MAKING THE INTERNET
A SAFER PLACE
UTSA Discovery profiles exciting new research and other creative activities at The University of Texas at San Antonio. The inaugural issue was a great success. We hope you will find this second issue illustrates even more dynamic advances in research at UTSA.

UTSA’s strategic plan to become a premier public research institution identifies specific strengths in security, health, energy, environment, sustainability and human and social development. You will find a common thread in these areas running through the projects that are profiled in UTSA Discovery. Our cover story in this issue deals with lapses in cyber security, which can lead to identity theft, compromised emergency responses and even potential terrorist attacks. Computer security, already a significant research field at UTSA, is poised to become even more robust with the new Institute for Cyber Security.

You will also note that the discoveries emerging from these research programs do not remain dormant or “on the shelf.” UTSA has launched an aggressive collaborative program with other components of the University of Texas System for commercializing its intellectual property by taking these discoveries from the laboratory to the marketplace.

We believe you will enjoy this issue of UTSA Discovery. If you would like additional information, please visit the UTSA research Web site at http://vpr.utsa.edu.

Robert Grant, Vice President for Research
Ricardo Romo, President

On the cover
Computers, servers, cell phones, satellites and other communications devices fall prey to cyber criminals. But UTSA’s Institute for Cyber Security is researching ways to protect cyber infrastructure.
Illustration by Stephen Durke

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30 First Edition
UTSA faculty published books covering a variety of topics in 2007–2008. UTSA Discovery takes a look at just a few of them.
By Analisa Nazareno

With research funding approaching $40 million, UTSA has built an extensive commercialization program designed to take inventions from the laboratory and move them into the marketplace, either through licensing to existing companies or through the startup of new companies. The result of that commercialization is the creation of new jobs for San Antonio.

The commercialization program is made up of a mixture of UTSA offices: the South Texas Technology Management office, which is a regional technology transfer office; the Center for Innovation Technology and Entrepreneurship; the Institute for Economic Development; the Institute for Cyber Security; and the Office for Contracts and Industrial Agreements. It is also supported by the San Antonio Technology Accelerator Initiative, a private, not-for-profit Texas corporation that assists researchers, inventors and entrepreneurs in marketing their technologies.

By establishing a state-of-the-art technology transfer office that helps researchers bring their discoveries to the commercial marketplace, UTSA hopes to recruit more top-notch faculty who will help the university achieve its goal of becoming a premier public research university, said Marianne Woods, senior associate vice president for research administration.

“We have moved at a phenomenal rate to get everything up and running,” Woods said. “In part because you can’t rate to get everything up and running,” Woods said. “They’re all interrelated, and they all have to work together,” Woods said.

Invention Management

Last year, UTSA and the University of Texas Health Science Center at San Antonio jointly recruited Kenneth Porter from the University of Colorado to establish STTM, which oversees patenting, marketing and licensing for research discoveries at both institutions, as well as at the University of Texas at Brownsville and the University of Texas-Pan American. STTM is jointly supported by these groups and the University of Texas System.

At Colorado, Porter participated in transforming technology transfer from a single-campus approach to a system-wide, best-practices operation, which led to a dramatic turnaround for the university and continues to push it into the top echelon of U.S. technology transfer offices.

In San Antonio, he has developed a similar office with “just-in-time” patenting practices that emphasize the commercial potential of inventions, economize the STTM patent budget and focus STTM personnel and UTSA inventors on licensing inventions. This has built industry partnerships and has continued to reap rewards—both through royalties and by gaining access to industry facilities and expertise.

The University of Texas at San Antonio Office of the Vice President for Research

Emphasizing cradle-to-grave invention management by skilled licensing personnel, the process that Porter has put into place at STTM moves decision-making from the hands of academic committees to those of licensing associates, who assess inventions using STTM and inventor industry contacts, the U.S. Patent and Trademark Office databases and any other resources available that can shed light on the patent landscape and commercial potential for a particular invention.

Once the uniqueness and commercial viability of an invention have been determined, the associate works with university researchers to apply for a patent. Patents are drafted and filed by a small number of partner intellectual property law firms that work closely with STTM to create strong and defendable patents at reasonable costs. Limiting the number of attorneys builds a close working relationship so the attorneys understand the expectations of the office, become proficient at working with faculty, and, effectively, extend the reach of STTM.

At many of the universities that have set up these practices, the proceeds from the licensing of intellectual property fund the operations of the patenting and licensing offices. And while the university currently funds a part of STTM operations, Porter said, as the regional office grows and demonstrates success, it will move toward total self-funding as well as provide a return to UTSA inventors and UTSA research administration.

“It’s necessary to have a functioning technology transfer office to effectively recruit Tier I faculty,” Porter said. “This is especially true for engineers, because their research is closely aligned with industrial applications.”

Currently, UTSA maintains an active portfolio of more than 30 invention disclosures, including 11 active patents. These are statistics Porter hopes to improve quickly in the next few years. To assist with that goal, he recently announced a $1 million fund that provides researchers with $10,000 to $25,000 grants to be used toward research expenditures that advances inventions to the marketplace.

“In Colorado, it took us three years to implement similar funding; and it was the most important thing we did,” Porter said. “Such funding resulted in licensing opportunities, new startup companies, and follow on investment from venture capitalists and from the legislature.”
Hallam also created a one-day technology entrepreneurship boot camp, designed to help prospective entrepreneurs understand the key elements needed to launch a technology company. The semi-annual program has brought in angel investors to discuss what they look for when investigating whether to support a startup technology company, successful local entrepreneurs to describe the development of their businesses, and faculty from the College of Business, who address the basic elements needed to launch an enterprise. Also established was a cross-college technology startup competition that pairs engineering students who have designed inventions with business students who help them develop business plans. Competitors go before a committee of local investors, who grill students on their knowledge of the technology and the marketplace for such inventions. Winners of this competition then become eligible for a spot in the Roadrunner Incubator.

“When you look at most Tier I universities, many of the students and faculty who develop intellectual property also start new companies based on their intellectual property,” Hallam said. “And that’s what we’re trying to build at UTSA. What we are doing is creating a pipeline of technology and business innovators and entrepreneurs who think about new venture creation, which is responsible for over 60 percent of the new jobs in the country. We’re giving them the skills, the training and the support to do that.”

Tech Transfer in Action

And while the establishment of STTM and CITE is likely to draw more top researchers who can help UTSA reach premier public research university status, Woods said the addition of Ravi Sandhu as the founding executive director and chief scientist for the Institute for Cyber Security also has great potential to contribute to this effort. Sandhu is the principal investigator overseeing a $3.5 million grant from the Texas Emerging Technology Fund, which provides funding for startup and growth-stage technology companies, to develop secure cyber systems that can be used by both government and commerce to protect daily operations and transactions.

Leaders in the San Antonio technology development and investment community say they are excited about the technology transfer activities at UTSA, and are particularly excited about the addition of Sandhu, who holds 10 U.S. security technology patents, has published more than 170 technical papers on cyber security and is co-founder and chief scientist of Tricipher, a company that provides authentication technology for banking and health care service providers.

“Here’s an industry leader who has world-renowned research credentials, who also has knowledge on how to commercialize what he invents,” said James Poage, president and CEO of the San Antonio Technology Accelerator Initiative. “What he brings as a role model is the training and the support to do that.”

Launching New Technologies

While many university researchers license their discoveries to established companies, some form their own businesses or work in conjunction with entrepreneurs who will then start a business centered on the newly developed technologies.

That’s where Cori Hallam, CITE and the Roadrunner Incubator come in. Hallam joined UTSA in 2006 and quickly set up CITE as a joint venture between the College of Business and the College of Engineering. He designed CITE to cross-train engineering and business students, support enterprise failing businesses, and provide business and technology training for the larger San Antonio entrepreneurial community.

Toward the end of his first academic year, Hallam launched the Roadrunner Incubator. One of its first projects was to provide laboratory space and support to a local startup company that is working with cutting-edge radio frequency technology for cancer treatments. Other incubator participants include a student team working on an Internet book-trading company and another student team working on a baby-monitoring device that is intended to prevent Sudden Infant Death Syndrome.

Hallam holds a doctorate from Massachusetts Institute of Technology in technology management and policy. Prior to joining UTSA, he managed programs for aerospace government contractors Aurora Flight Services and Northrop Grumman Integrated Systems.

News

STTM Licensing Process

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Remaining to be done in the Lower Ninth Ward: There’s years of work being done in the Lower Ninth Ward, said the director of the project, which stretched over two weeks in March.

“One day we went to six families’ houses. It was really amazing to hear their stories,” de la Fuente said. “Then we got to sit down and explain how much money and energy they’ll be saving. We figured out that it is $500 in a five-year span.”

Development. A long-term goal of the center is to make this historic district of the nation’s first carbon-neutral community by 2030. A carbon-neutral community balances the release of greenhouse gases, like carbon dioxide, into the air with strong conservation standards designed to reduce the production of these gases.

Dupont, whose recent work has focused on merging concepts of sustainability and historic preservation, was one of a dozen organizers for the project, which stretched over two weeks in March.

For Joshua de la Fuente, a senior interior design major, the task that made the biggest impression was working on Green Light New Orleans, where volunteers replaced incandescent bulbs with compact fluorescent lamps in homes in the area.

“One day we went to six families’ houses. It was really amazing to hear their stories,” de la Fuente said. “Then we got to sit down and explain how much money and energy they’ll be saving. We figured out that it is $500 in a five-year span.”

Dupont is already making plans for UTSA to have a bigger presence at next year’s Historic Green event.

“It’s all about being sustainable, but also being respectful of the historic context and seeing where those two things have come in. That’s what will translate UTSA to a Tier I university.”

Abstracts written by Lynn Gosnell

Restoring Homes, Sustaining Hope

P

arts of New Orleans’ hurricane-ravaged Lower Ninth Ward were recently restored, courtesy of a volunteer effort called Historic Green. Eight students from the College of Architecture, along with faculty members Shelley Roff and William Dupont, were among the 350 volunteers nationwide who dedicated their spring break to this effort.

The purpose of the Historic Green event was to define, practice and promote “sustainable preservation” in the historic Holy Cross neighborhood of the Lower Ninth Ward. The area features shotgun-style houses, Creole cottages and bungalows. Although many of the homes survived hurricanes Katrina and Rita, the area was left in tremendous need of cleaning, repair and restoration.

Neighborhood residents, volunteer professionals and students from all over the country worked together to integrate sustainable practices into specific historic preservation projects. The UTSA crew participated in demolition and salvage work on the site of a future neighborhood center, cleaned playgrounds and constructed “rain gardens,” which are landscapes designed to soak up storm water runoff, improving drainage and flood control.

In 2007, the Holy Cross Neighborhood Association formed the Lower Ninth Ward Center for Sustainable Engagement and LEARN MORE

For more on CITE, see story on page 8. To read more on Sandhu, see “Safety ‘Net’ on page 16.
PARTNERS IN INNOVATION
Each semester, engineering students pair up with business students to create new technology ventures with the hopes of securing a patent. It's part of UTSA's New Technology Venture Startup Competition, sponsored by the Center for Innovation and Technology Entrepreneurship (CITE).

“The goal is to select the projects which have the most business viability, create the business development plan and secure patents on these projects,” said CITE Director Cory Hallam. “This gives students hands-on experience as early-stage entrepreneurs, brings in additional revenue for the UT System through technology licensing and lends prestige to the university’s efforts in entrepreneurship.”

In May, 33 students participated in the contest. The winning team, Livelynx Enterprises, developed a wearable glove-based cursor control device called The Palma. Other projects included a low-cost biodiesel manufacturing system, a telemetry system for model rockets, an athletic swimming monitoring device, a wireless electronic coaster for restaurants that would notify servers when a customer’s drink needed refilling, and oil and gas cleaning equipment.

“If you look at it, most universities train their students to work for other people, but most of the wealth creation and the new job creation in the country is by the entrepreneurs—over 60 percent of the new jobs in the country are small businesses or entrepreneurial businesses,” Hallam said. “One of our goals for the center is to help unlock the entrepreneur in both faculty and students through education and experiential activities.”

Educator directs innovative South African literacy program
The paperback booklet with bright orange trim is sized just right for a child’s hands. On the cover, a young boy wearing a backpack walks along a road as the sun comes up over nearby hills. Just How Long, How Far? tells the tale of Tshego, a young black South African who lives in a village with his grandparents, but wants very badly to visit his parents’ home in far-away Johannesburg.

The book, titled Ke bokilele ke bokae. Go bokgakala go bokae in the Setswana language, is one of 1,376 original storybooks created from a unique partnership called the Ithuba Writing Project. These books, the first to be created in South Africa’s nine official indigenous languages, will be used as the basis for lessons in language, math and natural sciences.

Since 2005, the College of Education and Human Development has received $5 million in grant monies from the United States Agency for International Development for the project, which is directed by Miry Sailors, associate professor in the Department of Interdisciplinary Learning and Teaching. Project collaborators include the Republic of South Africa Department of Education, the University of Pretoria, the University of Limpopo and two South African non-governmental organizations.

Ithuba, which means “opportunity” in IsiZulu, another indigenous language, is a multilayered effort to promote literacy and learning among South African students and professional development among their teachers. More than 120 teachers have gone through three book-development workshops to date. At these workshops, teachers learn to write high-interest stories for children based on their own lived experiences, said Sailors. The workshops will result in the production and distribution of more than 2 million books in South Africa by next year. The project is part of the $600 million Africa Education Initiative to increase access to quality education in 30 sub-Saharan countries through scholarships, textbooks and teacher training programs.

Sailors, who holds a Ph.D. in curriculum and instruction and who is also a reading specialist, served as an internal evaluator on a multimillion-dollar educational reform effort in South Africa before taking on this current project. As part of her earlier work, she documented the scant test resources available in classrooms to serve the literacy development of children.

STUDY ON SAN ANTONIO WOMEN REVEALS “GOOD-NEWS, BAD-NEWS” TRENDS
The first-ever study of challenges faced by women and children in the San Antonio area was recently completed by Juanita Firestone, professor of sociology in the Department of Criminal Justice, and Richard Harris, professor of sociology in the Department of Social Work.

The Report on the Status of Women and Girls in the San Antonio Metropolitan Area was funded with a $68,000 grant from the Mayor’s Commission on the Status of Women. A preliminary report was given to the commission in late May.

“What we wanted Dr. Firestone to do was to take a snapshot of how women are doing in San Antonio,” said Sonia Rodriguez, a local attorney and chair of the commission. Rodriguez said the commission will use Firestone’s Findings as a basis for proposals to take to the city “to encourage funding for projects and programs that will elevate the status of women in San Antonio.”

Firestone and student researchers analyzed data in seven areas: demographics, economics and employment, education and training, family and community, politics and voting, health, and crime and safety.

In addition to providing a foundation for action, Firestone’s data will be released to the public so that other researchers can use it to develop grants, projects and other initiatives. A preliminary report will be released this summer.

“Firestone and the researchers discovered could be summed up as ‘good-news, bad-news’ trends. For example, Firestone sees a ‘clear increase of women in managerial and professional jobs,’” but these jobs tend to be in lower-status, lower-paying occupations. In sales and clerical occupations, 72 percent of the jobs are held by women; in sales, women tend to hold positions dealing with lower-end items instead of high-dollar merchandise such as cars or major equipment.

Also, women are becoming more politically active, she found, but they tend to hold volunteer positions. They’re also more likely to hold positions at the municipal level rather than the state or national level. Still, said Firestone, “they’re gaining political experience and knowledge.”

In education, women and men in San Antonio are almost equally represented in a number of categories—those lacking high school degrees (women, 38.5 percent; men, 40.3 percent), those with bachelor’s degrees (women, 10.7 percent; men, 10.6 percent) and those holding graduate degrees (women, 5.2 percent; men, 5.9 percent). Yet despite these parallels, men on average still earn more than women.

If you elevate the status of women, you also elevate the status of families in San Antonio,” Rodriguez said.
THE TOOLS OF THE TRADE

Financial Studies Center to integrate teaching, research and outreach

UTSA junior Sergio Silva is bearish about his future as an investment manager—even as the markets he follows reel and churn with the latest economic news. Silva was one of just 10 students in finance professor Yuiman Tse’s spring course, FIN 4953: Trading and Analysis of Financial Instruments.

“The lab introduces students to the atmosphere and environment of trading,” Tse said. “Financial training and analysis using tools such as Bloomberg are quickly becoming a requirement for students pursuing careers in financial institutions.”

Tse’s students added to their professional knowledge through certification in the use of the lab’s three Bloomberg terminals.

“There is a wealth of information in the Bloomberg system,” said Silva, who founded the UTSA Investment Society in 2007. “The certification process teaches you how to maximize its use.”

Providing the means to complete the Bloomberg Certification Program is yet another milestone on the path toward launching a comprehensive Financial Studies Center in the College of Business. As envisioned by Dean Lynda de la Viña, the center will be “student-oriented, faculty-oriented and community-oriented. It fits for all three of our stakeholders.” Construction has begun on the center, which will be located in the Business Building’s first floor.

A prominent feature planned for the new center will be a larger and fully functioning trading lab that will be used for both student education and faculty research.

“Our ultimate hope is that we’ll have the students run their own fund—a real dollar fund, not simulated—much like is done at business schools across the country,” de la Viña said.

Another key component of the center is community outreach. For example, the center will house UTSA’s Latino Financial Issues Program, a yearlong course open to undergraduate and graduate students that promotes financial literacy and entrepreneurship in Latino communities while teaching students about personal finance. The program integrates classroom instruction, service learning and paid summer internships in community economic development organizations.

“Students leave the LEF program with a strong understanding of how their financial decisions can affect their future,” said Lisa Montoya, program faculty director and associate dean for undergraduate studies in the College of Business.

Not only have UTSA students benefited from the program, but also to date, more than 60 local high school students have received training in financial planning for college. The center will also be promoted as an executive education resource to the South Texas business community, offering customized programs on topics ranging from capital budgeting to portfolio optimization.

The timing is right for the creation of a Financial Studies Center at UTSA, de la Viña said. According to a recent study by the Finance San Antonio Ad Hoc Committee, the finance industry registers an economic impact of $20.5 billion in San Antonio, the largest of any local industry.

“San Antonio is slowly becoming a real financial center in Texas . . . so I believe we have to have students trained in this area,” said de la Viña.

Our ultimate hope is that we’ll have the students run their own fund—a real dollar fund, not simulated . . .

UTSA hosts energy summit, announces new institute

UTSA’s first North American Energy Summit, held in May, brought together experts from the United States, Mexico and Canada to discuss the future of energy on the continent.

“Energy is becoming a challenge for our society,” said Stathis Michaelides, chair of the Department of Mechanical Engineering and conference organizer. “We have to do something about increasing the amount of energy we produce and also using the energy we have in more thoughtful ways.”

The two-day conference, which featured 31 speakers and 128 participants, showcased expertise from academia, business, industry and government. Panel topics included the short-term future of energy, global environmental change, energy production, energy efficiency, the path to sustainability, emerging technologies, and social, policy and educational challenges.

The conference served as a prototype event for UTSA’s planned Institute for Conventional, Alternative and Renewable Energy, a consortium of industry, government and academic representatives that will focus on energy practice and policy.

During the summit’s plenary session, UTSA President Ricardo Romo stressed the importance of collaboration to find solutions to “the impending energy crisis.”

“Energy efficiency is of critical importance and will require new solutions and major investment,” he said. “Additionally, we need to pay more attention to cleaner, renewable and sustainable energy sources . . . One cannot just address energy short¬age through technological breakthroughs, because technology, policy, education and business are closely tied together in the energy arena.

“We want to convey to you that we are ready to step up and commit our efforts to help address the challenges we face in the energy industry.”

PSYCHOLOGIST TO COLLABORATE ON STUDY EXAMINING PTSD IN VETERANS

A UTSA research psychologist is participating in a $33 million study to investigate the detection, prevention and treatment of combat-related post-traumatic stress disorder.

Deborah Mangold, assistant professor in the Department of Psychology, will focus on the neurobiology of stress as part of the five-year project funded by the Department of Defense. The study involves physicians and researchers from universities around the country as well as the military and the Department of Veterans’ Affairs.

“My interest in this grant is examining how changes in the brain’s response to stress occur over time following exposure to traumatic events,” Mangold said. She will partner with the genomics team of the University of Texas Health Science Center at San Antonio, headed by psychiatrist Michael Escamilla, to help identify biological markers that confer a risk for PTSD.

Mangold’s graduate training was in clinical psychology and biopsychology, and included postdoctoral training in neuropsychology. Her ongoing program of research focuses on the role of psychiatric disorders and personality factors in the brain’s response to stress. For this project, she will work with soldiers at military bases in the San Antonio area.

“One of the purposes of looking at biological markers would be that we would ultimately be able to identify people at greatest risk,” Mangold said. “This could lead to the development of potential pharmaceutical interventions that might be targeted at these specific brain systems.”

In addition to researching a genomic component, the consortium will evaluate various methods for assessing the disorder as well as treatments for PTSD, using neuro-imaging to document how treatment methods affect the brain. The multi-institutional project is led by Alan L. Peterson, professor in the department of psychiatry at the UT Health Science Center.

It is estimated that PTSD occurs in 12 to 20 out of 100 veterans of the war in Iraq and between six and 15 out of 100 veterans of service in Afghanistan, according to the Department of Veteran Affairs’ National Center for PTSD.
DISCOVERY

ABSTRACTS

Lavelda Bradley and David Pillow, associate professor of psychology, are investigating why some Attention-Deficit Hyperactivity Disorder (ADHD) patients stop taking their medication. ADHD is a neurodevelopmental disorder that affects a person’s ability to pay attention, control impulsive behaviors, and hold their focus. This can lead to difficulties in school, work, and personal relationships. Bradley and Pillow have noted that some ADHD patients, despite initial improvement, decide to stop taking their medications. They are using psychology, specifically Ajzen’s theory of planned behavior, to understand the reasons behind this behavior.

For the pilot study, Bradley and Pillow interviewed eight UTSA undergraduates who had a history of ADHD and who were not taking stimulant medication on a regular basis. Next, an online survey was administered to 82 students in an introductory psychology course at UTSA that addressed their experiences with ADHD as well as their beliefs and perceptions. Pillow and Bradley analyzed the data using psychologist Icek Ajzen’s theory of planned behavior, which seeks to explain the relationship between attitudes, intentions, control, and actual behavior.

For the full study, Bradley and Pillow administered to 82 students in an introductory psychology course at UTSA that addressed their experiences with ADHD as well as their beliefs and perceptions. The study examines why patients stop taking medication that has been reported to be effective.

The researchers found that a lot of information has been published about ADHD, including the efficacy of stimulant medications (73 percent of patients see improvement), as well as the long-average regimen lasts before a patient stops taking this medicine (34 months). But few studies examine why patients stop taking medicine that has been reported to be effective.

For the pilot study, Bradley and Pillow interviewed eight UTSA undergraduates who had a history of ADHD and who were not taking stimulant medication on a regular basis. Next, an online survey was administered to 82 students in an introductory psychology course at UTSA that addressed their experiences with ADHD as well as their beliefs and perceptions. Pillow and Bradley analyzed the data using psychologist Icek Ajzen’s theory of planned behavior, which seeks to explain the relationship between attitudes, intentions, control, and actual behavior.

Bradley’s data set is extremely complex, Pillow said, exploring 50 beliefs as they relate to the expression of general attitudes. “If students with ADHD have positive attitudes toward using stimulant medications, then [we would predict that] they should adhere to their medication regimen,” Pillow explained. “Of course, there will be exceptions to this rule, and the theory points to two important exceptions: family or friends feel that they should not use medication, and/or the individual does not perceive that he/she can maintain the regimen given lack of insurance or other barriers,” he said.

Recently, Bradley presented her findings, “Applying the Theory of Planned Behavior to ADHD Medication Intention,” to two research symposia: the UTSA Honors College Undergraduate Research Symposium and the National Conference on Undergraduate Research symposia: the UTSA Honors College Undergraduate Research Symposium. The research will provide acoustical and behavioral data that will help guide future studies of sound perception in natural habitats, Ratnam said.

The long-term goal is to develop and package wireless microphones, so that scientists can study specific environments remotely, allowing more efficient and less intrusive monitoring over time of animal populations and how they are affected by changing environmental conditions.

At his field site at the Cibolo Nature Center in Boerne, Texas, northwest of San Antonio, Ratnam has recorded and analyzed hours of melodious chorusing from Gulf Coast toads, cricket frogs and leopard frogs. The “Cocktail Party Effect” is one of the most famous phenomena in auditory research. In a crowded, noisy setting, humans are able to pick out and pay attention to one single voice. How does the brain accomplish this neurological feat? It turns out that frogs and toads are also experts at this party trick. When the sun sets on any spring or summer evening, males begin calling to find mates and to defend their territories. The calls enable females to find mates of their own species. The chorusing goes on amid a variety of amphibious calls. Rama Ratnam, assistant professor of neurobiology, is developing technologies to measure acoustic communication and sound perception among anurans (frogs and toads). Along with research collaborators Douglas Jones, professor of engineering at the University of Illinois, Ratnam is using a sophisticated signal analysis technique called beamforming to create space-time maps of chorusing anurans. Space-time maps chart the spatial locations of individual subjects over time. Acoustic beamforming has been put to use in hearing aids, enabling humans with hearing loss to extract some sounds and block out others.

The research will provide acoustical and behavioral data that will help guide future studies of sound perception in natural habitats, Ratnam said.

GOVERNOR NAMES ESCHBACH TEXAS STATE DEMOGRApher

Karl Eschbach, UTSA associate professor of demography, was named state demographer by Gov. Rick Perry. Eschbach will serve as director of the Texas State Data Center. The center, which is housed at UTSA, distributes census information for the state, as well as Texas population estimates and projections, and information from federal, state and other government sources.

Eschbach replaces Steve Murdock, who was appointed director of the census at the Department of Commerce last year. “UTSA is proud to be the home of the Texas state demographer, and I wish Karl continued success,” said UTSA President Ricardo Romo. “By selecting Dr. Eschbach, the governor chose an outstanding professional and brilliant researcher and also has provided educational opportunities for graduate students in our applied demography doctoral degree program.”

Eschbach is the interim director of the UTSA Institute for Demographic and Socioeconomic Research. He is a past board member of the Texas Economic and Demographic Association and past caucus chair of the American Public Health Association.

“This is a great honor and I look forward to serving the state of Texas and working with the extraordinary staff that has assembled at UTSA,” Eschbach said. “Because the state is growing and in the midst of dramatic demographic transformation, I look forward to the opportunity to provide access to the highest quality information and analysis to business and civic leaders so they can respond to the implications of these changes.”

State Sen. Leticia Van de Putte said the move will benefit UTSA, the city and the state. “San Antonio provides the state demographer a superb location for collecting data that is critical for forging good public policy,” she said. “Because San Antonio is a predominately Hispanic city, our demographic profile is reflective of the trends we are seeing in countless cities across America.”

Eschbach is a member of the Population Association of America, Southwest Social Science Association and Gerontological Society of America. He also is a member and volunteer with the Galveston Historical Foundation. He received a bachelor’s degree from the University of Pennsylvania, a master’s degree and doctorate in sociology from Harvard University, and a postdoctoral fellowship in demography from the University of Wisconsin.

Froggie Went a Courtin’

THE “COCKTAIL PARTY EFFECT” is one of the most famous phenomena in auditory research. In a crowded, noisy setting, humans are able to pick out and pay attention to one single voice. How does the brain accomplish this neurological feat? It turns out that frogs and toads are also experts at this party trick. When the sun sets on any spring or summer evening, males begin calling to find mates and to defend their territories. The calls enable females to find mates of their own species. The chorusing goes on amid a variety of amphibious calls. Rama Ratnam, assistant professor of neurobiology, is developing technologies to measure acoustic communication and sound perception among anurans (frogs and toads). Along with research collaborators Douglas Jones, professor of engineering at the University of Illinois, Ratnam is using a sophisticated signal analysis technique called beamforming to create space-time maps of chorusing anurans. Space-time maps chart the spatial locations of individual subjects over time. Acoustic beamforming has been put to use in hearing aids, enabling humans with hearing loss to extract some sounds and block out others.

The research will provide acoustical and behavioral data that will help guide future studies of sound perception in natural habitats, Ratnam said.

At his field site at the Cibolo Nature Center in Boerne, Texas, northwest of San Antonio, Ratnam has recorded and analyzed hours of melodious chorusing from Gulf Coast toads, cricket frogs and leopard frogs. The “Cocktail Party Effect” is one of the most famous phenomena in auditory research. In a crowded, noisy setting, humans are able to pick out and pay attention to one single voice. How does the brain accomplish this neurological feat? It turns out that frogs and toads are also experts at this party trick. When the sun sets on any spring or summer evening, males begin calling to find mates and to defend their territories. The calls enable females to find mates of their own species. The chorusing goes on amid a variety of amphibious calls. Rama Ratnam, assistant professor of neurobiology, is developing technologies to measure acoustic communication and sound perception among anurans (frogs and toads). Along with research collaborators Douglas Jones, professor of engineering at the University of Illinois, Ratnam is using a sophisticated signal analysis technique called beamforming to create space-time maps of chorusing anurans. Space-time maps chart the spatial locations of individual subjects over time. Acoustic beamforming has been put to use in hearing aids, enabling humans with hearing loss to extract some sounds and block out others.

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As the problem worsened, she could sing for only 10 minutes before having to stop. Her disorder was a result of a partial paralysis of one of her vocal cords, so she unknowingly compensated by overusing the other. The condition eventually required surgery. “I couldn’t speak for three weeks,” Gray says. “I wore a sign around my neck that said, ‘Recent vocal cord surgery. I cannot talk,’ so that people wouldn’t think I was rude.”

Gray is not alone in suffering a voice box injury. According to a 1997 study by the National Center for Voice and Speech, teachers in the United States make up 4.2 percent of the workforce, but account for 19.6 percent of patients seeking medical help for voice problems.

These statistics are one reason why John Nix, UTSA associate professor of voice, voice pedagogy and research, organized an international conference at UTSA on occupational voice injuries in 2007. It brought together about 50 of the world’s leading vocal researchers to discuss their findings. Funding for the conference was provided by the National Institutes of Health.

UTSA will again provide a forum for this issue when voice researchers, including doctors, voice scientists, music teachers, choral directors and speech pathologists, convene in January 2009 to share their latest information at the 4th International Conference on the Physiology and Acoustics of Singing. The economic impact of voice injuries in teachers is significant. Because voice-related difficulties result in lost workdays, payments to substitute teachers, voice therapy/rehabilitation fees, early retirements and job retraining expenses, the estimated cost is $2.5 billion annually, according to the study, “How Much Do Teachers Talk? Do They Ever Get A Break?”

Voice problems arise because teachers must speak frequently and often loudly, which puts them at risk, says Nix. Like Gray, some may begin to overuse one vocal cord to compensate for weakness in the other. Others develop pathologies on the vocal cords, such as cysts or polyps, which are like fluid-filled blisters. The result is fatigue, hoarseness and loss of one’s voice. Those who shout or scream can even develop vocal cord hemorrhages. Worst-case scenarios may require surgery.

“In the case of a cyst or a vocal cord polyp, there’s usually a period of being on anti-inflammatory drugs,” Nix says. “You would be on complete vocal rest for 10 days with absolutely no talking. After the rest period, you would begin regular voice therapy sessions and begin slowly building your voice back up by only adding 5 to 10 minutes of voicing per day.”

“It’s not career ending, but it can be devastating to someone whose occupation requires the expressive, healthy function of his or her voice.”

While some with polyps might require surgery, a nodule, which is like a callous on the vocal cords, can usually be resolved by changing a person’s habits, Nix says.

Actors, singers, lawyers, broadcasters, telemarketers, counselors, ministers and politicians also are at risk of voice injury, Nix says. For those who require treatment, vocal therapy is recommended.

“Many types of vocal tasks during a day involve making sounds with your mouth partially or totally closed, like humming, or vocalizing into a straw,” he says. “Therapy can reduce compensatory tensions and can also modify the way your vocal cords function, creating a more efficient production.”

Bad habits need to be identified, Nix adds, to prevent voice injury in the first place or, if injury has already occurred, to prevent further harm.

“Speaking too loudly or too low is also a risk factor,” he says. “A good therapist can help a person find an appropriate pitch to speak at, or help a person who is overly aggressive with words that start with vowels to use words like ‘happy Halloween’ or ‘hello’ to get them to learn to start speaking out more easily.”

Nix explains that forcefully pronouncing words that begin with vowels is the result of taking a breath of air and holding it back with the vocal cords closed too firmly, irritating them when air is expelled.

“It’s about behavior modification,” he adds. “Surgery is usually the last option, but what good is surgery if you haven’t changed the bad habits that got the person there in the first place?”

It is also important to identify possible risk factors, including how much and how loudly a person talks, the pitch range being used and even exposure to pollutants, such as dust and fumes. Current research involves examining the causes of voice injury and identifying at-risk populations, as well as developing devices that monitor voice use.

“There is also research looking at whether it is beneficial to give someone an amplifier like an aeroform device that monitors voice use,” he says. “Therapy can reduce compensatory tensions and can also modify the way your vocal cords function, keeping them moist and less prone to irritation.”

“Prior to John’s arrival, there were limited resources for the ‘sick singer’ when it came to vocal pedagogy,” Simpson says. He praises Nix’s expertise in working with singers who have vocal cord pathology.

Simpson advocates what he calls good vocal hygiene so that patients keep their voices in peak condition. For example, drinking six to eight glasses of water a day helps produce a thin mucus that coats the vocal cords, keeping them moist and less prone to irritation. Not smoking, treating acid reflux and getting proper sleep also help.

When Gray began to experience severe hoarseness, she used a harmonica to get her students’ attention so as not to raise her voice. When her condition worsened, she sought the help of Simpson, who eventually removed a polyp from her vocal cord.

After surgery, the music teacher worked with Nix, who taught her to speak in a higher pitch and to form words differently. He also assisted her in what she calls voice aerobics, which involves doing vocal exercises to stretch your vocal cords,” she says. Nix also instructs choral students. Because they are studying to become singing teachers, the professor prepares them to be able to assist individuals with voice problems.

“Choral directors are voice experts for the vast majority of the population. They are on the front lines, so they need to have accurate information,” he says. “We discuss what healthy voice production is, and what a voice teacher can do to help versus knowing when there is a problem beyond their expertise and to refer them to a specialist.”

To view abstracts or videos from the 2007 Occupational Voice Conference, visit http://projects.dlc.utsa.edu/OVC/index.html.

SYMPTOMS OF VOICE INJURIES

Sudden change in volume or quality of sound Persistent roughness in sound of voice Loss of range when singing Breathing and cracking of voice

Source: John Nix, UTSA associate professor of voice, voice pedagogy and research, and Blake Simpson, UT Health Science Center, Department of Otolaryngology
It’s no secret that organized crime is flourishing on the Internet. Cyber thieves pluck bank account, credit card and identity information by hacking into vulnerable systems or using fake Web sites and e-mails to trick users into divulging sensitive information. What many people don’t realize is that their own computer could be used in a cyber attack against other systems or even critical infrastructure—and they wouldn’t even know it.

The detection of botnets—networks of hijacked, or “zombie,” computers used to carry out crimes while making them harder to source—is a significant research area for UTSA’s newly created Institute for Cyber Security (ICS). Under the direction of world-renowned expert Ravi Sandhu, ICS has as its mission the protection of the cyber infrastructure through research and its commercial applications, as well as through education and service.

“We’re not just commercializing what we have,” Sandhu says. “We have to develop some cutting-edge stuff. It has to be something new.”

UTSA last year won a competitive $3.5 million grant from the Texas Emerging Technology Fund to create the institute and hire as its founding executive director Sandhu, who left the information security faculty at George Mason University to come to UTSA. He also received a $1 million grant from the University of Texas System. The institute, which involves the departments of computer science, electrical and computer engineering, and information systems and technology management, has a half-dozen full-time-equivalent researchers. Reaching his goal of 10 to 15 full-time-equivalent researchers would make UTSA’s cyber security program one of the biggest in the country among academic institutions, Sandhu says.

Securing the funding to launch the institute and attract someone of Sandhu’s caliber was a university- and community-wide effort that underscores the level of local support for the research and the problem-solving it will spawn, says Robert Gracy, UTSA’s vice president for research.

“It really gives us a giant leap forward,” he says.

The establishment of the institute at UTSA is a wise move for the university and for San Antonio because there is not yet a national leader in the academic field, Sandhu says. He adds that UTSA’s commitment to commercialization sets it apart from other cyber security programs because it moves beyond publishing and peer review by demanding real-world performance.

“It think our focus on commercialization is unique,” he says. “The ultimate test of a security technology is if it succeeds in the market. The ideas can be pretty, they can be elegant, they can be deep, but if they don’t see some practical application, they are just an ivory tower. … Your research is a failure if not applied in the real world.”

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BY

KATE HUNGER
To that end, research at ICS will fall into two tracks: academic and startup. The academic track will pursue traditional, fundamental research and will take years—perhaps up to a decade—for some of its projects to realize their commercial potential. The startup track, meanwhile, will target rapid commercialization prospects with a much shorter timeframe of two to three years. Ravi Sandhu, inventor, technology executive, and entrepreneur, will lead the commercialization effort.

Even with its lab and offices still under construction last spring at the Science Building and the Biotechnology, Sciences and Engineering Building, respectively, the institute had already won its first grant, to study assured information sharing for the Air Force Office of Scientific Research. The project is a collaboration with five other universities: the University of Maryland, Baltimore County; University of Illinois at Urbana-Champaign; University of Michigan; Purdue University; and the University of Texas at Dallas.

Information sharing is a key piece of the cyber security puzzle. After Sept. 11, it became clear that U.S. intelligence agencies were not communicating effectively with each other, they made efforts to shift away from a need-to-know policy to a more open approach. However, shared information still must be protected, Sandhu says. UTSA’s share of the five-year project is $1 million, and the institute will use it to study the security aspect of assured information sharing as well as specific Department of Defense applications.

In all areas, ICS researchers will aim to answer two core questions. First, what does it mean for a system to be secure? And second, how do we secure it? In addition to the detection of botnets, ICS’s basic, foundational research into secure systems and how systems get attacked would have applications in a number of areas, including social networking sites such as MySpace and Facebook, and multimedia, Sandhu says.

Researchers also will study new developments in Internet technology and ongoing efforts to essentially redesign the way the Web functions. For example, the Semantic Web, which has been in development for several years, would allow Web sites to communicate and share information. If realized, this would have significant security implications. Not only is personal and financial information vulnerable in today’s increasingly connected world, but the nation itself is also a target. “They are looking for knowledge, information, secrets,” Sandhu says of other countries seeking an understanding of U.S. cyber space. Territorial attacks are one concern, he explains, but cyber “information warfare” is also a threat.

Sandhu is excited by the opportunity to lead a well-funded and focused research center in a field that is essentially a frontier ripe with challenges. Faster computers and advances in technology create new challenges in maintaining security, and therefore more opportunities for cyber criminals. In addition, innovations that appeal to users because of their open nature, such as social-networking sites, give criminals avenues to make an attack. And companies that cut costs by putting more and more of their business online are creating even more targets.

“Anything that goes online can be attacked,” Sandhu says.

LEARNING FROM THE PAST

Even though it is a young field—consider the recent arrival, in historical terms, of the personal computer and, even more recently, the Internet—cyber security already has moved beyond its original focus on protecting business enterprises. Security may now also involve contending with the sometimes conflicting interests of a business, such as a bank, and its customers.

Despite the rapid evolution of computer technology, it’s important to understand the history of cyber security. Sandhu stresses, “Today’s students are woefully inadequately informed about the history of computer security.” Sandhu says. “If you can’t learn from lessons past, you are going to repeat mistakes. Cyber security is an immature field. The state of the security today is pretty awful.”

For cyber security researchers, the only constant is change. No longer comprising mostly hackers intent on showing off their skills, the world of cyber crime is now highly organized, with its own economy, supply chain and outsourcing. Sandhu says. Bank accounts and credit card numbers are sold online, as are directions on how to hack sites.

And yet, many computer users are unaware of the implications of this increasingly interconnected world. A recent survey of 2,249 consumers by the National Cyber Security Alliance found that 71 percent of respondents had never heard the term “botnet.” The stealthy manner in which botnets operate means that users aren’t aware their computer has been compromised, Sandhu explains.

Online fraud is common, too. One form of cyber crime—phishing—has grown to many thousands of reported cases each month, according to the Anti-Phishing Working Group (APWG). Phishing is carried out by using “spoofed” e-mails or Web sites, often of known and trusted brands, to persuade users to share their account information. Another form of phishing is to infect computers with crimeware that intercepts passwords or other sensitive information. In December 2007, APWG received reports of 23,328 unique phishing sites and tallied 144 brands hijacked by phishing sites during that month.

“The stuff is amazingly authentic-looking now,” says Peter Cassidy, deputy general of APWG.

Phishers are essentially working a numbers game, he says, because eventually, they will reach someone who is too tired or distracted to recognize the trap they are falling into.

A TRADITION OF SERVICE

Although the ICS is new, the field of cyber security at UTSA is not. The university’s Center for Infrastructure Assurance and Security (CIAS), established in 2001, has been working to raise awareness of cyber threats to critical infrastructure, including power grids, 911 service and transportation. The center has helped communities figure out how secure—or insecure—their cyber assets are, including vulnerable utility and emergency response systems. CIAS continues to develop cyber security training courses, funded by the Department of Homeland Security, that, once piloted and approved, will be available to communities nationwide.

Among the courses offered through CIAS are a basic security threat awareness course and a more technical voice and data security course for networking staffs. CIAS also has created a road map to prove up to an optimized stage, where a community is constantly working to improve its security and regularly tests it.

CIAS is now part of the institute. Prior to Sandhu’s arrival, “there hadn’t been anyone who was trying to bring the security researchers together,” says Greg B. White, CIAS director and associate professor of computer science. “What we have done in the CIAS is start to make a name for UTSA.” But the approach hasn’t been via the traditional route of research and publishing. “By going operational, we’ve started to address immediate needs.”

Research has been setting the message out that terrorist attacks can happen at the click of a mouse, through manipulating key infrastructure systems via computers to create the same result as a traditional, physical attack.

“All they are there to do is cause chaos to try to implement fear in our day-to-day lives,” says Natalie Granado, assistant director of training for CIAS.

The cost of a cyber terrorist attack would be small in comparison to that caused by weapons of mass destruction, she says, but the results would be dramatic. “With cyber, it doesn’t have to be as much,” Granado explains. “You can do some impact just by doing some simple things. … You can find free tools on the Internet to use against other people’s computers.”

Sandhu says that he hopes that CIAS will expand into additional service areas, such as larger government entities and industry.

LOCAL IMPACT

The potential impact of ICS on San Antonio’s economy is significant, says John Dickson, an owner of the Denim Group Ltd., a San Antonio information technology consulting firm that builds and secures large-scale applications for clients. Dickson is a board member of the San Antonio Technology Accelerator Initiative, which was involved in the funding effort for the institute.

When it is firing on all cylinders, ICS will produce experts in the field who will be extremely attractive to employers, he says. “We’re dying for people who are trained in secure coding, secure software development,” Dickson says, adding that “ultimately, if they do well, they are going to have ideas and intellectual property,” a circumstance that he likened to “the end of the rainbow.”

But even then, new challenges will arise that will demand action.

“There is no absolute security,” says Sandhu. “That means some attacks are always possible.”

AVOIDING SCAMS

For tips on how to avoid phishing scams, go to www.apwg.com/consumer_rec.html.
What seems on the surface like an arcane bit of San Antonio’s history is actually a critical step in the construction of a new hike and bike trail along the banks of the Medina River that will eventually connect Medina River Park to Mitchell Lake.

City, state and federal laws require cultural resource management research entities like CAR to investigate public properties that will be impacted by construction before groundbreaking can even begin. The regulations exist to protect historical resources—from buried archaeological sites to standing structures—that might otherwise be lost.

The Perez Ranch project is on the site of “one of the last remaining visual vestiges of the homestead,” says Kay Hindes, staff archaeologist for the City of San Antonio. “We have to preserve the resource for the greater good of the public as a whole.”

The law

The National Historic Preservation Act requires that any new federally funded development or construction on federal land first undergo a survey to establish if there are historic properties that could be impacted by the project.

The State of Texas enacted its own law in the early 1970s. The Antiquities Code of Texas mandates that prior to any construction on state-owned land, the project area be thoroughly surveyed. If historical sites are found, it is then determined whether there is research potential and whether the site warrants nomination to the National Register of Historic Places.

To protect local property, the City of San Antonio included in its Unified Development Code (UDC) stringent regulations about preserving historical resources. It is now considered one of the strongest preservation codes in the nation.

According to the code, before a building permit can be issued by the city, historic preservation officers research whether the proposed development is in an area of a known archaeological site. If such sites exist or are thought to exist, the city can require archaeological investigations before the project can begin.

“Every city has a story. We want to preserve as much as we can,” says Steve Tomka, director of CAR. “The city, through its UDC … wants to preserve as much about its history as possible.”

Dual roles

CAR was established in 1974 and has carried out a mix of academic and cultural resource management research since its early days. It competes with for-profit firms to bid for research contracts with agencies like the Texas Department of Transportation and the City of San Antonio, who typically have staff archaeologists of their own to oversee the numerous projects. At any given time, the center could be working on as many as 40 projects throughout the region.

HISTORY Beneath Our Footsteps

UTSA archaeologists help build San Antonio’s future by preserving its past

Just across from the Toyota plant in south San Antonio is a stretch of ranchland pockmarked with blue tarps from UTSA’s Center for Archaeological Research (CAR). Underneath the tarps lie clues about the property, once an original Spanish land grant obtained by Lt. Col. Ignacio Perez, who occupied the land from about 1793 to the 1850s.

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“The city’s history goes back to the 1700s, so the people that helped put the code together made sure they took care to preserve any archaeological deposits that might be able to contribute to the story of the city of San Antonio and Bexar County in the future,” says Steve Tomka, director of CAR. “The city, through its UDC … wants to preserve as much about its history as possible.”

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Money received through research contracts goes toward the salaries of CAR's 31 staff members, consisting of archaeologists and field and laboratory technicians, many of whom are current students or UTSA alumni. CAR receives between $800,000 and $1.2 million a year in outside funding. That is the largest portion of outside funding received by any department in the College of Liberal and Fine Arts.

The entire process of bidding for contracts, seeking grants, conducting research, carrying out excavations and sorting the thousands of artifacts retrieved for analysis and curation is beneficial for students, Tomka says. “The beauty of it is that you get hands-on experience with large-scale excavations, lab work, analysis, reports and client interactions. This range of experience is invaluable for active students and those who will soon join the job market.”

Like a medical student studying to become a doctor, archaeologists-in-training must practice before they can enter the workforce, he says. “Part of our mission here is to provide experience to our students so when they leave, they do have those skill sets, they are more employable or they are stronger Ph.D. or master’s students. The center complements the training students receive in the Department of Anthropology, and in the process, everybody wins.”

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“The Perez Ranch is the definition of hands-on training, says Kristi Ulrich, a project archaeologist and 10-year CAR veteran who has surveyed, conducted research and excavations in Bolivia, Peru, Texas and Missouri. “As a state-certified curation facility, CAR has amassed 9 to 12 million items from throughout Texas, 75 percent of which are held in trust collections for the state and are to be preserved in perpetuity. CAR’s work begins long before excavation sites are dug. First, the archaeologists spend hours exploring libraries and archives for information on the location of a proposed development. They search through old fire insurance maps, historic photographs and city maps to reconstruct the locations of houses and outbuildings and the routes of streets and roads. They also talk with longtime residents to gather family histories. Next, they devise a detailed plan with questions they hope the excavation will answer and a timeline for how long they expect the project to take.

Once on site, archaeologists conduct a survey of the proposed project locale. They conduct shovel tests and examine surface and subsurface areas for signs of archaeological deposits. Around San Antonio, artifacts can date back 500 to 5,000 years, Tomka says.

Prehistoric findings, which are usually underground, require shovel testing and sometimes backhoe trenching. Archaeologists document their findings through photographs, drawings and detailed field notes.

“In some cases, we can make recommendations if sites have research potential or not immediately after the conclusion of the surveys,” Tomka says. If a site is found to be eligible for the National Register of Historic Places or has research potential, and the proposed development cannot be redesigned to avoid impacting the site, large-scale excavations are necessary.

DIGGING FOR HISTORY

CAR plays a valuable role in the development of a city like San Antonio, which is not only growing fast but also has years of history underfoot. Because CAR’s archaeologists seek and retrieve thousands of artifacts, as well as piece together and preserve the stories that accompany them, they help keep the city growing without losing its heritage and its connection to the past, Tomka says.

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“We won’t be able to recover 100 percent of the site, but the Antiquities Code requires that archaeological investigations are conducted to mitigate the impact of the development and recover as much as necessary to address the research questions posed prior to the inception of the excavations,” Tomka says.

Once an excavation is completed, a report is submitted to the Texas Historical Commission, which monitors the compliance of each project with the law. CAR staff members catalog, analyze and prepare artifacts for storage. Since almost all of their excavations generate objects, that translates to extensive lab work. “For every one week we spend in the field, we spend another three weeks in the lab,” says Tomka.

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THE PEREZ RANCH

Walking along a dirt road leading to what was once the Perez home in south San Antonio, Ulrich prods a piece of blue and white pottery with her boot. It’s one of many small pieces littering the property, she says. Though tiny and only a few decades old, it gives her a hint about the history of the land and the family that once occupied it.

Further up the road, members of her archaeology team skim the dry earth with their tools. Another worker stands a few feet away, carefully sifting excavated dirt to recover pieces of spackle, lath, porcelain and glass. It is a tedious process, but it yields telling results.

When the investigations began on the Perez Ranch, the patch of pasture seemed to consist of nothing but piles of rock. But after weeks of excavation, dodging rainstorms and the curious cattle that roam the property, the archaeologists uncovered the foundations of an 1840s ranch house. They also discovered a fire hearth that may have been used to prepare the evening meals and evidence of the very first occupation of the ranch by the Perez family dating back to the late 1700s or early 1800s.

Few people know of the history of this spot across from the Toy- ota plant. But someday, visitors will travel down the hike and bike trail along the Medina River and see the old tenant shack that still stands on the property and signals with information about the family.

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“We won’t be able to recover 100 percent of the site, but the Antiquities Code requires that archaeological investigations are conducted to mitigate the impact of the development and recover as much as necessary to address the research questions posed prior to the inception of the excavations,” Tomka says.

Once an excavation is completed, a report is submitted to the Texas Historical Commission, which monitors the compliance of each project with the law. CAR staff members catalog, analyze and prepare artifacts for storage. Since almost all of their excavations generate objects, that translates to extensive lab work. “For every one week we spend in the field, we spend another three weeks in the lab,” says Tomka.

As a state-certified curation facility, CAR has amassed 9 to 12 million items from throughout Texas, 75 percent of which are held in trust collections for the state and are to be preserved in perpetuity.

THE PEREZ RANCH

Walking along a dirt road leading to what was once the Perez home in south San Antonio, Ulrich prods a piece of blue and white pottery with her boot. It’s one of many small pieces littering the property, she says. Though tiny and only a few decades old, it gives her a hint about the history of the land and the family that once occupied it.

Further up the road, members of her archaeology team skim the dry earth with their tools. Another worker stands a few feet away, carefully sifting excavated dirt to recover pieces of spackle, lath, porcelain and glass. It is a tedious process, but it yields telling results.

When the investigations began on the Perez Ranch, the patch of pasture seemed to consist of nothing but piles of rock. But after weeks of excavation, dodging rainstorms and the curious cattle that roam the property, the archaeologists uncovered the foundations of an 1840s ranch house. They also discovered a fire hearth that may have been used to prepare the evening meals and evidence of the very first occupation of the ranch by the Perez family dating back to the late 1700s or early 1800s.

Few people know of the history of this spot across from the Toy- ota plant. But someday, visitors will travel down the hike and bike trail along the Medina River and see the old tenant shack that still stands on the property and signals with information about the family.

“When we think about the Recovery Act, CAR is capitalizing on that as well,” Ulrich says. “We’re rewarding to know our work pays off.” Tomka says. “If we don’t find and document it, it may be lost forever.”

Left: Field technician Nathaniel Devito excavates near the Perez Ranch house foundation. Right: As a state-certified curation facility, the Center for Archaeological Research has amassed 9 to 12 million items from throughout Texas. STEVE TOMKA Director, Center for Archaeological Research. Steve Tomka’s research interests include the archaeology of South American camelid domestication and hunter-gatherer adaptations in Texas. He has conducted research and excavations in Bolivia, Peru and Texas. His interests focus on hunter-gatherer land use, food production technology and all facets of lithic (stone) technology. Tomka has been a presenter on such topics as preserving the history of the Alamo through archaeology at various meetings and conferences, and is the author of national and international publications and articles about lithic technology, camelid, prehistoric architectural sites and more.

He received a bachelor’s degree in anthropology from the University of Missouri—Columbia and a master’s and Ph.D. in anthropology from UT Austin. Tomka has been the director of UTSA’s Center for Archaeological Research since June 2002.

Left: A dilapidated tenant shack remains on the Perez Ranch property. Right: Members of CAR’s archaeology team discovered buttress, pottery and other artifacts.
Regenerating LIVES

By Vincent T. Davis

Imagine: a soldier loses an arm in an IED blast in Iraq or Afghanistan. A civilian loses a leg in an automobile accident or facial bone from a gunshot. Today their options are few. They could have a surgical amputation and doctors could fit them with a prosthetic limb. Other choices might include replacing the injured bone with bone from cadaver or another area of the body. In the future they may have another option. Doctors could regenerate the bone tissue that was lost and patients return to function as they did before their injuries. The College of Engineering at UTSA is working to make bone regeneration for traumatic injuries a reality.

Biomedical engineering researchers received $2 million from the U.S. Army's Medical Research and Material Command and the Institute for Medical Research in November 2007 to study tissue-engineering methods. C. Mauli Agrawal, dean of the engineering college and Joo Ong, chair of the bioengineering department, will head the project. They are collaborating with the Army, San Antonio's Southwest Research Institute, Carnegie Mellon University and the University of Texas Health Science Center at San Antonio. The endowment will be funded for four years.

It's the largest grant that the College of Engineering has received to date. The award was one of several that the Army distributed nationwide for research in regenerative medicine for the war wounded.

“The idea of tissue engineering is to regrow or repair functioning tissues like bone, which usually heals itself. But if there's a lot of damage in the bone, it does not grow back. With tissue engineering, scientists use cells from a different part of the body and implant them into a scaffold, a three-dimensional shape formed of polymer foam and molded into the shape of missing bone. The scaffold features interconnected holes in a Swiss cheese-like material that allows bone tissue and blood vessels to grow and bridge with existing bone.

Agrawal's background is working with medical implants and implantable biomaterials. His lab concentrates on cardiovascular and orthopedic biomaterials and has invented methods using scaffolds for creating mineralized occlusions.

Ong's research of implant biomaterial surfaces for dental and orthopedic applications has resulted in promising bone regeneration results. His laboratory is one of the few in the nation that focus on generating bone-like scaffolds for dental and orthopedic treatments.

Merging these two specialties and their respective expertise with scaffolds created new possibilities and also new dilemmas. One of the biggest problems was with tissues involving large segments of bone. Bone grafted from the same person has been known to cause secondary trauma, yet bone taken from another human can induce immune rejection. Together, Agrawal and Ong studied how they could regenerate bone and infiltrate it with blood vessels that are the roadways to bringing nutrition to the cells.

“When you're talking about a soldier whose femur has been blown apart and there's seven inches of bone missing, how do you grow that back?” Agrawal asks. “It's not going to work unless you have arteries going into it.”

**THE PROCESS**

Individually, Agrawal and Ong tested their research in living organisms with promising results. Ong's scaffold worked successfully in smaller bone defects and had shown it could get nutrition around the scaffold and feed the cells. Agrawal's polymer scaffold, with a special surface treatment implanted in animals, generated blood vessels.

They had success growing bone cells in a Petri dish, but not actual bone. So the researchers combined their two processes to see if Agrawal's technology could help generate blood vessels for Ong's scaffold. The solution came in the form of three components — calcium phosphate (which serves as a growth factor), an antibiotic and a polymer.

The first step involves cutting polymer foam, molding it into the shape of the missing bone and dipping it in a calcium phosphate mixture. Designing a scaffold that is the right size and surface that permits branching into channels and pores is critical. The implant is put in a furnace and baked at 3,000 degrees Fahrenheit for several days. When the foam burns off, it leaves a ceramic portion behind.

Two other components are also integral to the process. Ong said that the calcium phosphate expedites bone regeneration. An antibiotic is also included to reduce the risk of infection in the localized area.

The step that's critical to regeneration is the insertion of a polymer rod-shaped material in the center of the calcium phosphate that would induce angiogenesis, which creates new blood vessels from pre-existing vessels.

**TISSUE ENGINEERING**

Bone regeneration has been around since the 1980s. “Until that point in time and even up to today, when there is a defective part in the body, the idea is to go in surgically and excise that part and replace it by a man-made part,” Agrawal says. “The latest philosophy of bone regeneration is slightly different. It says instead of doing that, scientists can help the body heal itself so in the long term, no medical implant will be left in the body.”

Instead of metallic implants, surgeons could use the scaffolds, which contain living tissue and cells to facilitate bone regeneration. The concept started in Boston at Massachusetts Institute of Technology and has spread all over the world, with bioengineers researching methods for regenerating every type of tissue in the human body.

Regenerative studies are being done on the kidney, bladder and nerves. Work is also being done in the area of cancer surgery and skin for burn patients.

With the expertise at UTSA, coupled with animal models from the UT Health Science Center and special capabilities at Southwest Research Institute to make scaffolds that fight infections, the outlook is promising, he says. Being in close proximity to wounded soldiers at Brooke Army Medical Center also helps researchers focus on developing a process to decrease devastating injuries.

**THE FINAL PHASE**

The researchers’ work could move into clinical studies in five or six years, Ong says. Once in that final phase, researchers will continue with their work in the lab to optimize results. The Food and Drug Administration will analyze the procedure and ensure it meets safety standards.

The findings of UTSA researchers will add to the history of medical advances that improve the quality of life for soldiers as well as civilians. Agrawal says younger generations might see a day when loss of limb and organs will not be as traumatic as today.

“I always tell people and especially students that in their lifetimes, they’ll drive by and see a sign that says ‘body shop’ and it will have a totally different connotation,” Agrawal says.
B. John Son was a high school track and field athlete frustrated by the opponents he saw getting an unfair advantage from static weighing tanks for determining a person’s body-fat percentage, which Fogt says is much more useful than pounds. Lab equipment can be used to analyze the biochemical properties of blood, muscle and other tissues. He also aims to help athletes and non-athletes alike improve their exercise regimens.

Since he moved to the Department of Health and Kinesiology in 2005, Fogt has contributed to grant applications exceeding $1.7 million, with $621,104 already awarded and another $875,000 pending. His research includes a Addiction to Defense grant to determine when fatigue begins affecting troops and pilots flying lengthy missions, a study supported by the U.S. Army Research Office. The study was conducted at Lackland Air Force Base in San Antonio. One case of heat stroke in 1999 was fatal.

“Ideally, we’d like to be able to predict [fatigue and dehydration] in training, so a medic can determine if a soldier is near the breaking point and if we need to hold them back,” says Fogt. One way to do this, he suggests, may be through “smart uniform” technology. Such technology collects biomarkers and biochemicals through clothing. The information is then transmitted to a remote location for analysis. Test pilots and astronauts already use similar gear.

The Air Force tries to prevent heat-related illnesses during basic training by conducting regular tests of trainees’ physical status, but inadequate hydration remains a significant contributor to lost training time. Because of the range of water carriers available, Fogt compared the effectiveness of old-fashioned canteens to the newer “camelback” hydration systems. The results were mixed. This can pose a logistical challenge. Because of the range of water carriers available, Fogt compared the effectiveness of old-style canteens to the newer “camelback” hydration systems during the hottest period of the summer. Fogt’s team collected saliva samples from airmen to measure their fatigue levels. That study ended up proving that canteens were just as effective as keeping the troops hydrated as the more costly hydration system.

“We weren’t sure it was worth the expense; a canteen is about $30,” says Lt. Col. Laura Brosch, flight commander for trainee health surveillance at Lackland. “We were looking at over a million dollars more per year.”

Sedentary Risk

Fogt’s work also extends to the local community. He is part of a mobile health lab designed for health screening and study of adults and children throughout South Texas. Fogt notes that a sedentary lifestyle is even more of a threat to good health than a poor diet. “Low fitness levels contribute to heart disease. Even if you’re lean and eating well, a sedentary lifestyle increases your risk for cardiovascular diseases, including stroke and heart attack,” he says.

Sixty percent of U.S. adults don’t get the recommended minimum activity per week. The American College of Sports Medicine suggests that sedentary but otherwise healthy adults walk briskly for 30 minutes, which should equal about two miles, three times a week. Instead of walking, adults could do 30 minutes of active gardening or yard work three times a week to meet the recommendations.

“When we go out and measure health risk factors in South Texas communities, we see extremely low fitness levels. Unbelievably low,” says Fogt. “People just aren’t moving. That is the biggest problem, and it’s the most painful one to fix.”

In a school-based health screening study conducted on students from lower-income South Texas families, Fogt and his colleagues found that many obese children with pronounced diabetes risk actually eat less total food than their leaner peers. “The food choices are higher in fat and sugar, but the primary factor for these kids’ poor health outlook is a lack of movement,” he says. “Our findings suggest that in this population of children, low physical activity as opposed to excess energy intake may play a greater role in their obesity and related diabetes risk. We’ve concluded that prudent advice might be to focus on increasing physical activity and intake of nutrient-dense foods rather than to restrict calorie intake.”

These findings also demonstrate the need for screening and early detection for children at risk for diabetes, he says. Fogt and his colleagues are awaiting publication of their findings in the Journal of the American Dietetic Association.

FROM THE LAB TO THE NATION

Whether it’s improving children’s health, finding ways to keep soldiers and airmen safe, or helping athletes improve their performance, Fogt is optimistic that research conducted in his lab will produce meaningful results.

But the ultimate test for his various projects is found not in the lab, but in translating his findings into action, he says. “It’s a big challenge. Can we make policy changes related to the promotion of physical activity and other healthy lifestyle practices that affect the entire [city of] San Antonio, South Texas and the U.S. population?”

Donovan Fogt

Assistant Professor, Department of Health and Kinesiology

Adjunct Assistant Professor, Department of Medicine, Division of the General Clinical Research Center at the UT Health Science Center at San Antonio

Before joining UTSA in 2005, Donovan Fogt taught at the State University of New York in Brockport and at Baylor University. He also worked at UT Austin and the University of Arizona while completing his schooling.

His interests are the body’s response to exercise and dietary manipulation and the regulation of carbohydrate metabolism in skeletal muscle by hormonal factors, exercise, and nutritional and pharmacological interventions.

Fogt received a bachelor’s degree in nutritional science from the University of Arizona, followed by a master’s degree in exercise physiology. He received a doctoral degree in exercise physiology from UT Austin in 2002.

How long can U.S. soldiers operate in the desert before succumbing to heat exhaustion, or military pilots fly before fatigue sets in? And how serious is the danger to children who practice poor nutrition and don’t get enough exercise?

These are among the questions UTSA assistant professor Donovan Fogt from the College of Education and Human Development is seeking to answer. His research interests may seem disparate, but they all go back to one thing: the needs and capacities of the human body. Fogt’s search for answers actually began when he was a high school track and field athlete frustrated by the opponents he saw getting an unfair advantage from performance-enhancing steroids.

“Understanding how the body works is fascinating to me,” Fogt says. “People know how to fix their cars, how to program their computers, but they don’t know anything about what’s going on in their own bodies.”

Since he moved to the Department of Health and Kinesiology in 2005, Fogt has contributed to grant applications exceeding $1.7 million, with 621,104 already awarded and another $875,000 pending. His research has delved into dehydration, fighting obesity and the benefits of exercise on non-insulin-dependent diabetes. He also aims to help athletes and non-athletes alike improve their exercise regimens.

Fogt’s Exercise Biochemistry and Metabolism laboratory in UTSA’s Physical Education Building is filled with exercise bikes, heart-rate monitors, treadmills, a dehydrator and a body-weight scale accurate to 600 pounds. Lab equipment can be used to analyze the biochemical properties of blood, muscle and other tissues and measure numerous hormonal responses to changes in diet and exercise. Across the hall sits a large hydrostatic weighing tank for determining a person’s body-fat percentage, which Fogt says is much more useful than body-weight for understanding one’s fitness level, weight loss or gain and risk of disease.

Fogt’s test subjects range from healthy normal-weight individuals to overweight and at-risk adults to coaches and athletes at various competitive levels, and they include members of the U.S. armed services. He has worked with marathoners, cross-country runners and other athletes from across South Texas. But the majority of Fogt’s time and research are dedicated to funded studies such as a $231,000 Department of Defense grant to determine when fatigue begins affecting troops and pilots flying lengthy missions, a con-
t only a second to produce the plastic components of a pen, but it may take days to get that pen assembled.

“Il mostly because of the waiting,” says F. Frank Chen, the Lutcher Brown Distinguished Chair in Advanced Manufacturing and professor of mechanical engineering. “Waiting for other outsourced parts, waiting between assembly stations.”

Those delays often translate to increased cost for the consumer. Efficient production and fast delivery of all products are critical to the success of manufacturing companies. When manufacturers miss production goals, consumers take a hit to their wallets. It has been estimated that manufacturing companies lose billions of dollars each year due to inadequate systems and poor production planning.

Chen, Can (John) Saygin, associate professor of mechanical engineering, and their colleagues are working on ways to improve production and therefore ease the price crunch consumers often face. Their Center for Advanced Manufacturing and Lean Systems (CAMLS) looks at the integration of intelligent machines (such as robots), Web-based software and automatic sensors with a company’s infrastructure. This can improve production processes—which include planning, implementation and output—in a variety of manufacturing settings, and can pinpoint where waste occurs. The center’s efforts are garnering attention. In its first year, CAMLS attracted more than $1.2 million in federal research funding and corporate membership fees, including a recent $499,856 grant from the National Science Foundation’s Major Research Instrumentation Program.

The CAMLS research team has grown from five people in April 2007 to 37 today, including four faculty members, one research fellow, 10 graduate students and 19 undergraduates in three labs. Their awareness of industry needs is resulting in products that will improve companies’ competitiveness in the global marketplace, according to Chen and Saygin.

In the CAMLS labs, the team analyzes how a company makes its decisions, from production to the final product, to determine how automatic scanning technology can help. “Our goal is to eliminate waste, which is anything that does not add value, such as waiting time,” Chen says.

He and assistant professor Hongda Wan use three Web-based software packages that they co-designed. By using this system, corporate clients can assess their own organization’s “leanness”—that is, how well they minimize waste—by responding to more than 100 questions that cover training, inventory turns, standardization of processes, preventive maintenance and continuous improvement processes. Companies can also implement waste-reduction practices and six-sigma process improvement, a widely used business management strategy, at the same time.

In addition, Wan and Chen turned production instruction boards of the famous Toyota Production System into a Web-based system that allows manufacturers to better control production to meet customers’ demand rates. In the future, Chen and Wan hope to develop software that can be used to describe the full process of converting raw materials into finished goods, called value-stream mapping, using real-time data supplied by automatic sensors.

“Most companies are doing value-stream mapping by using pens and paper,” Chen says. With real-time analysis, companies would be able to pinpoint just how efficient they are currently and where to focus their efforts next to further reduce waste.

CAMLS also involves applications of radio frequency identification (RFID) technology. This technology is used in hospitals to keep track of newborns and patients with mental disabilities by scanning their ID bracelets. The CAMLS team is looking to expand this technology into the manufacturing sector to enhance sales, customer service and marketing activities.

By combining RFID tags with other automatic sensors on the shop floor to track parts and inventory, receiving docks that take in huge quantities of goods on pallets could also benefit greatly, Saygin says.

“Somebody going through the pallet, even with a barcode scanner, takes some time,” says Saygin, who runs UTSA’s Manufacturing Systems and Automation Laboratory. “But RFID can read them seamlessly, saving time and warehouse space.”

But the technology still needs tweaking. Current RFID systems can read only about 60 to 70 percent of tagged items on any pallet. That’s because the accuracy depends on the orientation of tags, type of tagged items, number of items on the pallet and power setting on the RFID readers. When active RFID readers are placed too close together, they can generate duplicate counts or cancel each other out. Saygin is testing ways to optimize usage of the devices.

So far, San Antonio—based Lancer Corporation, which manufactures soft-drink beverage dispensers and other food service equipment; ABB Robotics, a leading manufacturer of industrial robots; the Chion Co., a family-owned penning manufacturer in San Antonio; and Spain-based BMC International Training, a provider of automated systems for educational environments, have joined the CAMLS research consortium to benefit from its applied research and onsite training.

“The fundamental motivation in creating the center is to be a one-stop source for advanced manufacturing and enterprises systems that can support the ever-strengthening manufacturing base in San Antonio and the South Texas region,” Chen says. With government and corporate funding, CAMLS plans to be self-sustaining within three to five years.

Manufacturing in San Antonio has blossomed in just the last few years. Port San Antonio (at the site of the former Kelly Air Force Base), the new Toyota truck assembly plant and its suppliers, and Caterpillar’s acquisition of a manufacturing facility have created thousands of new manufacturing jobs. The city also has hundreds of manufacturers with fewer than 50 employees. These enterprises play a critical role in supporting San Antonio’s economy—they added $14.4 billion in 2006—making the need for training and education in advanced machining, lean manufacturing and integrated manufacturing systems vital, the CAMLS researchers say.

“When it became clear that the manufacturing industry was growing rapidly in San Antonio and there was no university-level workforce development program available in the area, we were quick to respond and establish the center,” says UTSA President Ricardo Romero. “We want to be a true partner in bringing about solutions in our community.”

By Assiatou Sidimé

Researchers improve production, ease price crunch

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Hidden Talent: How Leading Companies Hire, Retain, and Benefit from People with Disabilities

Mark Lengnick-Hall and his colleagues were prepared and then presented to employers as applicants, “says Lengnick-Hall.

“We wanted to give them good examples to follow.”

Horowitz has a joint appointment in the Department of Interdisciplinary Learning and Teaching and the Department of Counseling and Educational Psychology. She explains, “Talking Texts comes after a century in which students were to be seen and not heard, where seatwork and silent reading, fill-in-the-blank or short essay writing dominated, and speaking meant recitation.”

Horowitz spent more than eight years conducting research with graduate students, compiling and editing the work of international researchers and reporting on a half century of research on classroom interaction, instructional conversations, peer discussions, adult-expert collaborations, family talk and self-reflective talk.

By showing how dialogue is key in creating new knowledge, the book proposes that teachers can be trained in a range of styles of interaction targeting particular age groups and populations as they process texts they read or write.

Talking Texts also illustrates how dialogue can be used effectively in different subject areas—to teach not only the technicalities of math, science and engineering, but also the arts, poetry, drama and music.

Talking Texts: How Speech and Writing Interact in School Learning

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Talking may make you smarter and more interested in reading. In her book, Talking Texts: How Speech and Writing Interact in School Learning, Rosalind Horowitz and colleagues present research showing that a high level of quality classroom participation increases the likelihood that students will be inquisitive and engaged, with improved cognitive processing when reading, writing and reasoning.

The researchers shared the same simple motivation. “We were all concerned about the low employment rate and the previous emphasis on the rehabilitation model, where people with disabilities were prepared and then presented to employers as applicants,” says Lengnick-Hall.

“What mattered to us was investigating why some employers were proactive in hiring people with disabilities, and why others chose not to hire them. We wanted the book to serve as a summary of our research on what people are doing, but also to help employers who are interested in this but aren’t aware of exactly how to do it. We wanted to give them good examples to follow.”

From Renaissance to Counter-Reformation

The Architectural Patronage of Carlo Borromeo During the Reign of Pius IV

by John Alexander

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Thirteen years of intensive research went into this first book by John Alexander, assistant professor of architectural history. By focusing on a few defining years in the life of Cardinal Carlo Borromeo, Alexander expands on what is known about the critical period of Counter-Reformation architecture created under Borromeo’s direction in 16th-century Italy.

“His biographical investigation of this young man,” Alexander says, “he’s not the most sympathetic character, because he was very strict, and by today’s standards he would have been considered harsh. We see him for all the rigor, all the seriousness, all the single-mindedness that he had, and also for all of his appreciation for visual beauty. Instead of being a caricature of a religious reformer, he now becomes a three-dimensional human being.”

The book’s cover shows a striking fresco commissioned after Borromeo’s death, depicting the moment when he “received the red hat” and became a cardinal. Inside, Alexander presents a scholarly work resulting from his close study of letters, contracts and other documents that fill in the gaps in current biographical and scholarly material on Borromeo.

Alexander’s next project will build upon this research by contrast- ing Borromeo with César Gamba, the bishop of Tortona who held differing views about the responsibilities of ecclesiastical patrons.

With the ability to work at the atomic level, UTSA physicists, biologists and chemists are working across disciplines to understand how diseases such as cancer are induced—research they hope will lead to the development of new drugs to combat a wide variety of human disease. Now, thanks to the generosity of the Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation, three of the most sophisticated state-of-the-art electron microscopes now reside in a physics laboratory at The University of Texas at San Antonio. The foundation’s gift of $822,000 made the purchase of these microscopes possible, and their arrival on campus has increased and magnified the research capabilities of university scientists.

In a message of gratitude to the foundation, UTSA President Ricardo Romo said, “The Klebergare great Texans, whose audacity of imagination and determination to pass on a legacy of philanthropy have provided countless opportunities for excellence at this university. "These microscopes will form the nucleus of a groundbreaking research unit that will be unique not only here in San Antonio, but also across the entire state of Texas.”

Gifts like these make UTSA’s mission of excellence in education a reality. As UTSA grows, support from donors such as the Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation becomes even more important to the university. To learn more about giving to UTSA, contact the Development Office at (210) 458-5162.

On the Web: www.utsa.edu/development