites current events involving stars Jolie and Streisand as excellent examples of the “wikification” of GIScience.

Sui teaches GEO 695—Frontiers in Geographic Information Science (GIScience)—which looks at the theoretical foundations and latest developments in GIScience. This past academic year Sui and his students have been exploring an exciting new development they call the “wikification” of GIScience.

“Wikification describes the growing trend of mass collaboration among individuals using server software called a ‘wiki’ to freely create and edit web-page content using any web browser,” said Sui, who is professor of Geography and holds the Reta A. Haynes Chair in Geosciences. “The wind of wikification started blowing in the GIScience community in the last two years.”

In Angelina Jolie’s case, this meant having an innocuous tattoo turned into a source of information worldwide. Working from a photo of her tattoo featuring the latitude and longitude of where her four children were adopted, Jolie’s fans used new mashup capabilities in Google Maps/Earth to produce a map marking the children’s birthplaces with detailed, street-level information and high resolution satellite imagery. The map was instantly broadcast to Google Maps/Earth’s more than 200 million users.

Streisand lost a lawsuit to have crystal clear, high resolution aerial photos of her backyard taken off the website of the California Coastal Preservation Project, a privately funded effort documenting erosion along the entire California coast. The court ruled against Streisand, reasoning that this was an

Although her passion lies in a small subfield of geography, Williams values the diversity within the Geography Department.

“This is a fascinating place,” Williams said. “Being able to interact with faculty and graduate students focusing on so many different areas of geography creates many interesting opportunities. I’m funded through a National Science Foundation GK-12 grant with Dr. Sarah Bednarz focusing on fostering spatial thinking and the use of geospatial technologies in local high school and middle school geography and science classrooms. Also, I just went on a field trip to Costa Rica to assist in surveying and mapping land donated to Texas A&M for a research station. The trip included students and faculty with expertise in different areas—geographic education, coastal geomorphology, biogeography, physical geography—it was great!”

who is now state health toxicologist for the Idaho Department of Health & Welfare. Williams’ dissertation examines the spatiotemporal aspects of student stress exposure. Study participants wear a Garmin wristwatch GPS/heart rate monitor during test periods throughout the semester. In addition, they keep daily diary accounts to add context to the data. The data she collects is used to create 3-D maps relating the participants’ stress exposure with their daily path.
environmental protection project that was not targeting her. It just happens that her home sits on the cliffs above the coast in Malibu. The photos are still online.

“Both situations reflect a new trend of web-based mass collaboration which relies on free individual agents coming together and cooperating to improve a given operation or solve a problem,” Sui said. “I think overall this is an interesting development that has blurred the boundaries between map users and map producers. It’s a general societal trend in the Web 2.0 age.”

Also known as collaborative mapping, wiki cartography is achieved using a combination of web-based maps and user-generated content. Sui notes that this relatively recent phenomenon (past 15 months) relies on collective intelligence and asserted information. He said that it has empowered millions of private citizens who are largely untrained and get no obvious reward from their efforts, yet there is also no guarantee of truth or authority in the product they produce. In 2004, there were 1 million users of GIS worldwide. By December 2007, that number had grown to over 200 million.

According to Sui, GIS mapping is just one manifestation of broader cultural/societal trends towards involving the public in business, entertainment, education and even research. The audience has become part of the show; corporations are inviting consumer input for developing their new products/services; universities are embracing open education perspectives, and organizations like the US Geological Survey and the US Census Bureau are enlisting volunteer participants to help create maps and collect census data.

Needless to say, this new trend carries with it some unintended consequences such as privacy issues and accuracy concerns. Several students in Dr. Sui’s class researched the social/legal implications of the wikification of GIScience. Other student projects involved related topics such as the reliability of wiki websites as data sources in academic research, and the compatibility and usefulness of crisis management sites. Some students chose to create their own mashups using a combination of open source and high end mapping software to look at a variety of topics including disease and public health issues, environmental issues, and even alcohol-related traffic fatalities in Texas.

Sui feels that the wikification of GIS is one of the most exciting and revolutionary developments since the technology emerged in the early 1960s, and he is anxious to see where this new trend will lead.

“We are witnessing the emergence of a new geography without geographers,” he said. “This will increase the demand for geography students to develop higher level skills and challenge them to embrace emerging technology to carve out their own niche in the new Web 2.0 world. This new trend also further elevates the importance of geographical/spatial perspectives for better understanding the world we live in.”
Oil and gas industry leader R. Ken Williams ‘45 was presented the Michel T. Halbouty Geosciences Medal at commencement December 14, 2007.

The Halbouty Medal is awarded annually to an individual for his or her outstanding achievements in the discovery, use and application of geosciences and the conservation of earth resources. The medal is named for the late Michel T. Halbouty ‘30 who was the first recipient of A&M’s professional degree in geological engineering, founded Halbouty Energy Company, and for whom the building that houses the Department of Geology & Geophysics is named.

In presenting the medal to Williams, College of Geosciences’ Dean Björn Kjerfve noted that Williams’ interest in oil and field geology led him to support the College of Geosciences in many ways over the years, including establishing an endowed chair in the offshore drilling program and establishing a major endowed excellence gift fund for climate studies.

“This particular gift has enabled the College to build a state-of-the-art radiogenic isotope geosciences laboratory that will elevate geochemistry at TAMU into the top tier of U.S. universities,” Kjerfve said. “Ken has certainly been a great friend to both Geosciences and Texas A&M University.”

Born in Oklahoma, Williams’ family moved to Midland where he graduated from high school and still lives today. He enrolled at A&M in 1941 but joined the US Army through ROTC in 1943. Williams served in Okinawa and returned to A&M in 1946 to finish his degree in mechanical engineering.

Williams worked for Shell Oil for several years and in 1952 helped form MWJ Producing Co., an independent oilfield company exploring the Permian Basin. His company had major success in drilling operations in West Texas, Colorado, Wyoming, New Mexico, North Dakota and other areas, eventually operating more than 300 wells.

Williams attributed much of the company’s success to an emphasis on geology and its application to oil and gas exploration. In 1996, Williams and his partners dissolved the company but he continues to be active as an independent investor in the oil and gas exploration industry today.

Williams is a member of many oil and gas professional associations, along with Texas A&M’s 12th Man and Zone Clubs, the President’s Endowed Scholarship program and the President’s Advisory Council. He is also active in the Episcopal Church of the Holy Trinity in Midland. He and his wife Jane, a 1951 graduate of Baylor University, have been married for 55 years and have two daughters and three grandchildren.

Texas A&M University Interim President Eddie J. Davis congratulates R. Ken Williams at the December commencement ceremony with College of Geosciences’ Dean Björn Kjerfve.

The College of Geosciences dedicated the new R. Ken Williams ‘45 Radiogenic Isotope Geosciences Laboratory in the Michel T. Halbouty Geosciences Building on May 3rd. The lab is dedicated to R. Ken Williams ‘45 of Midland, who has committed over $2 million to this project and continues to contribute annually to the endowment. Williams and his wife, Jane, attended the dedication with their daughters Jenny and Liza, granddaughters Mary Jane and Julianne, and other family friends.
New Endowed Chair Honors William R. Bryant

Twenty-three former students and associates of Dr. William R. Bryant have given a total of $1 million dollars to establish an endowed chair in his name in the Department of Oceanography. The William R. Bryant Oceanography Chair for Teaching, Research and Mentoring Excellence was announced at a dinner held in Bryant’s honor in February.

College of Geosciences Development Director Diane Barron who coordinated establishment of the chair said, “It is definitely unprecedented in the College and quite possibly in the University for so many former students from a single department to make a commitment like this. It was a grand gesture on their part of the gratitude and admiration they have for Bill and a true testament to his legacy.”

In his 45th year in the Oceanography Department, Bryant has designed and taught 12 undergraduate and graduate courses, chaired 51 masters’ committees, 52 doctoral committees, and has been a member of an additional 99 graduate committees. He began his career in teaching and research at Texas A&M in 1963. He was director of the TAMU Center for Sedimentology from 1982-85 and head of the Oceanography Department from 1998 to 2000. Bryant has made 38 major oceanographic cruises and four deep sea drilling legs. He is the first faculty member at TAMU to receive all three of the Association of Former Students’ highest University-level awards—the Distinguished Achievement Award in Research in 1982, in Teaching in 2001, and in Mentoring in 2007.

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This chair is the second chair in the College designated for the Department of Oceanography. The College of Geosciences has a total of 11 endowed chairs to attract, retain and reward outstanding faculty.
College Advisory Council Reestablished

In September of 2007, after a nine-year hiatus, Dean Kjerfve and the College of Geosciences reestablished the College Advisory Council. As of the Spring 2008 meeting, the Council has confirmed a new charter which dedicates it to “serving Texas A&M University and the College of Geosciences to fulfill their most critical objectives and strategies that contribute to enhancing their position of prominence nationally and globally.”

The College will benefit greatly from tapping into the experience, knowledge, network, and resources represented by Council members. The council enthusiastically accepted the challenge to assist the College and identified several key ways in which they will contribute:

- by illuminating the impact of the College’s contributions to the most pressing geoscience issues of today;
- by fostering strategic relationships with national and global thought leaders, industry, and government;
- by assessing the University’s science and technology capabilities to ensure that the College’s goals and objectives align and all contribute strategic value to Texas, the U.S. and the world, and
- by developing an endowment base to attract and develop global leaders.

Oceanography Development Council Reconvenes

The Oceanography Development Council (ODC), originally formed in 2000, reconvened with core members in early February 2008 under the leadership of council Chair Stuart Burbach and Oceanography Department Head Pierce Chapman. With the appointment of Chapman to department head last October and the many positive changes within the department, the time was right for the council to reengage and reconnect.

The initial step for the ODC was to establish a framework that incorporates the vast network and strengths of the council while addressing the needs of the department and College. Burbach, Chapman and the other council members identified the primary role of the council to be advocacy, with Burbach citing that “it is equally essential to promote our programs in order to obtain global recognition as it is to build the programs themselves.”

The two-day meeting coincided with a celebration dinner given in honor of Dr. William R. Bryant with the surprise announcement of an endowed chair in his name. The development council members present were part of a group of 23 former students and associates who gave a total of $1 million dollars to establish the William R. Bryant Oceanography Chair for Teaching, Research and Mentoring Excellence.

Members of the ODC who attended the February meeting are Bruce Appelbaum ’71, Chairman, Mosaic Natural Resources Ltd.; Lyle Baie ’67, Independent Consultant; Burbach ’77, President, Energy, Security and Defense Technologies, Sandia National Laboratories; College of Geosciences’ Dean Björn Kjerfve; Geosciences’ Development Director Diane Barron ’81; Carlos A. Dengo Ph.D. ’82, Vice President of Upstream Research Company, ExxonMobil, and Dan Allen Hughes Jr. ’80, President, Dan A. Hughes Co. Not present was Richard L. Findley ’73, President, Prospector Oil, Inc.
In October 2007, GEODAC (Geology & Geophysics Department Advisory Council) hosted the Greater Houston Aggie Social at the Houston Petroleum Club. Over 200 Geology & Geophysics former students attended the event which was graciously sponsored by Dan A. Hughes ’51 and Dan Allen Hughes ’80, who are loyal supporters of the College. Thirty faculty members, 30 graduate students and 12 undergraduate students spent the evening visiting with the former students—sharing information on their research and experiences.

“This event was spectacular,” said Diane Barron, Director of Development for the College of Geosciences and a GEODAC member. “It linked our G&G faculty and current students to this vast network of former students and strongly communicated our commitment to reconnecting the Department of Geology & Geophysics to the oil and gas industry.”

To contact Diane Barron, Development Director, call 979.862.4944 or d-barron@tamu.edu.
Aggie Social
GEODAC is On the Move

The Geology & Geophysics Department Advisory Council (GEODAC) has accomplished great things in the past two years. Council members have given selflessly to share their expertise and experience with Geology & Geophysics faculty in support of building a Geosciences community consistent with the traditions and standards of Texas A&M.

- **A historic event**—the first ever G&G Alumni Social—was held at the Petroleum Club, Houston, October 4, 2007 (photos on previous pages).
- **A two-day offsite workshop** in May 2007 with the G&G faculty led to the definition of core values and a strategic objective to “Build a Geosciences Community of students, staff and faculty who excel through collaborative pursuit in teaching and research.”
- **A follow-up workshop** in September 2007 identified several short term goals and articulated a long term focus.
- **G-Camp was launched in July 2008 (g-camp.tamu.edu)**

G-Camp is a new outreach program that takes 4th – 12th grade teachers and incoming Texas A&M freshmen on two-week geology field trips. It teaches the principles of geology in the field, letting participants learn and experience geology from the top of an outcrop, the slope of a volcano, and the footwall of a fault.

This past summer’s G-Camp for Teachers was the first phase of the program. Thirty teachers out of 350 applicants traveled with Geology & Geophysics faculty from Galveston through Texas to New Mexico and Colorado. Teachers attending G-Camp earned 3 hours of graduate credit. They also received curriculum materials, handouts, and field kits to share with their students and use in the classroom.

Phase 2 of G-Camp will be added next summer when a 2½ week field trip is offered to incoming freshmen. By attending G-Camp, students will earn 4 hours of science credit (Geology 101) before their first semester at A&M even begins.

Last summer’s G-Camp for Teachers was completely underwritten by industry partners Halliburton, Chevron, Hess, ConocoPhillips, Baker Atlas Hughes, and ExxonMobil. The only expense for the teachers was the cost of tuition for those who elected to receive graduate credit. This strong partnership with industry is essential to the growth of G-Camp so that eventually hundreds of teachers, and thousands of new Aggies, will be able to discover for themselves the excitement and wonder of geology.

G-Camp for Teachers participants climb Enchanted Rock.

GEODAC Members

William Barkhouse, Flagship Coordinator, ExxonMobil Exploration Company
Lee Billingsley, Ph.D. ’75, Vice President of Exploration, Abraxas Petroleum Corporation
Kellam Colquitt ’70, Chief Operating Officer, Reef Exploration
Carlos A. Dengo Ph.D. ’82, Vice President of Geosciences, ExxonMobil Upstream Research Company
Walter Hufford ’83, Manager, Environmental Business, Atlantic Richfield-BP
Mark Koelmel, General Manager, Earth Sciences Dept., Chevron Energy Technology Company
G.M. Byrd Larberg ’76, Director, Meridian Resources Corporation
Grant Macrae ’93, Senior Geophysicist, PGS Reservoir
Dusty Marshall ’75, Vice President for US Exploration, Hess Corporation
Ron McWhorter ’79, Senior Geophysical Advisor, Devon Energy Corporation, Council Chair
Dan Pedrotti ’53, President, SueMaur Exploration, Inc.
Carl Steffensen ’82, Geologist, BP America, Inc.
Catherine Strong ’80, Business Coordinator, ConocoPhillips
William Thomas ’75, Sr. Vice President and General Manager, EOG Resources, Inc.
Diane Barron ’81, Director of Development, College of Geosciences
Andreas Kronenberg, Ph.D., Geology & Geophysics Department Head

G-Camp for Teachers participants climb Enchanted Rock.
Aggie Oceanographers Dr. Jim Brooks ’75 and Dr. Bernie Bernard ’78 have maintained strong ties with the College of Geosciences, the University, and the vast Aggie network while building a leading scientific services company. Last year TDI-Brooks International, Inc., which they founded in 1996, was recognized by Mays Business School as an “Aggie 100”—one of the 100 fastest-growing companies owned or operated by Texas A&M graduates!

TDI-Brooks provides petroleum geochemistry services, surface geochemical exploration, oil spill response, oceanographic surveys, environmental chemistry services, and multi-disciplinary environmental assessments. Their client list includes most of the major oil companies and many state and federal agencies.

Not only are Brooks and Bernard former students, but a dozen key staff members are Aggies as well. And TDI-Brooks actively cultivates relationships with Aggie scientists through collaboration on multidisciplinary projects. One such project is the company’s $3.16 million contract with the U.S. Minerals Management Service (MMS) for a study of chemosynthetic communities on the lower continental slope of the Gulf of Mexico. TDI-Brooks has pulled together a team of world class scientists which includes A&M Oceanographers.

The project builds on the discovery of chemosynthetic communities made by the College’s Geochemical and Environmental Research Group (GERG) when Brooks was GERG’s director. It is a comprehensive study of existing seismic information to locate and characterize chemosynthetic communities, combined with submersible surveys of the ocean bottom.

“Everywhere on the surface of the planet, life exists because of the sun,” said Bernard. “All life is driven by photosynthesis—except for these seabed organisms. Communities of marine organisms live around oil and gas seeps on the bottom of the ocean in total darkness, existing on hydrogen sulfide and hydrocarbons alone. They are chemosynthetic.”

According to Bernard, nobody knew these life forms existed until about thirty years ago. “But once scientists found them and started studying them, we realized that they’ve been springing up around oil and gas seeps for about 35 million years. So if you’re looking for oil under the ocean, go looking for these critters.”

Therein lies the problem. As the existence of chemosynthetic communities became widely known, MMS realized it needed to protect them and set parameters for drilling near them to ensure they were not destroyed.

“The oil companies are actually very good stewards of the environment these days,” Bernard said. “They are extremely serious about protecting these species and complying with restrictions. But MMS needed to have a way to be reasonably sure where communities existed before setting restricted areas for exploration and drilling.”

Using 2 and 3-D seismic data which oil companies submit to MMS, the TDI-Brooks team set about confirming what the data was showing. They visited the chemosynthetic communities with the manned submersible Alvin and the remotely operated vehicle (ROV) Jason with towed camera systems, and documented the communities with chemical sensors, microbiological examinations, and digital video.

According to Bernard this “ground truthing” allowed their team to correlate what they were seeing in the seismic record with what was actually down there, and so far, they’ve experienced a 100% success rate.

“Our geologist picked 14 sites based on the data and when we visited them with the sub, we found communities at each one,” Bernard said.
The next steps in the project will be to construct models based on their findings and to look at communities in deeper water to determine how water depth affects them and their representation in the data.

With over 160 clients, this is obviously just one of many projects for TDI-Brooks. The team has won contracts from the National Oceanic and Atmospheric Administration, the US Fish & Wildlife Service, and the EPA, and it has been involved in many Natural Resource Damage Assessment (NRDA) studies. Because of its litigation-quality analytical product, TDI-Brooks’ affiliated lab, B&B Laboratories, Inc., is increasingly chosen for NRDA work and is one of only three labs in the U.S. that receive damage assessment samples when an oil spill occurs in U.S. waters. The company just won another $3.7 million/4 year MMS project studying deep corals on reefs, rigs and wrecks in the Gulf of Mexico. A&M Oceanographer Ian MacDonald will participate in the study and William Bryant’s ROV will be used.

TDI-Brooks owns and operates three marine research vessels, has a state-of-the-art laboratory in College Station, and boasts an accomplished staff with a broad range of expertise in geochemistry, environmental chemistry, and in chemical, biological, geological and physical oceanography.

TDI-Brook has supported the College of Geosciences in a variety of ways and anticipates increased activities with the following avenues of support: scientist stipends to support publication of research using provided marine sediment data sets; team membership to interested faculty in multi-disciplinary projects funded by MMS or industry; and hiring students part-time to work in B&B Labs and/or on their vessels during research cruises. Most recently, TDI-Brooks provided ship time to the Oceanography Department which will lead to increased research opportunities in the Gulf of Mexico for our students and faculty.

Aggie owned and Aggie operated, TDI-Brooks uses their maroon education to do great things. The company bleeds maroon!

An octopus on the sampling arm of the manned submersible *Alvin*. 

[Image of a group of people]
Scientists around the world are anxious to get their hands on something that has been here at Texas A&M for the past nine months—43 meters of rock core from an active section of the San Andreas Fault.

Geophysicists Judith Chester ’92 and Frederick Chester ’88, and several of their students, are some of the few people so far who have examined and described these rocks in detail. By collaborating with former students, an oil company, and other A&M departments, they are studying the rocks both inside and out.

Judith and Frederick Chester are key members of the science team for the San Andreas Fault Observatory at Depth (SAFOD), one of three research observatories constructed under the National Science Foundation’s (NSF) EarthScope program. EarthScope is one of the NSF’s largest programs in the Geosciences and is focused on understanding the processes that control earthquakes and volcanoes.

The Observatory at Depth is exactly that—a 4-kilometer hole drilled into the San Andreas Fault that lets scientists directly observe and monitor an active fault zone. The drilling site is midway between San Francisco and Los Angeles in a section of the fault that is constantly creeping. Tiny earthquakes—microquakes that barely register on seismometers—occur here regularly. The hole gives scientists access to rocks and fluids from an active earthquake nucleation zone and will house sensors to monitor that zone over the next 15 years.
The Chesters have been involved with the project since participating in a San Andreas Fault Zone drilling workshop in 1992 and submitting initial proposals to NSF in 1997. With co-investigators Jim Evans ’87 of Utah State University and David Kirschner of Saint Louis University, they have led the on-site characterization of the structure and petrology of SAFOD rock samples since a pilot hole was drilled in 2001 through Phase 3 drilling completed last year.

Both spent the summer of 2007 at the drilling site creating meticulously detailed wrap-around maps of the cores by hand to provide a non-invasive description of the structures. They are comparing that data to their prior work examining surface exposures of ancient traces of the San Andreas.

Those same rocks have been stored here at A&M for the past nine months, and given that SAFOD lead investigator William Ellsworth described them as being “not unlike bringing rocks back from the moon,” that has been both a tremendous responsibility and opportunity.

NSF contracted with the College’s Integrated Ocean Drilling Program (IODP) to store all the SAFOD core samples at its Gulf Coast Repository in Research Park, as well as to cut and disseminate samples to researchers around the world. When the opportunity arose, NSF also gave the Chesters permission to add a dimension to their study by collaborating with Dr. David Schechter in Petroleum Engineering to scan the core using computed tomography (CT).

Schechter, who manages the Engineering Imaging Laboratory, discovered that San Andreas Fault core was here while talking to Judith Chester one day at Starbucks. “I thought ‘Wow! That’s really neat! We should scan it,’” Schechter said. “Having been through a California earthquake, I’ve always wondered what rock from the fault looked like.”

Schechter experienced the last major earthquake to strike the San Francisco Bay area—the Loma Prieta earthquake—in 1989 when he was an assistant professor of petroleum engi-
What happened to the dinosaurs?

Some scientists have built careers trying to answer that. Many think that the extinction of the dinosaurs occurred due to the impact of a colossal meteorite off the coast of the Yucatan in Mexico and the firestorms, atmospheric disruptions, and tsunamis that followed. Others question whether this event, called the Chicxulub impact, did indeed precipitate an abrupt mass extinction.

All agree, however, that the answers lie in the geological record, or more specifically, in the study of the preserved strata, or layers, deposited during the Cretaceous-Tertiary (K–T) boundary interval period.

Conveniently, one of the great locations for studying the K–T boundary complex is in A&M’s own backyard.

In Falls County, less than 60 miles from campus, lies the Brazos Rose, a 2,000 acre ranch where owners Jackie and Ronnie Mullinax raise registered Texas Longhorns. Through the Brazos Rose runs the Brazos River. Along the riverbanks and adjoining valley margin are sedimentary exposures that, according to Geology & Geophysics Professor Tom Yancey, have been known to be stratigraphically important since the 1890s. The layers in these exposures contain information critical to understanding just what happened during the Cretaceous-Tertiary (K–T) impact event 65 million years ago.

The Mullinaxes had no idea that their ranch was of such geological importance when they bought it four years ago. Jackie said “At the closing, the prior owner said ‘by the way, sometimes scientists come on the property and look for rocks.’ Well, we didn’t know what to think.”

They soon found out when they were contacted by an international group of scientists working on documenting a record of the Chicxulub impact and its effects on nearby areas. Yancey, a stratigrapher who had studied these deposits in exposed rock layers along the river and nearby creeks for several years, was part of that team, and Geology & Geophysics professor Mark Everett soon joined as well.

Since then, the Mullinaxes have welcomed scientists onto their property and say that they have learned a lot in the process. “I feel like I’ve had an education—a master’s degree at least,” Jackie said. “This has turned our whole family into rock hounds. Every chance we get we’re out looking for fossils along the river.”

If current work by Geology & Geophysics department researchers is successful, the Brazos river site’s importance to K–T boundary studies worldwide may grow. Everett and graduate student Josh Gowan have embarked on a project to use seismic refraction technique to map the underground sandstone layer that marks the K–T boundary. Many refer to this layer as the “tsunami deposit.” Others have drilled core samples to study the layers in specific areas, but none have used seismic mapping to plot its placement in areas covered by younger sediments.

Everett said that Yancey suggested looking at the layers beyond the exposed creek bed. “By using a seismic technique, we can map out that critical sandstone layer to infer its continuity underground, which is useful to know for evaluating the different theories about the Chicxulub impact and its environmental effects.”
Studying the sandstone layer in this way is not for the fastidious or faint of heart. “It’s a muddy creek bed,” Everett said. “We lay out cables, hook up an array of geophones (small microphone recorders), and then use a sledge hammer to hit shot points along the 100 meter line to record everything. Then we pick up the line, move it over, and do it all again.”

According to Everett, this is a relatively established geophysical technique that is now being used in a new application area. “The kind of seismic we’re doing isn’t commonly used in Texas. It’s different from what the oil industry uses because it’s so shallow. But with this method we can acquire the data, put it on a computer, and analyze it all ourselves.”

Gowan is analyzing the data from the first three lines collected for his master’s thesis. If the results are encouraging, Everett and Yancey plan to do a 3-D survey of the larger area and use that as a springboard to take the technique to other sites known to be important to the K–T boundary complex.

The team is anxious to see the results, and so is the Mullinax family. “The researchers are so great,” Jackie said. “It’s been a lot of fun, and since we’re an Aggie family with our son, daughter, and son-in-law all A&M grads, we certainly hope they’re successful.”

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Economic Feasibility: Coaxing Oil from “Hiding Places” in Porous Reservoir Rocks

Our world relies on oil to maintain and improve the quality of everyday life. With rising prices taking a toll on family budgets and oil exploration companies seeking to keep up with skyrocketing demand, the research of Geology & Geophysics professor Dr. Wayne Ahr has become increasingly significant.

Before oil prices began to climb, it was cheaper for oil companies to extract a field’s easily recoverable oil, about one third of the total amount, and move on. Now, however, it is economically feasible to go after a field’s remaining oil, if one knows how to coax the remaining oil from its “hiding places” in the porous reservoir rocks. That is the tricky part and the question Ahr and his students set out to answer.

“Probably as far back as fifteen years ago I began to see that geologists were so oriented toward conventional stratigraphy and sedimentology that they didn’t collaborate with engineers and petrophysicists to learn about how fluids move through carbonate and sandstone reservoir rocks,” Ahr said. “I saw this coming like a freight train, so I began looking at what information we needed to improve our understanding of this problem in order to find ways to solve it.”

Much of that information came from the collection of rock cores Ahr brought with him when he came to Texas A&M from Shell Oil Co. in 1970 and has steadily added to over the years.

“I came here with 48,000 pounds of core,” Ahr said, laughing. “We had a core party unloading two semi-trucks with all the grad students we could get our hands on. I got out there with them, and we spent the better part of a day and a half unloading those semis.” Since then, many of the 59 graduate students who have worked with Ahr studied those borehole cores or others donated or loaned to A&M.

Using powerful microscopes to exam these cores and slices of rock from them called thin sections, Ahr and his students
identified and classified tiny pores in the rocks which he describes as different sized rooms. Like rooms, pores are connected by “doors” called pore throats, which also vary in size. In oil reservoirs, knowing how interconnected the pores are can tell experts how easy or difficult it will be to extract oil from certain areas.

This pore classification task became so important that Ahr and his students created a new classification system for pores in carbonate reservoirs and aquifers. Ahr presented a paper at the American Association of Petroleum Geologists international meeting in April about this system and how it can be used to get “the last drop” out of mature oil reservoirs. It can also be used to better understand groundwater aquifers and map pathways that may be taken by contaminants or other undesirable compounds in subsurface aquifers and porous rocks.

According to Ahr, understanding pore throats is the second piece of the puzzle. “If you want to get out of this room (a pore), you’ve got to go out of that door (a pore throat),” Ahr explained. “If the door is big enough for a man, that’s no problem. But what if that door is a two-foot round hole? Some oils are thick; some are thin. When you’re looking at fluids moving through pores in the subsurface, all of this becomes very important.”

After coming to understand how oil moves through rocks, another problem remained: how to locate the best areas for later drilling of infill wells in older fields or for determining where to inject sweeping fluids to knock loose and move as much as possible of the other two-thirds of the oil that was not recovered the first time.

To solve this, Ahr uses several techniques to link pore characteristics with each other. “We use microscope thin sections, core samples, mercury injection capillary pressure measurements, and nuclear magnetic resonance (NMR) measurements to identify pore geometry, pore classification type, and where the best pore systems occur in these older fields where we hope to extract more of the ‘last drop’ of oil,” Ahr said.

These techniques often require highly specialized equipment not available on campus. “We use labs in Houston to do NMR and mercury injection studies,” Ahr said. “The NMR tells us the size of pores. Its use in carbonates is very new and really a hot topic, right at the front edge of our research. Mercury injection capillary pressure studies tell us how big the pore throats are and how they are connected from pore to pore.”

Conducting research at the forefront of science’s understanding has certainly paid off for Ahr and his students. Ahr regularly lectures around the globe, and his book titled *Geology of Carbonate Reservoirs* was just published. As for his students, Ahr said they are in such high demand that their biggest problem is trying to decide which job offer to take when they graduate.

For more information on Dr. Ahr’s research visit his faculty profile.

geoweb/tamu.edu/profile/WAhr

by Justin Bailey
Photos by Wayne Ahr and IODP Imaging
Eighteen undergraduate and graduate students from Geology & Geophysics, Oceanography and Petroleum Engineering explored Utah’s Book Cliffs May 10 to 17 in a field geology course funded by a $30,000 donation from the Chevron University Partnership Program. The course incorporated a six-week seminar class, outcrop examination, and outcrop and subsurface exercises to explore the fundamentals of sequence stratigraphy in shallow marine, deltaic and fluvial systems. Bryan Bracken, in-house geology instructor for Chevron, led the field trip with Dr. Tom Olszewski, assistant professor of Geology & Geophysics, graduate assistant Leigh Fall, and Harris post-doctoral fellow Jason Moore.

This is senior geophysics major Alana Robinson’s account of the trip taken from her field notes and journal. Alana will graduate in December and plans to continue on to graduate school. She interned this past summer with Devon Energy in Houston.

Day 1
5:35 AM: Meet at airport to leave for Salt Lake City
12:30 PM: Arrive at Salt Lake City and get vehicles (3 Jeeps and an Escalade)
3:00 PM: 1st roadside stop at Thistle Slide, the farthest extent of Sevier Thrust Sheet, also boundary between thin skin deformation to west and thick skin deformation to east. To the east is the San Rafael swell, a foreland basin fill.
5:00 PM: Stop for groceries. Charles earns name “Chuck Bob.”
9:00 PM: Set up camp, make dinner, and start a fire. Klug brings back a tree for fire wood and spends an hour with an axe and a saw to cut off a foot-long section; by then everyone went to bed. Stella didn’t buy the Rusty Wallace NASCAR blanket and froze all night. So did most people though.

Day 2—Focus: Sedimentary structures, depositional facies, and sedimentary sequences, Blackhawk Formation (Campanian) shoreface
7:00 AM: Leave for field.
8:00 AM: Helper water tank overview, Book Cliffs depositional environment is a dip oriented foreland basin. Four sandstones in Spring Canyon: Sowbelly, Hardscrabble, Heiner, and Helper.
9:30 AM: Spent remainder of day describing Gentile Wash stratigraphic section in groups. Amy, Dax, Leslie, and Klug present their column on the white board.
2:00 PM: Lunch
2:45 PM: Look at Panther Tongue, a Cretaceous sediment gravity-flow-dominated delta front
4:00 PM: Look at downcutting channels in Panther Tongue
Day 2—Focus: Fluvial deposits: Castlegate Formation (Campanian) and Green River Formation (Eocene)
7:00 AM: My tent stayed up, but was blown flat on my face all night. Leave camp for day; weather is nice.
8:00 AM: 1st roadside stop. Weather is 33°F and snowing. Everyone is freezing because we don't have warm clothes with us. Look at channel and river deposits in Green River Formation. We find fossils of Gar fish scales and teeth.
12:00 PM: Stop for lunch at a much needed warm restaurant.
2:30 PM: Measure and describe Panther Tongue outcrop. Anne, Aubrey, Leslie and I present our interpretation on the white board.
6:00 PM: Kmart stop to buy blankets for the cold night ahead.
7:30 PM: After rearranging my tent so I won't blow away (thanks Leslie, Klug, and Chuck Bob), we cook spaghetti for dinner.
10:00 PM: Everyone is in bed; wind isn't bad.

Day 4—Focus: Deltaic deposits, Ferron Sandstone (Turonian)
7:30 AM: Leave camp with all of our stuff to switch campsites.
9:00 AM: Hike ½ mile to Ferron Overview. Look at 2 prograding river-dominated delta lobes.
11:00 AM: Drive to muddy creek and eat lunch. After lunch we hike to Rochester Panel Indian Rock art site and look at petroglyphs left by the Indians. On the hike back we see wave-dominated delta deposits.
2:00 PM: At Dry Wash we do a stratigraphic section of a wave-dominated delta. Thunder, Sara, Clay, and Dodson present on the white board. Two guys stop on side of road to show us the dinosaur scapula they had just found.
7:00 PM: Arrive at Green River Campsite.
Day 5—DAY OFF!
8:00 AM: Leave for Arches National Park. Half the group opt for an 8 mile hike (Devil's Garden). The other half decide to go on the drive-by tour of all the major attractions in the Escalade.
4:00 PM: Meet at Visitor's Center and drive to Moab for dinner.
7:00 PM: Grocery shop for last meals in field.
Day 6—Focus: Sego Formation (Campanian) Tidal delta systems
9:30 AM: Make a stratigraphic column of Sego Canyon in groups. Cory, Cheddar Bob, Daniel, and Riene present on the white board.
12:00 PM: Eat lunch in old town of Sego.
1:30 PM: Hike up Buck Tongue Member of Mancos Shale to see incised valley. At the top, I collect 2 pieces of hematite. Dodson uses these to paint tribal symbols on our faces.
5:00 PM: Back at camp, Clay grills steaks and makes cheesy potatoes.
7:30 PM: Leslie and I buy a 6 pack of Klondike bars and have people dance if they want one. “What would you do for a Klondike bar?” Sara shakes it in the grocery store, Tom “stirs the pot,” Dax boogies for two, Stella raises the roof, and Klug does the robot. Best 4 dollars ever!
Several Texas A&M professors have capitalized on the opportunity to sail on Ecuadorian Navy ships since the University signed an agreement with INOCAR, the navy’s Oceanographic Institute, in 2001. One of those was Oceanography professor Dr. John Wormuth, who traveled to the Galapagos Islands in the summer of 2007 with three graduate students—Scarlett Arbuckle, Ruth Mullins, and Julia O’Hern.

According to Wormuth, the trip had its ups and downs thanks to the unpredictable nature of maritime travel and the limited size of the ship. Still, Wormuth said that conducting field research in such an exotic and historically important area was the experience of a lifetime.

“I’ve never been to a place as unique as the Galapagos Islands,” Wormuth said. “They’re so isolated and the area is so biologically productive. I’m a birdwatcher too, so I made sure to see Darwin’s finches that I’ve read about for so many years.”

The Galapagos Islands are a group of about 22 islands located off the coast of Ecuador. They were made famous by Charles Darwin’s studies of various Galapagos species that contributed to his development of the theory of evolution.

Wormuth and one of his graduate students, Scarlett Arbuckle, made the cruise to capture some of the Humboldt squid that live in the waters. He and Arbuckle are studying the squid with hopes of answering a question that has puzzled scientists in recent years.

“It used to be that when there was an El Niño, which causes warmer water to move north, smaller-sized individuals of the Humboldt squid could be found around the waters of Los Angeles,” Wormuth said. “Now, and nobody knows exactly why, squid in excess of five feet long have been found further and further north along the west coast, even as far north as Alaska—so it’s undergone a big range expansion.”

Bad luck kept Wormuth and Arbuckle from seeing any squid large enough to catch with their nets. They already have samples from the California coast, and they had hoped to return with samples from the Galapagos to help advance Arbuckle’s ambitious research.

(Left) Julia O’Hern and ship’s crew prepare the hydrophones for a deployment.
“Scarlett wants to look at a comparison of isotopes and perhaps genetic material to see if these are connected populations and gain some understanding about why they’re continually moving north,” Wormuth explained.

According to Wormuth, more whales were seen on the trip than anything else, which was good for Julia O’Hern and Ruth Mullins who used hydrophones to listen to and record the whales and porpoises.

The small INOCAR ship was ill-equipped for passengers, which made the nights that Wormuth and his students spent onboard less than restful.

“On the ship we had no rooms to ourselves and next-to-no space for what we brought. The ladies shared the bridge for sleeping and I slept in the galley. We used the Captain’s bathroom and shower when it was available.”

While the ship was small, cruising on an INOCAR vessel did have its advantages. “It was rigged to tow our instruments like side-scan sonar and plankton nets. Civilian ships aren’t set up to do those things.” Wormuth explained. “We were able to slow the speed of ship to as few as two knots, which was very helpful.”

“We also were granted significant control over where the ship went,” Arbuckle added. “If we wanted to stop and listen for whales or tow for plankton, they stopped. It wasn’t a typical ‘passive’ cruise.”

Though he’s not sure when he’ll have the opportunity to visit again, a $5 million renovation on a larger ship, the Orion, was completed last summer and will soon offer Texas A&M researchers not only more space, but most importantly, more time onboard for research.

“They’re talking about a major cruise now that the ship is ready,” Wormuth said. “It would leave the mainland and travel around the islands. I’ve got two pretty sophisticated electronic net systems that tell you depth, speed, temperature, salinity, and other measurements that we would be able to tow behind us.”

Wormuth is also looking forward to returning to the Galapagos after a chance meeting with a former student on their last night in the islands. John Morrison ’74, who studied under Wormuth while earning his Master’s and Ph.D. in Oceanography, approached the group in a restaurant when he recognized Wormuth’s voice. Morrison is now a professor of Oceanography at the University of North Carolina Wilmington and working in the Galapagos.

“After talking over old times and the changes we’ve seen, we pledged to work together in the future,” Wormuth said. “I totally trust John, and I’m sure we’ll be able to do some great work.”

For more information on Dr. Wormuth’s research visit his faculty profile.

Oceanography
Oceanography Professor Will Sager spent the summer of 2007 cruising the Indian Ocean with scientists and students from universities around the world, including MIT, the University of British Columbia, the Russian Academy of Science in Moscow, and the University of Cape Town. Six A&M students accompanied him on the cruise to gain experience on a research vessel and assist with round-the-clock data collection during the 50-day voyage aboard the Research Vessel (R/V) Roger Revelle.

“To put it in perspective, the distance we covered over those 50 days is equivalent to going from Los Angeles to Philadelphia,” Sager said, “and we weren’t just going in a straight line. We went back and forth over some areas to map and dredge, but the ship was going maybe 10 knots, so that’s about 11–12 miles an hour—like bicycle speed. Imagine spending your summer bicycling across the country from LA to Philadelphia, and that’s essentially what we did, collecting rocks and data as we went.”

The goal of the cruise, informally titled Sea90e, was to test the hotspot hypothesis, a theoretical model of how sea floor ridges and seamount chains are established. The theory is that undersea volcanoes, which make up the volcanic chains, other culture,” said Paul. “To be here at A&M and see tier-one research is a big step up.”

Paul joined Sager on Sea90e to add to his experience aboard research vessels and to help collect the data that he is currently using for his dissertation. During the cruise, Paul was in charge of collecting multi-beam data to generate high-resolution maps of the Ninetyeast Ridge and surrounding seafloor. He volunteered to work the night shift, running equipment and collecting data while most of the crew slept.
form as a tectonic plate moves over a hotspot, or place of persistent volcanic activity beneath Earth’s surface, and where magma from the Earth’s interior floats to the surface.

“This model is very simple,” said Sager. “You have this plume or pipe of magma coming up, and you get a nice ridge that forms as the plate marches along over the magma. But I think we’re going to find when we look at the data that this model is too simple. It’s really more complicated than that.”

The National Science Foundation funded the research through the Ocean Drilling Program in 2006, but the ship wasn’t available until 2007. The delay gave rise to a new opportunity when Sager and the director of JOI Learning, now called the Consortium for Ocean Leadership, decided to expand the purpose of the cruise to include educational outreach for middle and high school students.

Middle school mathematics teacher Rory Wilson from Meeker, Colorado, was invited on the cruise to learn about the research being done and translate it into more accessible language for the general public. During the cruise, Wilson held video conferences with teachers and their classes and maintained a website with photos, a blog about his experiences on the ship, and articles about different aspects of the cruise, some written by Sager and his students. The website can be viewed at oceanleadership.org/sea90e.

The Revelle departed from Thailand for the Ninetyeast Ridge (NER), chosen because, at over 5000 kilometers long, it is one of the longest seafloor volcanic chains and is a major constraint for the motion of the Indian plate relative to

Ph.D. student Leslie Nemazi models an exposure suite (a.k.a. Gumby suit). All researchers and crew must practice putting on exposure suits for overboard drills. While it looks like a “gig ‘em,” Leslie’s thumbs-up is because they were timing themselves to see who could get into the suit the fastest.

STUDENT CONNECTIONS

“I volunteered to work nights because I’m a night owl,” he said, “but it does have its advantages. You still have to work as hard as those pulling day shifts, but at least you can avoid the nasty sunburns!”

To complete his Ph.D., Paul is analyzing the bathymetry and seismic data from the cruise to piece together the tectonic history of the Ninetyeast Ridge, which is not well understood. He is also working to determine whether or not the tectonic history is directly related to the hotspot hypothesis.

“The Ninetyeast Ridge is a great test-bed for the hotspot hypothesis,” said Paul. “More and more we’re finding out that we don’t understand the hotspot model nearly as well as we thought we did. What we collected out there will be significant. It’s definitely some of the best seismic data on the region.”

Although Paul spent much of the past year analyzing data from the Sea90e cruise, he also spent 10 hours a week last spring teaching high school physics at St. Joseph Catholic School in Bryan. He was hired to teach physics to help alleviate overcrowding issues in the classrooms. Paul was also a member of both the Oceanography Graduate Council and the College’s graduate student committee.

After finishing his Ph.D., Paul hopes to find a position as a research scientist and continue his work in marine geophysics and plate tectonics by studying oceanic crust. That means there should be many more oceanographic cruises in his future.
As the ship traversed the water above the ridge, a multi-beam echo sounder was used to map the morphology and topography of the seafloor, while seismic sound waves were sent down to map the sediment layers and the volcanic material underneath them.

The information collected was analyzed to determine the geologic structure of the NER and to find the best areas to dredge for geologic samples. They dredged at thirty-three locations, collecting rock samples from the ocean floor to be analyzed by the MIT researchers onboard to determine the geochemistry and precise age of the rocks.

The researchers were surprised by what they found. The multi-beam data indicated significant changes in morphology along the length of the NER, revealing large, separate seamounts, or underwater mountains, in the north that became more condensed in the south until they were nearly continuous. Also, the bathymetry and seismic data revealed faulting throughout NER, which could mean that the ridge has been more tectonically active than was previously thought.

Back on dry land, Sager and his students are now putting the collected data to good use. Two of the graduate students that participated in Sea90e, Amy Eisin and Chris Paul, are using the information in research projects for their degrees. The other four students—Masako Tominaga, Leslie Nemazi, Shari Hilding-Kronforst, and Dax Soule—are applying the knowledge they gained to their continued studies.

According to Sager, it will take years to evaluate all the data. “Even when we’re done, we may not know what all the data means,” Sager said. “But it’s all important because it allows you to make incremental additions to your knowledge that refine your ideas and maybe raise other questions.”

There are other theories more complicated than the basic hotspot hypothesis. While Sager does not expect the results of the Sea90e research cruise to explain every aspect of NER, he hopes the data collected will help bring scientists closer to fully understanding hotspots and their underwater formations.

A&M students on the Sea90e expedition discovered that research cruises are no vacation. Ph.D. student Masako Tominaga had many opportunities to flex her muscles moving equipment around the deck during the trip.

hotspots. The NER’s characteristics and formation are little understood due to a lack of high quality geophysical and geochronological data. The problem has always been its remote location and its depth, hidden beneath 2-5 km (1.3 - 3.1 miles) of ocean water.

At NER, the team collected bathymetry data, or measurements of water depth, and began creating a map of the ridge and surrounding seafloor.
Got a Science Question?

You’re writing a research paper or teaching a high school science class and you’re stumped—you need an answer, pronto. What do you do? You ask Dr. Bob.

Dr. Bob, also known as Bob Stewart to his students and friends, is an oceanography professor who communicates his love of science and the ocean to as many people as possible—students, teachers, fellow professors, anyone he can help.

To do so, seven years ago he started his ocean science website OceanWorld that includes the “Ask Dr. Bob” feature and eureka! Stewart found his calling, and like a creature in a science fiction movie, the site has taken on a very real life of its own.

From a few questions a week, he now receives dozens of queries every month as word has spread about his site and the helpful—and accurate—information that is available for free to anyone who needs an answer. On the information highway, there is now a helpful Q & A science rest stop that is hard to beat.

Stewart has become a sort of “Wizard of the Web” who has a loyal following. About 1,000 other websites around the world now have links to OceanWorld.

“We’ve been doing this for years now and it’s still fun,” Stewart explains. “But it’s rewarding to know that we are helping people, too, and many of them are thousands of miles from the Texas A&M campus. Every day is a new challenge, and we always seem to get interesting questions that we are glad to help answer.”

Not only are students and teachers impressed, but so are the folks at NASA. They awarded Stewart a contract to develop and maintain his Internet operations. Others have noticed, too. OceanWorld recently received the Best Web Site Award from the Geoscience Information Society.

Meanwhile, the questions from the “Ask Dr. Bob” link keep Dr. Bob busy.

A third-grader needs help regarding tides, while a middle school teacher wants information about carbon dioxide sources. A professor at another university is asking about detailed tsunami research. They all contact Dr. Bob, who makes a determined effort to answer them as quickly as possible—knowledge has deadlines, too, he understands.

The million dollar question: Has he ever been totally stumped?

“Not yet,” Stewart replies. “I’ve learned that if I don’t have the answer right at hand, I can get it very quickly, often in less than five minutes.”

OceanWorld was developed with the help of several graduate assistants who write material for the website, but when it comes to answering the questions, it’s all about Bob—he answers each and every one himself.

Stewart, who has taught at Texas A&M for 18 years, was a researcher at the Scripps Institute of Oceanography for more than 25 years. He learned then that making science more accessible to others is part of the big picture.

“I’ve said this before and I will say it again: I think it is very important that we in the academic community try to make knowledge more available,” Stewart said. “We should try to help everyone who is trying to learn, not just students. The OceanWorld site shows that Texas A&M cares about all people who want to learn, and it’s a way to pay back the people who pay our salary. If we can help people with an answer to their question, we should do it.”

Stewart practices what he preaches.

Noting that many college textbooks cost $100 or more, Stewart has made available through his website free downloadable versions of the three textbooks he has authored. Some of those books are now available in Portuguese, Spanish, Italian, Russian, and other languages.

Inquiring minds—the kind Dr. Bob likes most of all—can experience OceanWorld firsthand at oceanworld.tamu.edu.

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Photos by IODP Imaging

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The United States plans to spend $14.1 billion fighting illegal drugs in 2009 according to the National Drug Control Strategy FY ‘09 Budget Summary. This includes $601.9 million to counterdrug programs in Bolivia, Brazil, Colombia, Ecuador, Panama, and Peru, a region which “is almost entirely responsible for the world’s supply of cocaine and is a major supplier of heroin to the United States” (www.whitehousedrugpolicy.gov/publications page 5). The money supports law enforcement, border control, illicit crop reduction, and alternative development programs in the region.

Environmental Programs in Geosciences Interim Director Dr. Andrew Millington has confirmed that in Bolivia, US efforts to control illicit crop production and encourage alternative development over the past 30 years has created unintended environmental consequences. Due to those consequences, our country’s “War on Drugs” may ultimately carry a much greater price tag.

It’s all about coca, its cultivation, and the impact of anti-coca policies on the environment.

The coca leaf is the base ingredient for cocaine. Conventional wisdom holds that since cocaine comes from coca, growing coca is bad and encouraging farmers to grow legal crops is good. But Millington has found that in Bolivia, conventional wisdom does not apply.

In his research documenting four decades of development and deforestation in the Chapare region which spans the eastern slopes of the Andes and the southwest Amazonian Basin, Millington has found that periods of high illicit coca cultivation were actually better for the environment than periods when anti-coca policies were effectively enforced.

“When farmers grow coca, the deforestation rates are half or less than they are when they grow alternative crops. Coca is very conservative in terms of the amount of land it uses. For example, it takes 14 hectares (34.6 acres) of palmito to produce enough palm hearts to equal the value of one hectare (2.5 acres) of coca. Land-hungry substitute crops necessitate more for-
Drying coca leaves.

est clearing and increased forest loss,” Millington said.

Forest loss in this region comes with serious consequences. The Chapare forms a transition zone between biologically important Andean mountain forests and the Amazonian humid tropical lowland forests. Any development in Chapare compromises the biological interchange between the two which affects levels of biodiversity; additionally, the forest loss may modify the global carbon balance and modify the regional climate.

According to Millington, little attention has been paid to environmental issues related to anti-coca policies which include deforestation, forest fragmentation, soil erosion, and the contamination of soil, streams and groundwater when defoliants are used.

Coca has been cultivated in the Bolivian highlands and used by indigenous people since before the Incas. The plant’s leaves are mixed with an activating agent like baking soda or ash from fires, bundled, and tucked in the cheek, similar to chewing tobacco. It acts as a low level stimulant that suppresses appetite, dissipates the effects of altitude sickness, and is mildly hallucinogenic.

Traditionally, coca was only grown in the valleys of the eastern Andes and was very important to the economies of the Inca and Spanish Colonial cultures. It is still legally cultivated there today, and coca leaves are traded in Bolivia for chewing and as an herbal tea.

It wasn’t until colonization took hold in the Bolivian lowlands in the 1960s and cocaine became the international drug of choice in the 1970s, that farmers began illegally cultivating coca in the lowlands.

Millington became interested in this while researching land use change and conservation issues in Bolivia for the European Union 20 years ago. Working with researchers at the Universidad Mayor de San Simón in Cochabamba, Millington and then Ph.D. student Andrew Bradley helped produce maps of three national parks in Bolivia.
coca cultivation and processing in that area,” Millington said.

Millington and Bradley, who is now with the Centre for Ecology and Hydrology in the United Kingdom, had established good relationships with villagers in this area, “so we were able to really investigate how the drug industry and efforts to control it were major drivers of forest loss,” Millington added.

They did this using land-use mapping from a time series of satellite images, personal interviews with farmers, and analyses of economic data and policy documents from 1963 to 2003.

“We’ve visited the same villages many years since 1991 and talked with farmers about when and where they grew coca. We’ve gone with them to the very places where they’ve grown coca in the past,” Millington said. “We did this to validate what we were seeing in the satellite images. It’s rather risky work as you can imagine, because a lot of these guys still grow coca illegally. It is a somewhat insecure area.”

With the help of his current graduate assistant Danny Redo, Millington and Bradley have compared eight time periods between 1966 and 2006 and found that deforestation rates were very low from the late 1970s to the early 1990s when coca cultivation was widespread and anti-coca policies were weakly enforced. Before and after this period, when anti-coca policies were strongly enforced, deforestation rates were significantly higher.

“So what do we take away from this,” Millington asked? “Efforts to suppress coca and put in alternative development crops, which are essentially being funded by the US taxpayer, have actually promoted massive deforestation in Bolivia. That’s the dilemma isn’t it? We don’t want cocaine or crack on our streets, but in solving that problem, we’ve created a big environmental mess.”

Millington hopes that this work will raise awareness and encourage similar studies. “Our quantification of the deforestation rates is the first that has ever been done. It shows that an environmental problem exists in Bolivia which we have been complicit in creating. There is an interesting nexus between the environment and social issues and drugs that really needs to be investigated further. We just don’t want this to happen again.”

by Carol Trono
Photos by Andrew Millington and Danny Redo

See these websites for more information on the research of Dr. Millington.
geography.tamu.edu/profile/AMillington
After Major Refurbishment, IODP’s JOIDES Resolution Returns

NEW TO THE CORE

“The return to service of the JOIDES Resolution is a major step forward—providing much greater capabilities to allow scientists to unlock the secrets of how the planet works and address critical climate and resource issues of our time.”

The JOIDES Resolution is a dynamically positioned drillship and floating laboratory that can drill more than 2,000 meters into the seafloor through waters as deep as 7,000 meters.

After a complete overhaul of this 23-year-old scientific ocean drilling workhorse, the new JOIDES Resolution will embark on the next phase in ocean drilling for the Integrated Ocean Drilling Program (IODP).

Late 2008, the ship is due to leave the Singapore shipyard where it was transformed. It will complete a readiness cruise while in transit to the port of call for its first science expedition. During that cruise, scientists will test all equipment on board, and the ship will stop to drill a practice hole, collect cores, and do logging exercises.
Project manager Jay Miller said that, “By the time we arrive at our first port of call, we will have tested everything to make sure the ship is fully functional.”

According to IODP Interim Director Steven Bohlen, “The return to service of the JOIDES Resolution is a major step forward—providing much greater capabilities to allow scientists to unlock the secrets of how the planet works and address critical climate and resource issues of our time. On board the new and improved JOIDES Resolution, international teams of scientists will again lead expeditions exploring the deep biosphere and sub-seafloor ocean; environmental change—rapid climate change and climate extremes; and solid earth cycles and geodynamics.”

“The USIO has done a fantastic job with these components, and the systems exceed our expectations. Taken together, the physical and science system improvements result in a quantum leap in shipboard science capabilities, producing a truly transformative science environment.”

Scientists will use the ship’s microscopy, paleontology, downhole logging, core description, and petrophysics laboratories to better understand Earth’s climate conditions and sea level in the distant past.

Petrologists, volcanologists and geophysicists will use the ship’s chemistry, paleomagnetism, thin section and X-ray laboratories to analyze material and data during expeditions focused on improving our understanding of plate tectonics, volcano formation, gas hydrates, and earthquake mechanisms.

The refit of the ship was funded primarily by the National Science Foundation and coordinated by the U.S. Implementing Organization (USIO) comprised of the Consortium for Ocean Leadership, Lamont-Doherty Earth Observatory at Columbia University, and Texas A&M University. Laboratory space was increased by 34% and redesigned for greater core handling efficiency. Drilling capabilities and ship stability were enhanced, and living quarters were expanded and modernized. To support the science systems and other ship infrastructure, 230,000 meters of electrical cable was run—enough to stretch from College Station to Galveston.
Miller said that a “test drive” of the ship’s new Laboratory Information Management System and other analytical systems conducted at IODP headquarters in Research Park in June was “glowingly positive.”

The test drive was conducted by an external committee of 11 scientists who together had over 10 years experience in actual ship time – a wealth of expertise in scientific ocean drilling. In their executive summary, the team said, “The USIO has done a fantastic job with these components, and the systems exceed our expectations. Taken together, the physical and science system improvements result in a quantum leap in shipboard science capabilities, producing a truly transformative science environment.”

In addition to transforming the ship’s physical and science environments, IODP plans to transform its drilling program also as it enters the next phase of drilling. Under the leadership of Bohlen, a new vision and structure will be developed in preparation for renewal of the IODP contract in 2013. Due to increased operational costs and restricted funding for drilling platforms, avenues for engaging commercial partners to use the JOIDES Resolution approximately three months per year are being explored as a means of cost-sharing.

“Every opportunity to find industry work that can dovetail with or at least not disrupt the scientific objective of IODP is being explored,” Bohlen said. “As we craft a vision for the phase two program that incorporates industry partnerships, the science services model will evolve to face the new realities. But our guiding principles will continue to be the efficiency and effectiveness of science delivery, maximization of science outcomes, and interactions with and involvement of the research community.”

Bohlen will work closely with USIO alliance partners and the drilling community to build academic bridges and position IODP/TAMU to take advantage of current and future research opportunities in climate change, sea-level rise, energy security and other relevant national issues as plans are formulated for ocean science drilling beyond 2013.

Follow the progress of the JOIDES Resolution as it resumes drilling at the IODP website www.iodp.org and learn more about the ship’s conversion at www.oceanleadership.org/sodv.

by Carol Trono
Photos by IODP Imaging and Roy Davis
New Interim Director Takes the Helm

Dr. Steven Bohlen became interim director of IODP on August 1, 2008. Bohlen has been charged with developing a new vision and structure for the program. He will work closely with the program’s partners and the drilling community to build academic bridges and position IODP/TAMU to take advantage of current and future research opportunities in climate change, sea-level rise, energy security and other relevant national issues. He will also begin plans for ocean science drilling beyond 2013.

Bohlen has been appointed a research professor in geology & geophysics. Before joining Texas A&M, he was president of the Joint Oceanographic Institutions (JOI) from 2000 to 2007, and continued as president of the JOI Division of the Consortium for Ocean Leadership (COL) after a merger in 2007.

Through his positions with JOI and COL, Bohlen gained extensive experience with IODP on both a national and international level. “I’m am very excited about having the opportunity to help lead IODP at a time when the research results from scientific ocean drilling are so directly relevant to the everyday lives of every inhabitant of the planet,” Bohlen said.

Bohlen also worked for the U.S. Geological Survey for 12 years and held assistant and tenured associate professorships at the State University of New York, Stony Brook, from 1979 to 1988. Bohlen completed his A.B. degree at Dartmouth College and did his M.S. and Ph.D. at the University of Michigan. He has authored or co-authored 60 peer-reviewed publications, several of which are among the most highly cited in the geosciences.
Former IODP Director
Phil Rabinowitz Retires

Dr. Phil Rabinowitz, professor of Oceanography and Geology & Geophysics and former director of the Ocean Drilling Program from 1983 to 1995, retired in July after a 27-year career at A&M. Named a Texas A&M Regents Professor in 2004, Rabinowitz also holds the D. B. Harris Chair in Geophysics and received the Association of Former Students’ Distinguished Achievement Awards for Research in 1987 and for Teaching in 2002.

Rabinowitz came to Texas A&M in 1981 as a professor of oceanography. He earned his Ph.D. in marine geophysics at Lamont-Doherty Geological Observatory, Columbia University. He was named professor of geophysics in 1988, served as interim head of the Department of Geophysics from 1993 to 1994, and was the first head of the combined Department of Geology & Geophysics from 1994 to 1998.

"Phil has made many contributions to Texas A&M," said Geology & Geophysics Department Head Andreas Kronenberg. "When we needed an inspired leader and respected scholar to bring the Departments together, Phil was the obvious choice. He had a clear vision of what the new combined department could be, and he worked to make that vision reality."

Paul Jeffrey Fox
Steps Down

Dr. Paul Jeffrey Fox stepped down as director of science services for IODP in June. Milestones accomplished under Fox’s directorship include the successful bid in 2003 by A&M and its partners’ for a new 10-year ocean drilling con-tract with the National Science Foundation—the largest research contract in the University’s 127-year history. He managed the transition from the Ocean Drilling Program into a new phase as the Integrated Ocean Drilling Program in 2004. As IODP, the program with both national and international partners undertook an ambitious expansion of exploration beneath the oceans made possible by changing from the single-ship operation to a multiple-drilling platform.

Fox is a professor of Oceanography and Geology & Geophysics with research interests in processes which create oceanic lithosphere along the Mid-Oceanic Ridge System. Prior to coming to Texas A&M, Fox was at the University of Rhode Island from 1981 to 1995 as associate professor of research, research professor of oceanography, and professor of oceanography. He also held assistant and associate professorships at the State University of New York (SUNY) at Albany from 1972 to 1981, and was associated with Lamont-Doherty Earth Observatory, Columbia University, from 1964 to 1981.

Björn Kjerfve Appointed to IODP-MI Board

Dr. Björn Kjerfve, Dean of the College of Geosciences at Texas A&M University, has been elected to a three-year term on the Board of Governors of the Integrated Ocean Drilling Program Management International, Inc. (IODP-MI), a nonprofit, U.S. Corporation with an international membership of academic institutions committed to scientific ocean drilling research. This 14-member board governs and manages the affairs, funds, and property of the corporation. With offices in Washington, D.C. and Sapporo, Japan, IODP-MI is responsible for program-wide science planning and oversight of IODP.

Kjerfve serves as the TAMU representative to the Consortium for Ocean Leadership, and was previously a member of the Board of Governors of the two organizations—the Joint Oceanographic Institutions and the Consortium for Ocean Research and Education—which merged in 2007 to become the Consortium for Ocean Leadership.
A patch of brown grass here, a hardy cactus there, and a lizard sunning in the distance—for decades only the toughest plants and animals could survive in South Texas’ Bahia Grande. Water was cut off from the 10,000 acre area in Cameron County by the construction of Texas Highway 48 in 1933. The wetland that existed before the highway’s construction was slowly replaced by a haunting desert, eerily similar to photos sent back from the moon.

That was what Tony Reisinger, Cameron County Extension Agent—Coastal & Marine Resources for Texas Sea Grant, saw in the 1980s when he began working with community leader Joe Gayman on plans to connect the dying basin with the Brownsville Ship Channel.

“Sea Grant was really involved from the beginning,” Reisinger said. “I did some of the first searches to find out who the landowners were so they could be contacted to determine what it would take for us to be able to flood Bahia Grande.”

The Bahia Grande Restoration Project fit Sea Grant’s mission well—“to promote and sponsor research, education and outreach programs aimed at the wise utilization and conservation of the nation’s coastal and marine resources in order to develop and maintain a sustainable economy and a healthy environment.” Sea Grant and other organizations were eager to help revive this area with so much environmental potential.

Even with what was described as a “win-win” project, the obstacles in its path to completion were formidable. A seemingly endless number of factors had to be taken into account, including the well-being of animals that called the area home and concerns from landowners who were adamant that they not lose their mineral rights.

The situation took a drastic turn for the better in March of 2000, however, when United States Fish and Wildlife Services completed its acquisition of the land and new restoration plans were crafted.

The fresh plans called for a total of five channels linking Bahia Grande to two smaller basins to the northeast—La-
guna Larga and Little Laguna Madre—and most importantly, to the Brownsville Ship Channel to the south.

In 2003, with help from local communities, 3,000 black mangrove seedlings, Gulf cord grass, salt grass, and other native wetland species were planted in order to reduce the damaging effects of erosion. Two years later the pilot channel to the Brownsville Ship Channel was dug, and only a few months after being re-flooded, marine organisms had returned.

The changes were dramatic. What had been a salty dustbowl for seventy years, assaulting surrounding communities with vicious dust storms, was once again as nature intended. It was the largest wetlands restoration project ever attempted in the U.S.

With the most difficult work behind them, Texas Sea Grant and Tony Reisinger have taken on the role of educators, reaching out to local communities and teaching researchers to monitor and record progress.

“I served on the county committee comprised of over sixty partners guiding the restoration effort,” Reisinger explained, “and I recently worked with the University of Texas at Brownsville showing them how to set gill nets and seine to determine what fish species were establishing themselves. I also talk to civic organizations just to give them an idea about the scope of the project.”

This monumental effort hasn’t gone unnoticed. Last April, the Bahia Grande Restoration Partnership won the 2008 Texas Environmental Excellence Award from the Texas Commission on Environmental Quality (TCEQ), the state’s top environmental honor. And last November it won the second place Gulf Guardian Award from the Gulf of Mexico Program. Two other national awards, The Department of Interior Cooperative Conservation and Coastal America Partnership Awards, were earned in 2005 and 2006, respectively.

For Reisinger, seeing a project so immense in scale to completion is its own reward.

by Justin Bailey
Photos by Robert Stickney and Carrie Robertson for NOAA

For more information visit Tony Reisinger’s profile page or the Bahia Grande site.

texas-sea-grant.tamu.edu/mas/staff.php?staffpick=treisinger
gulfmex.org/crp2008.html
Texas takes oil spills seriously—so seriously that the Texas General Land Office runs a daily drill, 365 days a year, simulating what would happen if a marine oil spill occurred that day based on conditions in the Gulf.

For the past 13 years, those drills have used highly reliable real-time data collected by a system of moored buoys that dot the Texas coast from Brownsville to the Sabine Pass. Data generated by this system has aided in responding to 20 major oil spills since its implementation in 1995.

The Texas Automated Buoy System (TABS) was created by the Geochemical and Environmental Research Group (GERG). Formed in 1981, GERG is a Center of Excellence in applied geosciences within the College of Geosciences. It has a staff of over 30 scientists, technicians, graduate students and support personnel, and research funding of approximately $3 million annually.

Working with Woods Hole Group in Massachusetts, GERG designed and built the original five buoys within 9 months of receiving the contract from the Texas General Land Office. Since then, the design and capabilities of the buoys have been improved continuously. Nine TABS buoys currently dot the 624-mile Texas coastline in water ranging from 40 to 340 feet deep.

According to GERG director Dr. Norman Guinasso, TABS was the first offshore monitoring system in the Gulf, is still the largest, and is the only system in the country with a primary mission of providing ocean observations for use in oil spill preparedness and response. The system helps predict the movement of spills by transmitting data needed to create computer trajectory models.

“When an oil spill occurs,” Guinasso said, “critical decisions must be made within hours. To be effective, the spill-response management team needs immediate and accurate information about wind and current velocity condi-
tions to quickly evaluate the trajectory, fate, and potential impact of a spill.”

The TABS buoys record water currents every half hour and transmit data to GERG once every two hours. The buoys are made up of four subsystems: the oceanographic and meteorological sensors, the communications link, a solar-powered electrical system, and the buoy flotation structure. All of the assembly, wiring, system upgrades and maintenance on the buoys is done at GERG’s facility in College Station. Guinasso said that other than the basic shape of the hulls, there is little of the TABS buoys today that originally went to sea in 1995.

Guinasso claims that TABS has accomplished its primary mission of providing near-real-time data for tracking oil spills, and the system is now being used in other areas as well. TABS is a member of the Gulf of Mexico Coastal Ocean Observing System which has broader goals that include detecting and predicting climate variability, preserving and restoring healthy marine ecosystems, ensuring human health, and enhancing national security. TABS has also generated an archive of 1.5 million half/hour measurements of velocity data that give scientists and industry a statistically reliable description of seasonal surface currents in the Gulf. Additionally, the buoys have been through eight tropical storms and three hurricanes, collecting valuable data on water temperature and wind and current speeds and direction—before, during and after the storms.

“TABS has accomplished its primary mission of providing near-real-time data for tracking oil spills.”

When asked what the future holds for TABS, Guinasso’s response can be summarized in one word—improvement.

“We would like to improve what we have and add to what we measure—like adding instruments to measure more things,” he said. “We’d like to be able to extend our measurements through the water column to gather more chemical and biological data, put CO2 monitors on our buoys, and add radar to measure waves and surface currents.”

GERG is also working to make TABS a machine-to-machine interoperable system so that it can participate more fully with regional and national ocean observing systems.

Guinasso stressed that TABS would not exist if not for the commitment of the Texas Legislature which provides stable funding through the Texas General Land Office (GLO). He also emphasized the importance of the strong support for the program from the oil and gas industry which pays a 1 1/3 cent-per-barrel fee on crude oil loaded or off-loaded in Texas ports to fund the GLO’s Oil Spill Prevention and Response Program.

“For more information visit the TABS and GERG websites, or Dr. Guinasso’s faculty profile. tabs-os.gerg.tamu.edu
www.gerg.tamu.edu/research/currentresearch.htm
ocean.tamu.edu/profile/NGuinasso

by Carol Trono
College of Geosciences at a Glance

Departments & Programs
Atmospheric Sciences
Geography
Geology & Geophysics
Oceanography
Environmental Programs in Geosciences
Water Management & Hydrological Sciences Program

Research Centers & Institutes
Geochemical & Environmental Research Group (GERG)
GERG is a research center for applied geosciences within the College of Geosciences and a Texas A&M Board of Regents’ Center for Excellence. GERG strives to link academic education and research in the College and the University to the real-world needs of government and industry.

Integrated Ocean Drilling Program (IODP)
IODP is the largest geosciences research program in the world. Science operations are based at the facility on the Texas A&M campus which includes managing operations of the JOIDES Resolution drilling ship, archiving scientific core data and samples, and producing and disseminating data and program publications.

Texas Sea Grant College Program
Texas Sea Grant was one of the first four programs established under the National Sea Grant College Act and is dedicated to the wise use and conservation of valuable marine resources. It supports College and University research and also significant activities in marine education and outreach.

Departmental Degrees
Atmospheric Sciences
BS Meteorology; MS/Ph.D. Atmospheric Sciences

Geography
BS/MS/Ph.D. Geography; BS Spatial Science; BS Geography with GIS option

Geology & Geophysics
BA/BS Geology; BS Geology/Engineering Geology option; BS Geophysics; MS/Ph.D. Geology; MS/Ph.D. Geophysics

Oceanography
MS/Ph.D. Oceanography

Interdisciplinary Degrees
BS Environmental Geosciences; BS Environmental Studies; Master of Geoscience; Master of Water Management; Ph.D. Water Management & Hydrological Sciences

Minors
Earth Sciences; Geography; Geoinformatics; Geology; Geophysics; Meteorology; Oceanography

Certificate Programs
Geographic Information Systems; Remote Sensing; Ocean Observing Systems

Enrollment (OISP Reports)

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<th>Fall 2007</th>
<th>Fall 2008*</th>
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<td>Total Students:</td>
<td>754</td>
<td>836</td>
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<tr>
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<td>Water Mgmt &amp; Hydrological Sciences</td>
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Student Profile (OISP Fall 2008)*
Gender: 516 Male; 320 Female
Ethnicity: Hispanic – 68; Black – 10; Asian – 16; International – 141; American Indian – 5; White – 589; Unknown – 7

College Personnel—345 Total (As of 1 September 2008)
109 Faculty
4 Research Faculty
24 Research Scientists
133 Research Staff
14 Post Doctoral Fellows
61 Administrative Staff

Faculty Profile (As of 1 September 2008)
Academic Appointments:
57 Professors; 26 Associate Professors;
25 Assistant Professors; 1 Lecturer

Research Appointments:
3 Research Associate Professors, 1 Research Professor

Gender:
94 Male; 20 Female

Ethnicity:
4 Hispanic; 2 Black; 12 Asian; 22 Foreign Born

Faculty Honors, Awards, & Recognitions
51 AFS Distinguished Achievement Awards (since est. in 1955)
10 Fulbright Scholars (since 1987 – est. in 1946)
5 Regents Professors (since est. in 1996)
1 Presidential Professor Award (since est. in 2003)
4 Distinguished Professors

7,496 Total Geosciences Graduates
4,852 Bachelor Degrees
1,931 Master Degrees
713 Doctoral Degrees

*12th Day Preliminary Data
We are very proud of and heartily congratulate the many faculty and research scientists in the College who received recognition this past year for their teaching, research, and contributions to science. We highlight those who garnered national or international recognition and one who received the most prestigious faculty award presented by Texas A&M University.

Dr. Gerald North, distinguished professor of atmospheric sciences and oceanography and holder of the Harold J. Haynes Endowed Chair in Geosciences, was named the 2008 recipient of the American Meteorological Society's Jule G. Charney Award at its annual meeting in January. This award is granted to individuals in recognition of highly significant research or development achievement in the atmospheric or hydrologic sciences. North is cited “for groundbreaking research on climate models, atmospheric statistics, and satellite mission development.” North and his research group are interested in climate change and the determination of its origins. For over 25 years his group has studied a hierarchy of simplified models known as Energy Balance Climate Models and collaborated with statisticians and mathematicians on problems of observing system error analysis. His most recent work has been in estimating the strengths of forced response signals in the climate system over the last century.

Dr. Sarah Brooks, assistant professor of atmospheric sciences, was presented a Presidential Early Career Award for Scientists and Engineers (PECASE) by President George W. Bush at an awards ceremony at the White House in November. The PECASE is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. Selected for their innovative research at the frontier of science and technology, PECASE nominees must show exceptional potential to shape the future through intellectual and inspired leadership. Their educational activities must reflect a spirit of community service and may include efforts to help others understand the nature and implications of their research. Dr. Brooks was nominated by the U.S. Department of Agriculture in recognition of her work on assessing the impact of aerosols from agricultural sources on air quality and climate change.

Dr. Sarah Bednarz, associate dean for academic affairs and professor of geography, was named a Texas A&M University Presidential Professor for Teaching Excellence in April. This award, established in 2003 by former President Robert Gates, underscores the importance of teaching at a major research university. It is presented to only two faculty members each year. With a stipend of $25,000, this award is believed to be the highest in monetary value of its type in the nation. Texas A&M President Elsa Murano formally presented the award to Dr. Bednarz at the University’s summer 2008 commencement ceremony. Bednarz will retain the title of “Presidential Professor for Teaching Excellence” for the remainder of her career. Award nominations are made by students, faculty and deans from each of the University’s 10 colleges. The Faculty Senate reviews those and narrows the list, and President Murano makes the final selection.

Dr. Björn Kjerfve, dean of the College of Geosciences and professor of oceanography and geography, was recognized for his 25-year commitment to oceanography in Brazil at the biennial meeting of Associação Brasileira de Oceanografia (Brazilian Association for Oceanography) in May. He was cited for being “an internationally renowned researcher who has supervised numerous Brazilian oceanography students and performed studies to develop oceanography in Brazil.” Kjerfve was a part-time visiting professor at the Universidade Federal Fluminense, Niterói, RJ, Brazil, for 15 years and completed two full-time sabbaticals there. He was also a visiting professor at the Universidade de São Paulo for two years. Kjerfve has supervised and served as the major professor for 13 Brazilian graduate students and supervised 3 Ph.D. “sandwich” students who split their studies between Brazilian and U.S. universities. He has been involved in estuarine and coastal ocean and mangrove wetland research projects in Brazil for 25 years.
New Faculty FY 2008

ATMOSPHERIC SCIENCES

Robert Korty
Assistant Professor
Ph.D., Massachusetts Institute of Technology

INFORMATION

Inci Güneralp
Assistant Professor
Ph.D., University of Illinois at Urbana-Champaign

Brendan Roark
Assistant Professor
Ph.D., University of California, Berkeley

Heath Mills
Assistant Professor
Ph.D., Georgia Institute of Technology

OCEANOGRAPHY

Reuben Rose-Redwood
Assistant Professor
Ph.D., Pennsylvania State University

GEOGRAPHY

Tina Mangieri
Assistant Professor
Ph.D., University of North Carolina at Chapel Hill

Mike Tice
Assistant Professor
Ph.D., Stanford University

Bridget Wade
Assistant Professor
Ph.D., University of Edinburgh

Robert Weiss
Assistant Professor
Ph.D., Westfälische-Wilhelms-University

GEOLOGY & GEOPHYSICS

Inci Güneralp
Assistant Professor
Ph.D., University of Illinois at Urbana-Champaign

Brendan Roark
Assistant Professor
Ph.D., University of California, Berkeley

Reuben Rose-Redwood
Assistant Professor
Ph.D., Pennsylvania State University

Tina Mangieri
Assistant Professor
Ph.D., University of North Carolina at Chapel Hill

Mike Tice
Assistant Professor
Ph.D., Stanford University

Bridget Wade
Assistant Professor
Ph.D., University of Edinburgh

Robert Weiss
Assistant Professor
Ph.D., Westfälische-Wilhelms-University

OCEANOGRAPHY

John Kessler
Assistant Professor
Ph.D., University of California Irvine

Matthew Schmidt
Assistant Professor
Ph.D., University of California, Davis
Administration

DEANS

Björn Kjerfve
Dean
Ph.D., Louisiana State University
979.845.3651

Sarah Bednarz
Associate Dean for Academic Affairs
Ph.D., Texas A&M University
979.845.1579

John W. Nielsen-Gammon,
Acting Executive Associate Dean and Dean for Research
Ph.D., Massachusetts Institute of Technology
979.845.0637

Janice Mills
Assistant Dean for Finance
M.B.A., Texas A&M University
979.845.4234

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