

THE UNIVERSITY OF TEXAS AT EL PASO

RESEARCH GUIDE



INSIDE

- 2 Message From the President**
- 4 Message From the Vice President for Research**
- 5 UTEP Fast Facts**
- 6 Overview**
- 8 About This Guide**
- 10 Major Research Awards at UTEP**
- 12 Bioinformatics**
- 14 Biomedical Engineering**
- 18 Biomedical Sciences**
- 24 Community Health/Hispanic Health Disparities**
- 34 Computer Science**
- 38 Defense and Homeland Security**
- 42 Environmental Science and Resource Management**
- 50 Geological Science and Geographic Information Systems**
- 52 Materials and Manufacturing**
- 58 Transportation**
- 60 Inspiring New Researchers**
- 64 Future Facilities of UTEP Research Programs**
- 65 Provost/Vice President for Academic Affairs and College Deans**

The recently completed \$45.1 million Bioscience Research Building is a five-story, 100,000-square-foot structure equipped with core facilities in Protein Chemistry, Molecular Biology and DNA Sequencing, Cell Culture, Flow Cytometry/Cell Sorting, and Bioinformatics.





Message from the President

The University of Texas at El Paso Research Guide provides exciting evidence of UTEP's success in achieving both access and excellence in fulfilling our mission. The strong commitment that UTEP has made to create access to higher education opportunities for residents of the El Paso region has, since 1988, been paired with equally strong resolve to achieve excellence in academic programs, research, scholarship and creative activity. Such excellence is crucial to our commitment to access because UTEP students have every right to expect a level of quality comparable to that provided their peers in more affluent settings. And the recruitment and retention of faculty with capacity to provide that level of quality requires a campus climate conducive to achieving their research, creative and scholarly aspirations. As reflected in this *Research Guide*, these dual goals of access and excellence have successfully transformed UTEP during the past 20 years.

UTEP's transformation into a doctoral/research university has been endorsed by the Washington Advisory Group (WAG), which reported to The University of Texas System in 2004 that, "...UTEP can become a Carnegie Doctoral Research Extensive (Tier One) university and receive national recognition as a research capable, urban university in this decade." In addition, the U.T. System and the Texas Legislature have made investments of nearly \$250 million during the past several years in UTEP science and engineering research laboratories and equipment to accelerate this institutional transformation.

Outcomes of this systematic and sustained plan to transform UTEP are documented in this *Research Guide*. It's particularly exciting to note that UTEP has not only been successful in leveraging investments in capacity-building and greatly increasing our externally funded research portfolio, but we're also now competing successfully with major research universities for the highest-level, peer-reviewed research grants from the National Science Foundation, the National Institutes of Health and other federal agencies.

From initial steps that we took in 1988 to today's robust activity, UTEP's transformation into a doctoral/research university has been a team effort. We thank all of the faculty and staff members who write highly competitive proposals—more than 500 of them last year—and Vice President for Research Roberto Osegueda and the members of his team for providing the infrastructure and administrative support essential to the continued growth of our research and technology transfer activity. We can all be very proud of the progress we've made, and confident that it is providing us the momentum required to achieve UTEP's goal of becoming a National Research (Tier One) University.

Diana Natalicio
UTEP President







Message from the Vice President for Research



The University of Texas at El Paso has made great strides in building capacity and creating an environment of growth for research. With more than \$50 million in annual research expenditures, UTEP is well on its way to becoming a national research university. This success is due in part to the capital investment the University has made in research equipment and facilities, an investment that has facilitated the recruitment and retention of faculty who successfully compete at the national level. UTEP's success also is enhanced by the supportive climate for research, creative, and scholarly activities in all of the University's colleges. Last year, nearly 300 faculty and staff members engaged in research and sponsored projects, and a record 512 proposals were submitted, resulting in \$77 million in new funding to the University and the El Paso region.

As exemplified in the articles in *The UTEP Research Guide*, faculty and staff have attracted widespread national recognition for their cutting-edge research in many disciplines, such as Bioinformatics, Biomedical Science, Bioengineering, Computer and Computational Sciences, Nanomaterials and Manufacturing, to name a few.

UTEP also is committed to providing research opportunities to students, particularly undergraduates, that support them financially and give them experiences that make them competitive. For example, more than 40 percent of students graduating in 2005-2006 with baccalaureate degrees participated in research, scholarly or creative projects with UTEP faculty. By fall 2008, more than 43 percent of those students had enrolled in UTEP graduate programs.

Please enjoy the articles that follow. They reflect UTEP's commitment to serving our students and our region.

A handwritten signature in black ink that reads "Roberto Osegueda".

Sincerely,
Roberto Osegueda
Vice President for Research
Office of Research and Sponsored Projects
www.utep.edu/research



- ✦ Nestled in the desert foothills of the rugged southern Rocky Mountains just north of the Rio Grande, The University of Texas at El Paso is a multicultural public urban university serving more than 20,000 students in the El Paso/Juárez metropolis of 2.4 million residents on the U.S.-Mexico border.
- ✦ In fall 2008, UTEP enrolled a record 20,458 students—the seventh consecutive record fall enrollment.
- ✦ UTEP proudly delivers higher education access and excellence to a 21st century demographic—75 percent of the University's students are Hispanic, and more than half are the first in their families to attend college.
- ✦ With more than \$50 million in annual research spending, UTEP ranks among the top U.T. System academic institutions. UTEP makes the most of its strengths in the areas of biomedicine, Hispanic-health disparities, border and homeland security, environmental and Earth science, emerging technologies, and borderland arts and humanities. The Carnegie Foundation classifies UTEP as a “high research activity” doctorate-granting university.
- ✦ UTEP scientists have received numerous awards of \$1 million and more from prestigious research programs sponsored by the National Science Foundation, the National Institutes of Health, the departments of Defense and Energy, and other public and private agencies.
- ✦ UTEP has nearly 1,200 distinguished faculty, and one of the highest percentages of minority faculty among universities in the United States—more than 30 percent.
- ✦ UTEP offers 80 bachelor's degrees, 80 master's-level degrees and programs, and 16 doctorates—with more in development. UTEP also offers cooperative Ph.D. programs in pharmacy and nursing with UT Austin and the UT Health Science Center at Houston.
- ✦ UTEP is a key economic force in the Paso del Norte region that includes West Texas, Southern New Mexico and Northern Mexico. UTEP's operating budget for FY09 is \$295 million. According to the UTEP Institute for Policy and Economic Development, the University's contribution to personal income of local individuals is \$343 million, and the number of jobs attributed to UTEP's presence totals 6,123.
- ✦ UTEP is one of only six minority-serving institutions selected by NASA and the National Science Foundation for the Model Institutions for Excellence program to increase graduates from underrepresented groups in science, technology, engineering and mathematics disciplines.
- ✦ UTEP is one of only 11 universities nationwide to receive a \$5 million “Teachers for a New Era” research grant from the Carnegie Corporation.
- ✦ On the playing field, the UTEP Miners compete in Division 1 sports as a member of Conference USA's West Division. UTEP is home to the 51,500-seat Sun Bowl Stadium and the 12,000-seat Don Haskins Center, named for the legendary coach who, in 1966, delivered Texas' only Division 1 Men's Basketball Championship.
- ✦ In the 2008-09 academic year, the University embarked on an unprecedented \$260 million program of new construction and renovation projects, including a teaching and research building for Chemistry and Computer Science; a facility for the College of Health Sciences and the School of Nursing; a new University Bookstore and the Foster•Stevens Basketball Complex.



Overview





THE UNIVERSITY OF TEXAS AT EL PASO

The University of Texas at El Paso is located in El Paso, Texas, on the northern bank of the Rio Grande between the United States and Mexico. UTEP students live and study in one of the world's largest binational metropolitan areas, pursuing cultural, social, and academic opportunities not available on most university campuses.

UTEP has been a cornerstone of the El Paso community since it was founded as the Texas School of Mines and Metallurgy more than 90 years ago.

In 1914, the school opened with 27 students and a handful of faculty and staff. From this modest beginning, UTEP has grown into a dynamic urban university that today serves the needs of more than 20,000 students.

More than 75 percent of UTEP's student population is Mexican-American. In recognition of the University's success in creating educational opportunities for non-traditional students, the National Science Foundation designated UTEP as a Model Institution for Excellence, one of only six in the country. This has resulted in a multimillion-dollar NSF grant to support UTEP's science, computer science, engineering, and mathematics programs.

Capitalizing on UTEP's border setting, faculty research focuses on areas such as biomedicine, environmental science and engineering, and manufacturing engineering. Research expenditures totaled more than \$50 million in 2008, the last year for which comparative data are available. The University's undergraduate students participate in hands-on research, working at a professional level unheard of at other universities. Students also have many

opportunities to participate in binational research programs between UTEP and higher-education institutions in Mexico.

To expand its research capabilities, UTEP has embarked on an unprecedented \$260 million program of new construction and renovation projects, the most significant single campus transformation in its history. New construction includes a teaching/research building for chemistry and computer science and expansion of the science and engineering complex.

Also underway is construction of a new \$60 million facility for the College of Health Sciences and School of Nursing.

UTEP's achievements extend far beyond its traditional strengths in science and engineering. The University has received national acclaim for innovative programs in business, fine arts, education, the humanities, and health sciences.

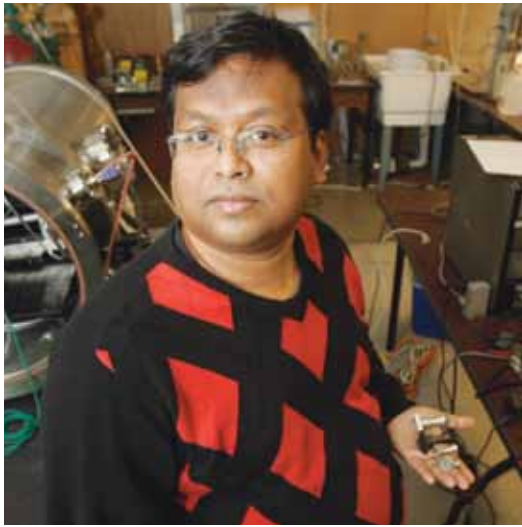
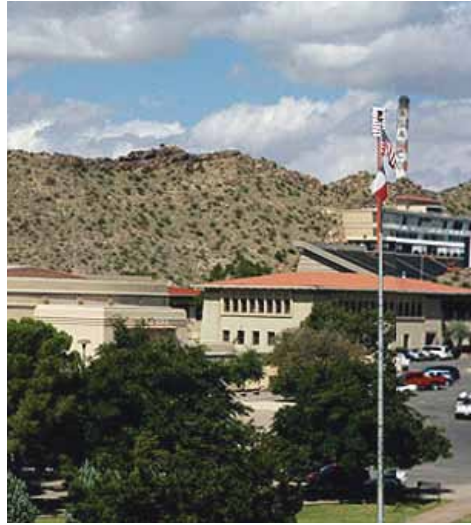
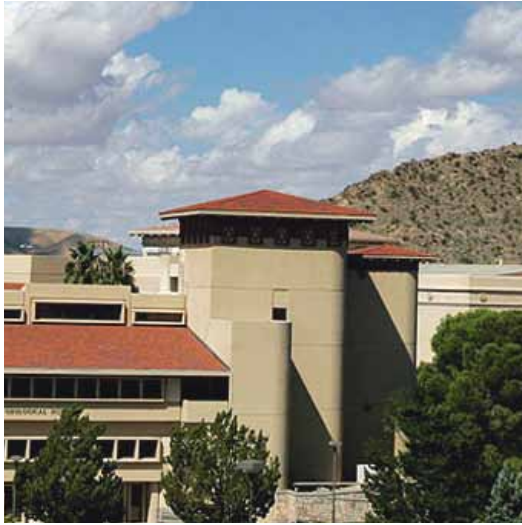
The Carnegie Foundation ranks UTEP as a doctorate-granting university with high research activity, placing us among the top seven percent of all colleges and universities in the United States. This classification reflects UTEP's success in providing our students with opportunities to pursue advanced degrees in a broad range of fields. Today, we offer 16 doctoral degree programs, and two more—in nursing and pharmacy—through cooperative programs with UT Austin and the UT Health Science Center at Houston. The Texas Higher Education Coordinating Board has granted planning authority for several other doctoral programs, including a Ph.D. in Ecology and Evolutionary Biology and Doctors of Nursing Practice, Physical Therapy, and Public Administration.



WWW.UTEP.EDU



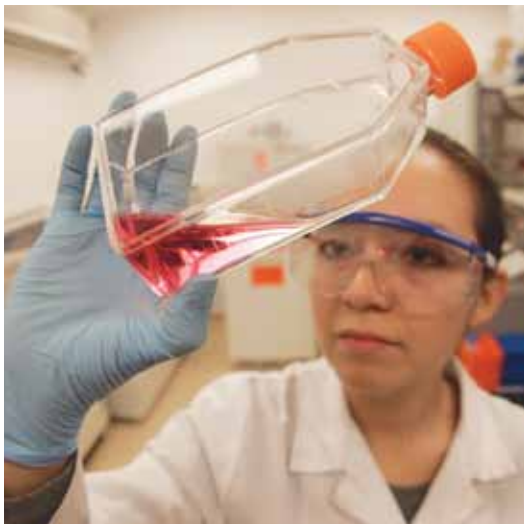
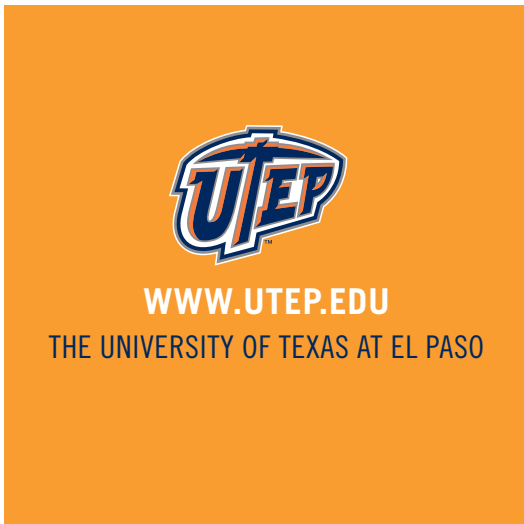
About This Guide



EXPLORE DISCOVER • CREATE INVENT INNOVATE CURE

The University of Texas at El Paso has experienced stunning growth in its research capacity during the past 20 years. Annual research spending has surged to more than \$50 million a year, compared to just \$3 million two decades ago. Undoubtedly, UTEP is positioning itself as a leader in science, engineering, and numerous other fields.

The UTEP Research Guide highlights many of the projects and programs that make UTEP a unique institution for conducting research. From testing novel drug therapies in the Bioscience Research Building to wrangling desert rattlesnakes at Indio Ranch to conducting climate and ecological research at both ends of the Earth, UTEP offers its distinguished faculty and talented students endless opportunities for discovery.





Major Research Awards at UTEP



Key Active Projects*

Atlantic Philanthropies, Inc.

- **Principal Investigator:** Maria L. Gonzalez, Ph.D.
- **Project:** Borderlands and indigenous education, evaluation and leadership initiatives
- **Amount:** \$1.5 million

Department of Defense

- **Principal Investigator:** Stephen Riter, Ph.D.
- **Project:** Regional Geospatial Center
- **Amount:** \$2.85 million

Department of Energy

- **Principal Investigator:** Pat Teller, Ph.D.
- **Project:** Dynamic adaptability in support of extreme scale computing
- **Amount:** \$1.5 million

Department of Homeland Security

- **Principal Investigator:** Ret. Army Brig. Gen. José D. Riojas
- **Project:** National Center for Border Security and Immigration
- **Amount:** \$2.46 million
- **Principal Investigator:** Dennis Soden, Ph.D.
- **Project:** UTEP Intelligence Center for Academic Excellence
- **Amount:** \$2 million

Howard Hughes Medical Institute

- **Principal Investigator:** Stephen B. Aley, Ph.D.
- **Project:** Development of curricular and team research in biomedicine
- **Amount:** \$1.5 million

National Institutes of Health

- **Principal Investigator:** Igor Almeida, Ph.D.
- **Project:** Molecular composition, biogenesis and function of trypanosoma cruzi shed vesicles
- **Amount:** \$1.5 million
- **Principal Investigator:** Maria Amaya, Ph.D.
- **Project:** Community-based participatory research in lead exposure
- **Amount:** \$1.76 million
- **Principal Investigator:** Robert L. Anders, Dr PH
- **Project:** Hispanic Health Disparities Research Center
- **Amount 1:** \$4.09 million
- **Amount 2:** \$6.77 million
- **Principal Investigator:** Manuel Miranda-Arango, Ph.D.
- **Project:** Insights into the regulation of the glycine transporter 1
- **Amount:** \$1.01 million
- **Principal Investigator:** Marc B. Cox, Ph.D.
- **Project:** Functional characterization of FKBP52 interactions with steroid hormone receptors
- **Amount:** \$1.04 million
- **Principal Investigator:** Richard T. Miller, Ph.D.
- **Project:** Nitroarene-dependent nitration of neural proteins as a mechanism of toxicity
- **Amount:** \$1.37 million
- **Principal Investigator:** June Kan-Mitchell, Ph.D.
- **Project:** Mapping novel subdominal B*5701 epitopes in conserved regions of the HIV proteome
- **Amount:** \$2.35 million



- **Principal Investigator:** June Kan-Mitchell, Ph.D.
- **Project:** Optimizing Gag CTL epitopes to improve immunogenicity
- **Amount:** \$2.42 million

- **Principal Investigator:** Laura E. O'Dell, Ph.D.
- **Project:** Nico-Teen: Mechanisms of nicotine reward and withdrawal during adolescence
- **Amount:** \$1.42 million

- **Principal Investigator:** Keith H. Pannell, Ph.D.
- **Project:** Undergraduate biomedical research training at UTEP
- **Amount:** \$2.37 million

- **Principal Investigator:** Nicholas Pingitore, Ph.D.
- **Project:** UTEP-UNM HSC ARCH program on border asthma
- **Amount:** \$4 million

- **Principal Investigator:** Joseph W. Tomaka, Ph.D.
- **Project:** BASICS El Paso: Screening and brief intervention for UTEP students
- **Amount:** \$1.32 million

- **Principal Investigator:** Michael Zarate, Ph.D.
- **Project:** Minority mental health research at UTEP
- **Amount:** \$1.45 million

National Science Foundation

- **Principal Investigator:** Ann C. Gates, Ph.D.
- **Project:** Cyber-ShARE Center of Excellence
- **Amount:** \$2.46 million

- **Principal Investigator:** Ann C. Gates, Ph.D.
- **Project:** Computing alliance of Hispanic Serving Institutions
- **Amount:** \$2 million

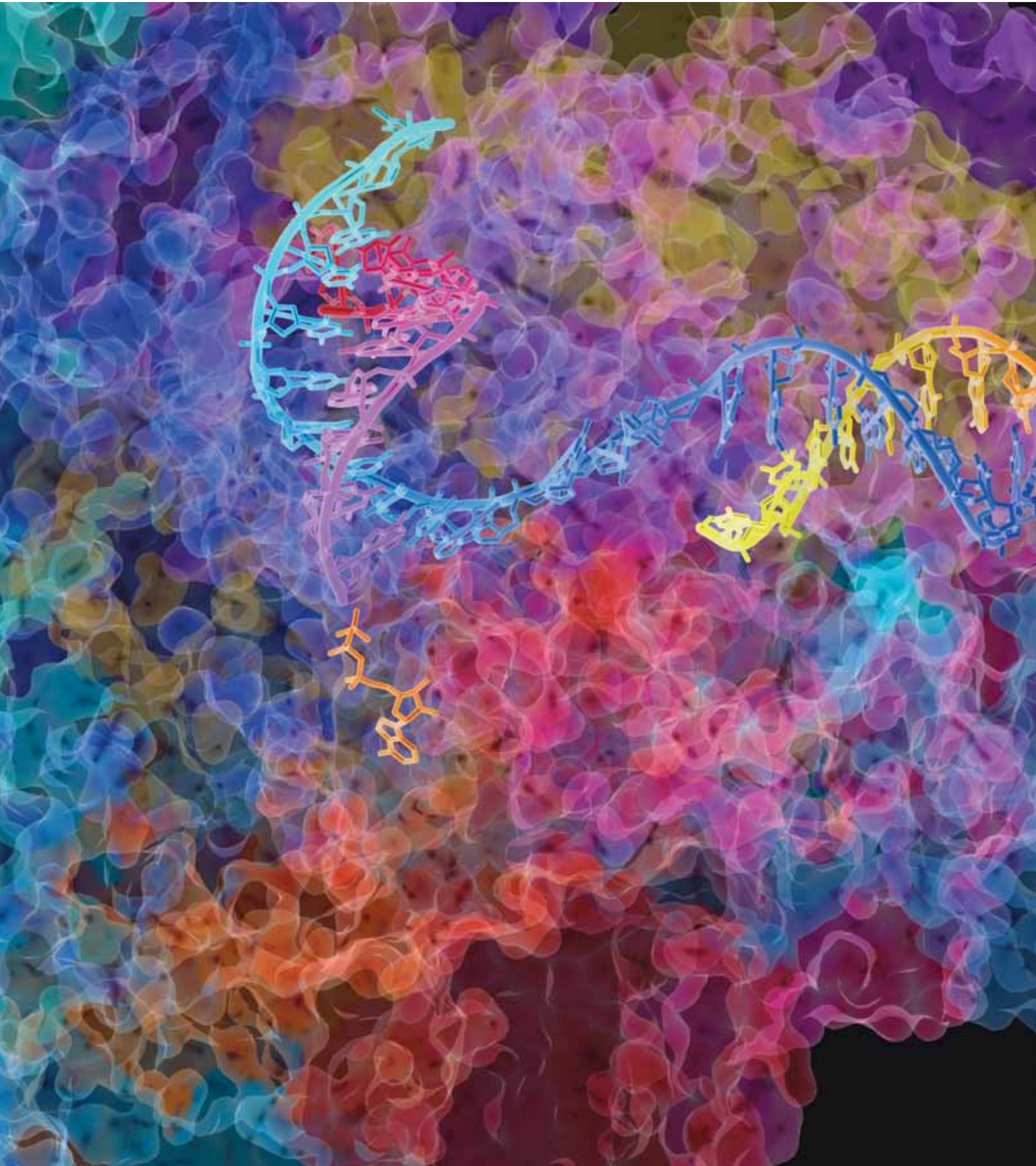
- **Principal Investigator:** Kate Miller, Ph.D.
- **Project:** Pathways: A geoscience network for training and recruitment of future Earth scientists in El Paso
- **Amount:** \$1.15 million

- **Principal Investigator:** Kate Miller, Ph.D.
- **Project:** GK-12 partnership for exploring the environment on the U.S.-Mexico border
- **Amount:** \$1.78 million

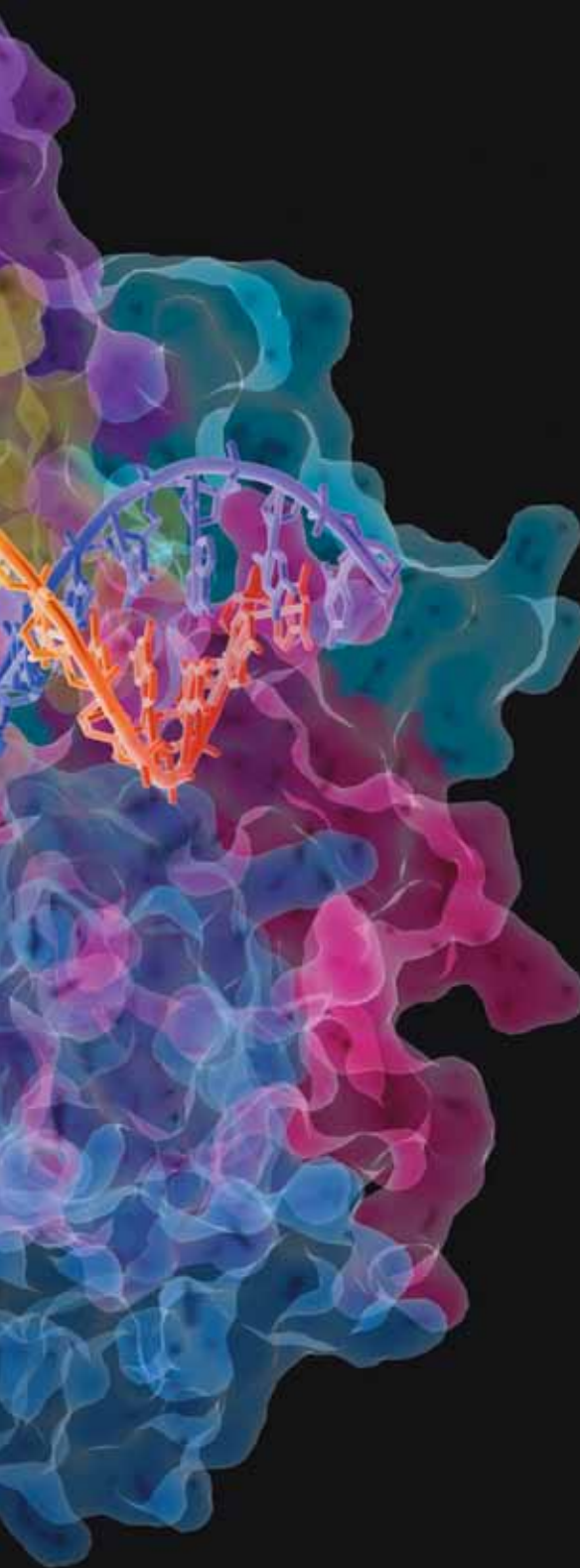
Paso del Norte Health Foundation

- **Principal Investigator:** Theodore V. Cooper, Ph.D.
- **Project:** A comprehensive and collaborative approach to tobacco control in the border region
- **Amount:** \$1.9 million

**Does not include all active research projects*



MINING GENETIC INFORMATION FOR ANSWERS TO DISEASE



In the field of biology, the beginning of the 21st century will be remembered for a “Big Bang” of genetic information—the completion of the first survey of the entire human genome.

The genetic blueprint of human beings, the human genome presents researchers with billions of bits of genetic information waiting to be mined for ways to prevent, diagnose and cure diseases.

This ever-expanding amount of human and other genetic information has given rise to the field of bioinformatics, which brings together the power of mathematics, statistics and high-performance computing to tackle complex biological problems.

At UTEP, faculty and master’s-level students in the Bioinformatics Program are conducting a wide range of research, from investigating gene therapies for diseases to developing powerful software tools for genetic scientists.

For the computationally intensive applications required by their research, the bioinformatics teams tap into the power of UTEP’s high-performance computing resources, including IBM eServer p590 and p690 machines and a Cray XD1 Linux Cluster.

The Bioinformatics Program is directed by Ming-Ying Leung, Ph.D., professor of mathematical sciences, whose own research focuses on using probabilistic modeling and scan statistics to study genetic sequences. Her work has shed light on the workings of the virus that causes Severe Acute Respiratory Syndrome and the replication behavior of herpesvirus genomes.

Leung also is focusing on projects that will improve the mathematical and computational tools available to bioinformatics researchers. With the support of a four-year, \$594,000 award from the National Institutes of Health, she is developing a set of open-source grid-computing software tools to predict genome structures in RNA viruses. Also, the National Science Foundation is funding Leung’s four-year, \$416,000 project to develop mathematical models for the prediction of RNA secondary structures in large RNA molecules.

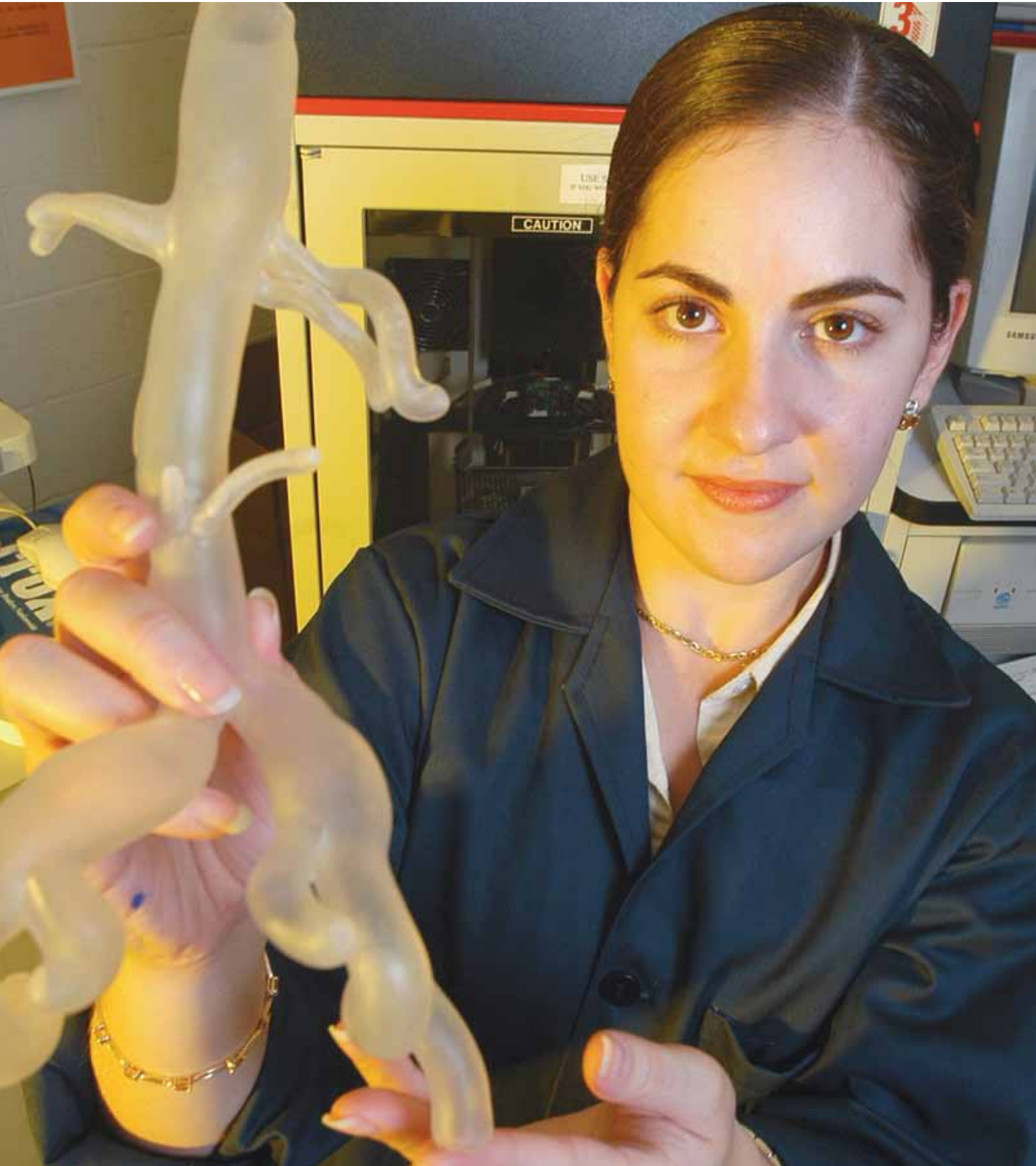


Ming-Ying Leung, Ph.D.

Research Assets

Bioinformatics Program –
www.bioinformatics.utep.edu

- **DNA sequence assembly and analysis**
- **Ecology and phylogeny**
- **Microarray and proteomics data analysis**
- **RNA and protein structure prediction**





INTERDISCIPLINARY RESEARCH LEADS TO HEALTH CARE INNOVATIONS

Blurring the boundaries between medicine and machines, UTEP engineers are investigating innovative ways to heal the injured and sick, from regenerating bone and nerve tissue to helping patients with neurological problems learn to walk again.

The University's biomedical engineering research and education programs are growing rapidly under the leadership of College of Engineering Dean Richard Schoephoerster, Ph.D., who established biomedical engineering programs at Florida International University before coming to UTEP in 2007.

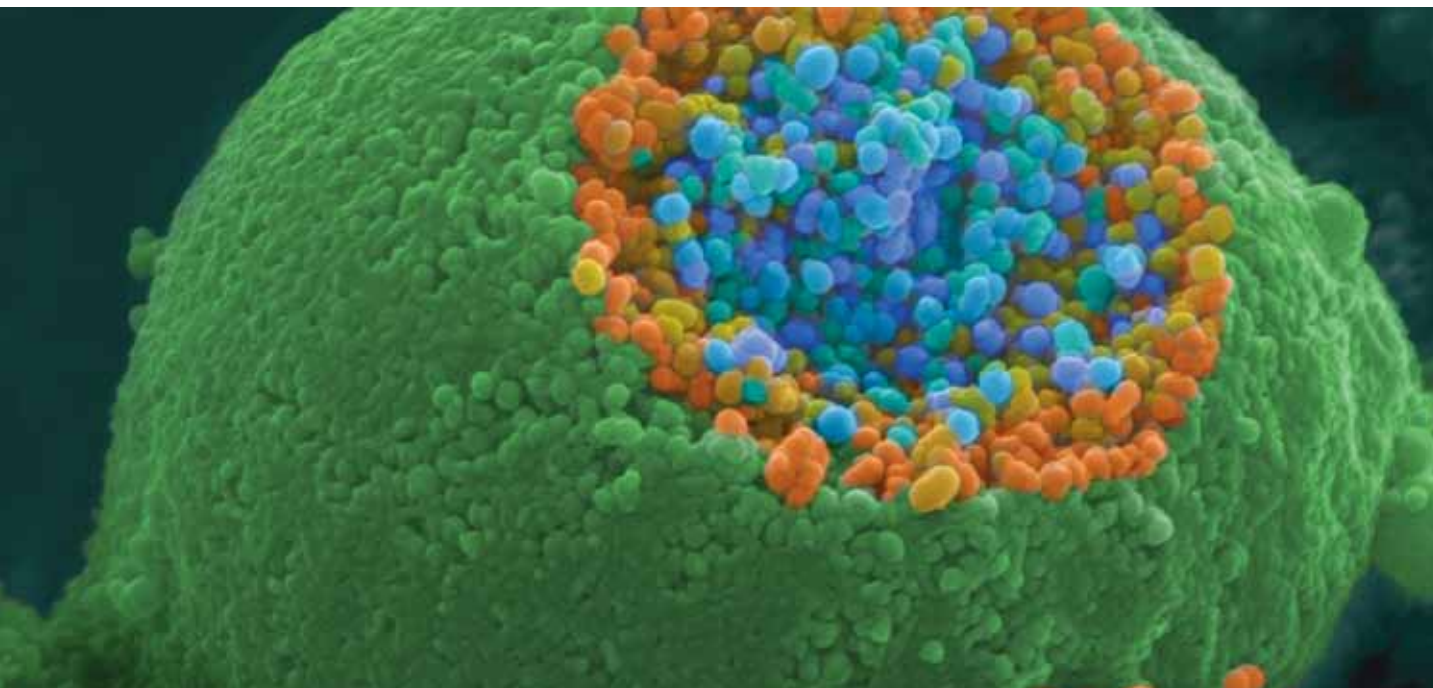
New master's and doctoral programs in biomedical engineering are in the works as UTEP leverages a century-old engineering legacy with the strength of its biological sciences research portfolio.

At the W.M. Keck Center for 3D Innovation, research teams are using rapid-prototyping machines to fabricate unique implantable "scaffolds" for tissue engineering.

And in the Laboratory for Human Motion Analysis and Neurorehabilitation, engineering expertise is improving diagnosis and treatment for people suffering from nerve disorders and injuries.

Through collaborations with local hospitals, biomedical engineers are turning research into real solutions for patients. Schoephoerster sees more and more opportunities to make an impact in this emerging discipline, thanks to the opening of the Paul L. Foster School of Medicine at the Texas Tech University Health Sciences Center in El Paso, and our region's strong manufacturing sector.

"Biomedical engineering is one of the main areas we will be focusing on because so many opportunities exist. We have a very solid base to build on," Schoephoerster says.



Tissue Engineering

Mending bone and nerves at the cellular level

Healing bone and other tissue lost to injuries and disease is a major focus of research at the W.M. Keck Center for 3D Innovation, home to unique rapid-prototyping manufacturing technologies.

Mechanical Engineering Professor Ryan Wicker, Ph.D., and Assistant Professor Malcolm Cooke, Ph.D., are each leading interdisciplinary research teams in the development of implantable devices known as scaffolds that provide a structure for cells to develop into tissue.



Ryan Wicker, Ph.D.

Wicker, director of the W.M. Keck Center, is collaborating with colleagues at the University of Utah and William Beaumont Army Medical Center in El Paso to develop scaffolds for repairing damaged nerves. Wicker's project is supported by a three-year, \$270,000 grant from the National Science Foundation.

Cooke's research focuses on bone-tissue scaffolds to repair injuries and defects of the skull, and is funded by a three-year, \$333,000 grant from the National Institutes of Health.

The scaffolds are designed with CAD software to mimic the porous structure of living tissue. Rapid-prototyping equipment then precisely fabricates the scaffolds layer by layer, using lasers that convert a liquid hydrogel material into a solid form.

Seeded with living cells, the devices fill the gaps between damaged nerve stumps or lost bone. Made of a biodegradable material, the scaffold is gradually absorbed by the body, leaving a patch of new tissue.

Wicker says tissue-engineering scaffolds

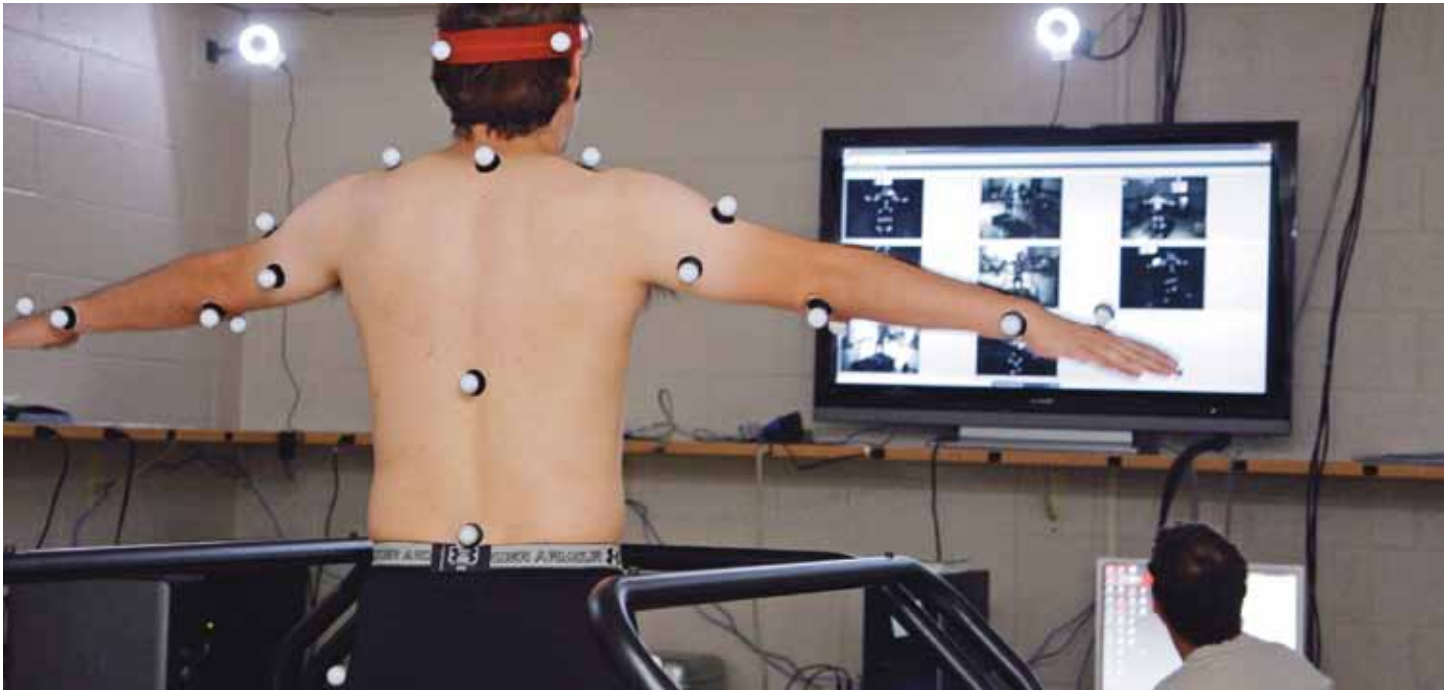
represent a significant improvement over current medical techniques, which typically require a surgeon to harvest a graft from healthy tissue.



Malcolm Cooke, Ph.D.

Noting the importance of the collaboration with Beaumont, the researchers say the tissue-engineering technology holds promise in the treatment of

traumatic injuries, and has the potential for improving the lives of soldiers injured in combat.



Smartgait

A new tool for physical rehabilitation

At the Laboratory for Human Motion Analysis and Neurorehabilitation, researchers led by Electrical Engineering Associate Professor Thompson Sarkodie-Gyan, Ph.D., have developed the Smartgait Rehabilitation System, a specialized treadmill and equipment that give doctors the ability to measure and analyze a patient's walking pattern from within the body.

Using Smartgait, doctors and therapists can better identify physical impairments and plan an effective course of treatment for patients who suffer from neuromuscular disorders or traumatic injuries to the brain or nervous system.

Sarkodie-Gyan says the patent-pending technology provides more accuracy than other gait-analysis systems, which typically use video cameras and a software program to give a "best estimate" of a patient's walking impairment.

"Our technology is more exact. Because we measure from within the patient, it gives us very precise measurements," he says.

Among the first to benefit from the Smartgait system will be patients at El Paso's Sierra Providence Physical Rehabilitation Hospital. The patients will have access to the system on campus initially.

"We are very excited about the research being done at UTEP," Gene Miller, Sierra Providence senior vice president and chief operating officer, says. "We're very concerned about patients that have difficulty with mobility and we're looking forward to working with Dr. Sarkodie-Gyan."



Thompson Sarkodie-Gyan, Ph.D.

Research Assets

W.M. Keck Center for 3D

Innovation -

research.utep.edu/wmkeck

- Tissue engineering
- Cardiovascular hemodynamics
- Imaging, modeling and manufacturing

Laboratory for Human Motion Analysis and Rehabilitation -

humanlocomotion.utep.edu

- Biorobotics
- Biomedical instrumentation and design
- Design, manufacturing and testing of assistive devices
- Fabrication of biosensors

Laboratory for Industrial Metrology and Automation -

research.utep.edu/lima

- Human motion analysis
- Biosensors
- Cybernetics and systems science





ADDRESSING CRITICAL HEALTH ISSUES ON THE BORDER AND BEYOND

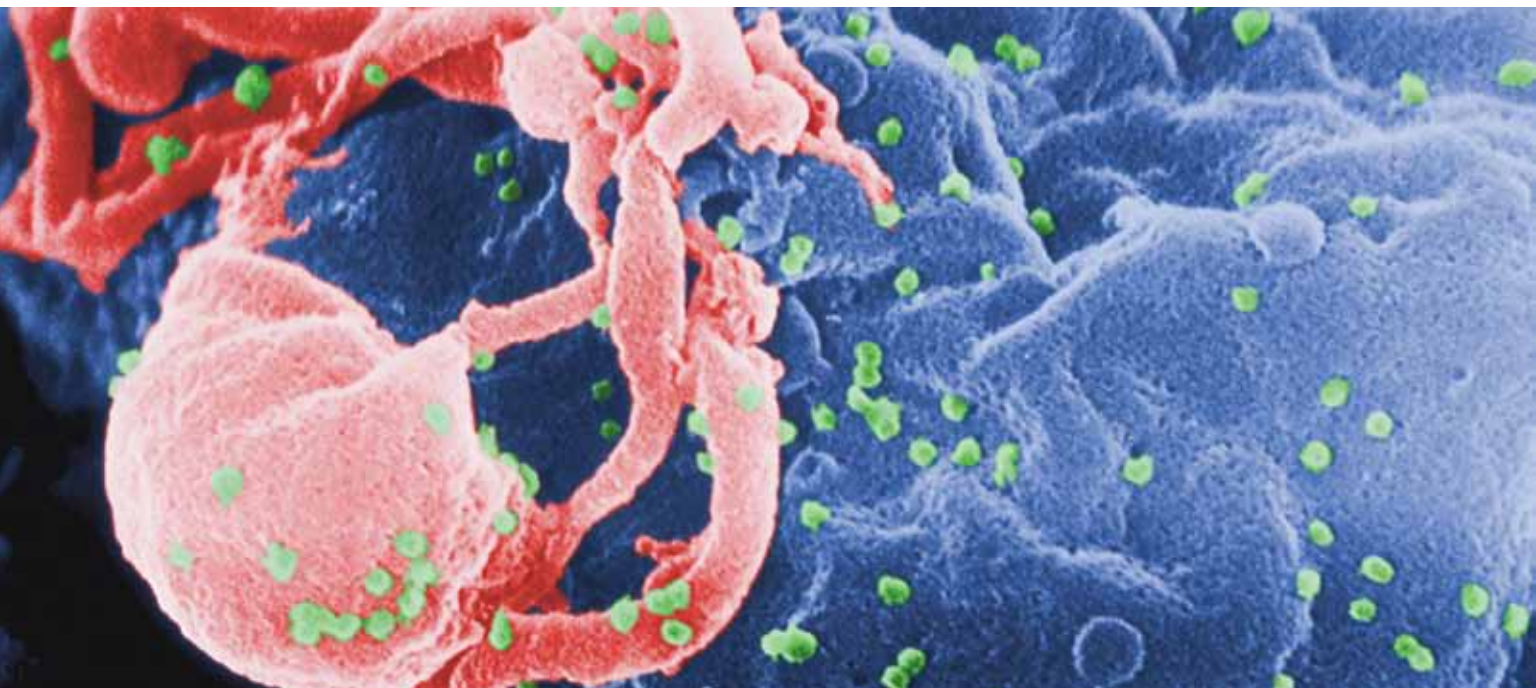
Infectious diseases and other health conditions that impact our unique community on the U.S.-Mexico border are a major focus of biomedical research at UTEP.

The Border Biomedical Research Center is the hub of a wide range of research activity, organized into three research units: infectious diseases, toxicology, and neuroscience and metabolic disorders.

Research conducted by BBRC faculty and staff includes the investigation of vaccines for HIV, and treatments for parasitic diseases and conditions caused by exposure to toxins such as lead.

The growth in biomedical research at UTEP, accompanied by millions in funding from the National Institutes of Health and other agencies, led to the recent construction of the \$45.1 million Bioscience Research Building. Located near the heart of the campus, the five-story structure features new state-of-the-art laboratories and equipment.

The Bioscience Research Building and Biology Building are also home to the BBRC's core research facilities, which include laboratories for analytical cytology, cell culture and statistics, and facilities for biomolecule characterization and DNA analysis.



HIV Vaccines

Helping T cells find their targets

There is no cure for AIDS, a pandemic that has killed more than 25 million people since 1981, according to United Nations estimates.

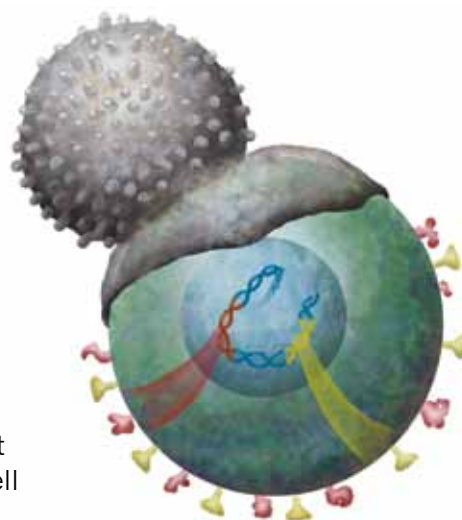
Therefore, researchers around the world are focusing their energy on developing a vaccine for the HIV virus that causes AIDS.

HIV vaccine research is taking place at UTEP as well, led by Biological Sciences Professor June Kan-Mitchell, Ph.D.

Kan-Mitchell has two major projects underway that are investigating ways to make T cells (a white blood cell that plays a major role in the body's immune response system) effective as a vaccine for the HIV virus.

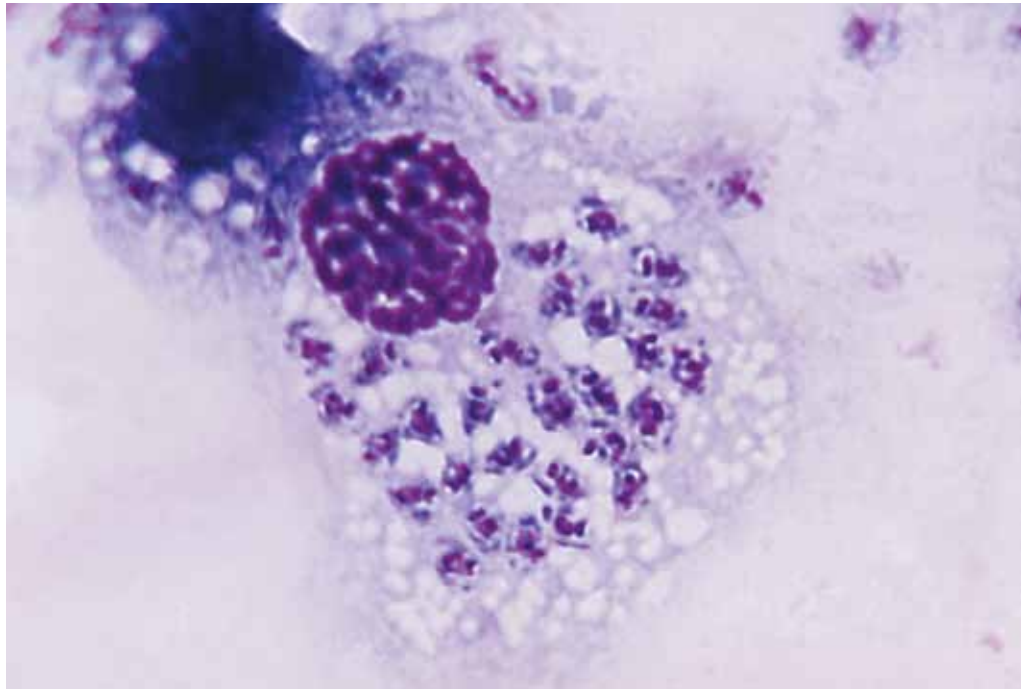
The pursuit of an HIV vaccine holds particular importance for the Hispanic community, where the rate of new HIV infections is three times that of Caucasians, according to the Centers for Disease Control. In 2005, AIDS was the fourth leading cause of death among Hispanic men and women aged 35–44.

Kan-Mitchell's research is funded by \$4.8 million in highly competitive R01 awards from the National Institutes of Health. Her research may also hold potential for the development of vaccines against certain human cancers.



June Kan-Mitchell, Ph.D.

“The objective is to develop novel vaccine concepts to better combat HIV, and possibly, various human cancers.”



Chagas Disease

Common to Latin America, Chagas creeps into the U.S.

Spread by a parasite-laden insect known as the kissing bug, Chagas disease is endemic throughout Latin America, infecting about 11 million people. Chagas can lead to miserable gastrointestinal problems and even deadly heart conditions.

With immigration to the United States from Latin America increasing, the Centers for Disease Control estimates that at least 100,000 people in the United States are infected with Chagas. Screenings of blood donations has shown that one in every 27,500 donors tests positive for Chagas, with significantly higher rates in states with large Hispanic populations.

At UTEP, Biological Sciences Associate Professor Igor Almeida, Ph.D., is studying the Chagas' parasite, *Trypanosoma cruzi*, with a goal of developing improved treatments for the disease.

Currently, antiparasitic drugs are used to treat Chagas, with mixed results. Almeida is hoping his research will lead to a vaccine.

“The social and economic burden of Chagas disease is still very high, and there is an urgent need for the development of new therapeutic approaches,” he says.

The National Institutes of Health recently awarded Almeida a five year, \$1.5 million grant for his research on the Chagas' parasite.



Igor Almeida, Ph.D.

“We have been trying to understand how the parasite is able to modulate and evade the host immune response at both acute and chronic phases of the infection.”



Diabetes and the Immune System

Understanding why patients are at risk for infection

People with diabetes commonly find themselves at risk for a variety of serious medical problems because of the body's impaired ability to fight infections.

The prevalence of type 2 diabetes, often associated with obesity, is a major concern in predominantly Hispanic communities such as El Paso. According to the Centers for Disease Control, 10.4 percent of Hispanics over age 20 have been diagnosed with type 2 diabetes, compared to 6.6 percent of non-Hispanic whites.

With a goal of finding better treatments for people suffering from the negative health effects of type 2 diabetes, Biological Sciences Associate Professor Kristine Garza, Ph.D., is working to unravel the mystery behind diabetics' weakened immune response to infection. She is focusing on leptin, a hormone known for its role in regulating body weight and metabolism.

Produced by the fatty tissue of the body, leptin also has a role in directing the response of the immune system to infections. Although obese diabetic patients have high levels of

leptin, the hormone seems to have a problem communicating with the cells that move the immune system into action against infection.

Garza is examining how leptin interacts with dendritic cells, the cells responsible for the primary response of the body's immune system.

Garza's study is funded by a four-year, \$713,000 award from the National Institutes of Health.



Kristine Garza, Ph.D.

"I have always wanted to be involved in minority education, with an emphasis on science because of my love of biology."



Taking Aim at West Nile Virus, Tick-borne Encephalitis

Investigating vaccines for viral infectious diseases

West Nile virus and tick-borne encephalitis are serious illnesses that usually begin with a fever, headache, vomiting and other miseries. In some cases, symptoms worsen, leading to serious neurological damage and even death.

The race is on to develop a vaccine for West Nile virus, which is spread by mosquitoes. Some vaccines are available for tick-borne encephalitis, though not yet in the United States.

At UTEP's Border Biomedical Research Center, Biological Sciences Assistant Professor Kyle Johnson, Ph.D., is part of the hunt. She is investigating the use of virus-derived self-replicating RNA molecules to develop vaccine candidates for both diseases.

Tick-borne encephalitis is typically found across Europe, Russia and Asia, home to the Ixodes species of tick that spreads the disease.

But in the United States, West Nile has been a concern since first appearing in 1999. Since then, thousands have been infected by the mosquito-borne disease. In 2007, the Centers for Disease Control documented 124 deaths in the U.S. from West Nile, 16 of them in Texas.

Johnson's projects have received multi-year awards from the National Institutes of Health totaling more than \$500,000.

Research Assets

Border Biomedical Research Center

- research.utep.edu/bbrc

Core Research Units:

- Toxicology
- Infectious Disease
- Neuroscience and Metabolic Disorders

Core Research Facilities

- Analytical Cytology
- Cell Culture
- Biomolecule Characterization
- DNA Analysis
- Statistical Consulting Laboratory



Kyle Johnson, Ph.D.

"It's interesting to work on a virus that emerged in the Western Hemisphere relatively recently. West Nile virus is of particular importance to the border, since we have cases here every summer."



Community Health/Hispanic Health Disparities





COMMUNITY HEALTH AND HISPANIC HEALTH DISPARITIES

The critical health issues and needs of the predominantly Hispanic El Paso community frequently shape the direction of UTEP's research.

Access to health care and poor health outcomes are a concern that led to the establishment in 2003 of the Hispanic Health Disparities Research Center, a collaborative effort between UTEP and the University of Texas at Houston School of Public Health-El Paso Regional Campus.

The HHDC's mission is to research and find solutions to health inequalities—poor health outcomes and lack of access to care in certain population groups, such as minorities, the elderly and the poor.

Center projects have included studies of the effectiveness of group mentoring for elderly Mexican-American diabetics; a resistance-training program to improve the fitness of Hispanic children; self-care strategies and depression among adult Mexican Americans; and many others.

The center recently received a five-year, \$6.8 million award from the National Institutes of Health to support its research.

Public health is a research focus among several other academic disciplines across the university, including biological sciences, geological sciences, engineering and psychology.

The projects include studies of lead levels in El Paso neighborhoods, how dust and traffic pollution affect asthma, programs for reducing smoking and binge drinking, and research on obesity and cardiovascular health.



A Breath of Fresh Air

Asthma research to help border children

Asthma, a chronic respiratory illness that causes wheezing and shortness of breath, is a serious health problem along the border.

Minorities, people with low incomes, and children living in inner cities are at higher risk for asthma attacks than the general population, according to the Centers for Disease Control. The disease is also one of the leading causes of school absenteeism.

To help understand the impacts of asthma in our community, UTEP and the University of New Mexico are collaborating on a five-year project that will examine the relationship between air, soil, household environment and asthma in El Paso children.

The study's official name is the UTEP-UNM Health Sciences Center Advanced Research Cooperation in Environmental Health Program on Border Asthma, but is better known as the ARCH program. It is supported by a \$5 million grant from the National Institutes of Health.

Geological Sciences Professor Nicholas Pingitore, Ph.D., is the ARCH program director at UTEP. He will help lead an interdisciplinary team of engineers, scientists

and health researchers from the two universities on the project.

The research includes household health surveys and environmental assessments, innovative testing of lung function in children and in-depth analysis of the area's air.

Other studies include the effects of pollutants on cells, and a geographic analysis of environmental quality and asthma occurrence.



Nicholas Pingitore, Ph.D.

"At the heart of the NIH program is the chance to give UTEP and its researchers an opportunity to greatly upgrade our environmental health research capacity."



Encuentros

Studying lead exposure in border children

The El Paso-Juárez area shares a history of mining, industrial activity, heavy vehicle emissions and neighborhoods with old homes—factors that increase the risk of childhood exposure to lead. Lead poisoning can cause learning disabilities and behavioral problems.

Researchers headed by Nursing Professor Maria Amaya, Ph.D., embarked on the Encuentros Binational Community Lead Project, an ambitious study designed to gather an accurate picture of lead contamination throughout the metroplex by measuring the metal's levels in the environment as well as in the blood of children.

Preliminary results show higher lead levels around the industrial districts in the urban core of El Paso, including the area near a closed smelter.

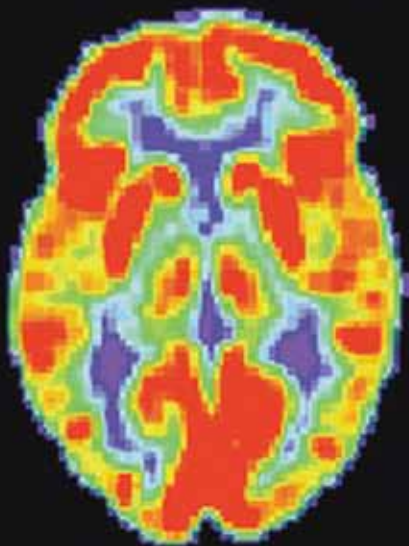
Amaya's team will gather measurements in Juárez, Mexico, to get a binational grasp of the lead problem. The Encuentros project also will develop a strategy with community partners to educate the public about the health risks of lead contamination.

Encuentros is supported by a \$1.76 million grant from the National Institutes of Health.

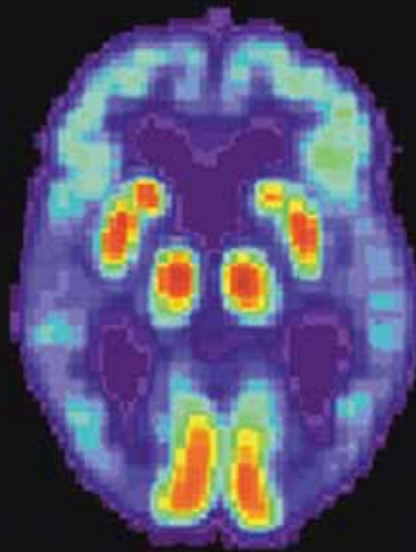


Maria Amaya, Ph.D.

"Poorly educated people on our border need to realize that lead exposure for young children can cause learning disabilities and that may be why children are having such a hard time learning English."



A scan of a normal brain.



A scan of a brain with Alzheimer's disease.

UTEP's First Biotech Commercialization

SeneXta therapeutics to develop UTEP researcher's Alzheimer's drug discovery

A promising drug therapy for Alzheimer's disease invented by Professor of Psychology Donald E. Moss, Ph.D., has been licensed to Swiss-based SeneXta, the first biotechnology company spawned from UTEP intellectual property.

Moss' patented drug therapy involves the use of a compound known as methanesulfonyl fluoride (MSF). In his research, Moss discovered that MSF could be an effective treatment for Alzheimer's patients, and plays a key role in memory, learning and other brain functions.

"In our preliminary trials, we discovered that MSF produces substantially more cognitive improvement than has been reported for other Alzheimer's drugs in this class," Moss says. "Also, MSF's unique properties permit delivery of an appropriate therapeutic dose without the side effects of nausea, vomiting and diarrhea."

"We are excited to sign this agreement with UTEP and look forward to establishing a solid and long-lasting collaboration with the University. MSF holds great potential in treating patients with Alzheimer's disease and stroke," says Enrico Braglia, CEO and founder of SeneXta.



Donald E. Moss, Ph.D.

"I am really pleased we are at a point where we have a product that can be commercialized."



Solving Addictive Behavior

Researchers study nicotine addiction among adolescents

It's no secret that a large number of adolescents smoke. A 2005 study by the Centers for Disease Control reported that 23 percent of high school students admitted they smoked cigarettes in the past month.

Laura E. O'Dell, Ph.D., an assistant professor of psychology at UTEP, is working to understand why adolescents seem more vulnerable than adults to tobacco addiction.

The National Institutes of Health has awarded O'Dell a five-year \$1.5 million RO1 research grant to study the mechanisms of nicotine reward and withdrawal during adolescence.

Her team is trying to find out whether the effects of nicotine or nicotine withdrawal are age- or sex-dependent by studying the neural mechanisms that mediate nicotine abuse.

"This is an addiction that we need to understand not just from a sociological perspective, but from a biological perspective," says O'Dell, who teaches a Drugs of Abuse and Behavior course that focuses on the neural basis of addiction.



Laura E. O'Dell, Ph.D.

"Our goal is to try to understand from a behavioral and neurochemical level what happens when adolescents get addicted to nicotine."



Fit for Life

Understanding lifestyle and cardiovascular health

It's well known that Hispanics as a group have high rates of obesity, a condition that opens the door to diabetes, cardiovascular disease and other serious health problems.

What is it about the Hispanic lifestyle that leads to unhealthy weight gain? Is it simply a lack of exercise and poor diet, or is there more to the picture?

Chantal Vella, Ph.D., assistant professor of kinesiology, is attempting to answer these questions by focusing on the lifestyles of Hispanic women in the Paso del Norte region.

The study, supported by a \$333,000 grant from the National Institutes of Health, will examine women who have normal weights, but are considered “metabolically obese.” This means that despite the healthy number on the scale,

the women have a higher percentage of body fat, reduced aerobic fitness and other conditions that make them predisposed to obesity and poor cardiovascular health.

Vella's team will look at metabolism, diet, lack of exercise and other factors involved in obesity and cardiovascular disease. The study could help lead to better interventions and care for this population, who, because they are normal weight, may not be aware that they are at risk.



Chantal Vella, Ph.D.

“We are trying to find out what is contributing to this metabolic obesity, and the next step will be how we can address it.”



Back to BASICS

Reducing binge drinking among college students

As college campuses nationwide grapple with the problem of binge drinking, UTEP researchers are reporting success with a unique program that has significantly reduced the dangerous practice among its students.

The Brief Alcohol Screening and Intervention for College Students, or BASICS, program assesses students' drinking habits and identifies those who are or are at risk of becoming binge drinkers.

After learning how to properly monitor their drinking, drink in moderation and avoid situations that result in overdrinking, the number of students in the BASICS program considered at-risk for binge drinking dropped by two-thirds, says Joseph W. Tomaka, Ph.D., a health promotion associate professor and director of the university's BASICS program.

"The impact our program has had has been very encouraging," says Tomaka. "Our message is that it's best not to drink, but if you're going to do it, do it knowing the facts and drink safely, responsibly."



Joseph W. Tomaka, Ph.D.

"We believe that our project can become a model for the way that college campuses provide intervention services for risky alcohol use, both nationally and among campuses with high Hispanic enrollments."



Smoking Hits a StopLite

Psychology lab helps El Pasoans say no to cigarettes

Kicking bad habits means changing behavior, and this is why psychology plays a big part in improving health conditions of El Pasoans.

At the Prevention and Treatment in Clinical Health Laboratory in the Department of Psychology, Assistant Professor Theodore V. Cooper, Ph.D., and his team investigate methods of disease prevention and health promotion, with an eye on issues such as alcohol, drug and tobacco use. Many of the projects in the PATCH lab, as it is better known, focus on Hispanics in the El Paso and Juárez area.

With the support of the Paso del Norte Health Foundation, the laboratory is involved in a number of projects dealing with tobacco use among Hispanics. The data gathered is being used to tailor smoking cessation programs toward that demographic.

PATCH is an example of how researchers are translating laboratory work into real-world solutions. One of the lab's major initiatives is StopLite, a program aimed at helping light smokers kick the habit before it turns serious. StopLite uses counseling,

behavioral and health therapies, and person-to-person contact to educate participants on the health benefits of quitting.

"We're trying to uncover the issues behind this habit, in order to help people quit, get healthy, and ultimately save lives," Cooper says.



Theodore V. Cooper, Ph.D.

"A lot of times they just need to be informed, educated, and it turns the light on for them. They learn it's never too late to quit."



Medication Literacy

Helping pharmacists and promotoras educate patients

Poor health outcomes often can be traced to patients who don't understand the correct way to use medications.

The UTEP-UT Austin Cooperative Pharmacy Program, under the direction of Clinical Associate Professor José O. Rivera, Pharm.D., is tackling this problem with a medication literacy study supported by a \$180,000 grant from the Paso del Norte Health Foundation.

Pharmacy researchers are conducting medication-literacy assessments in the community and also are developing educational materials for use by *promotoras* (community health educators) and pharmacists.

The Cooperative Pharmacy Program also is responsible for the Herbal Safety Web site at www.herbalsafety.utep.edu. The popular site is an outstanding resource for medical professionals and the general public who want to learn more about the drug interactions of medicinal herbs. Fact sheets on herbs are available for download in both English and Spanish.

Research Assets

Hispanic Health Disparities Research Center - www.hhdrc.org

Encuentros Binational Community Lead Project - encuentros.utep.edu

Prevention and Treatment in Clinical Health (PATCH) Laboratory - academics.utep.edu/patchlab

- Tobacco cessation programs
- Binge drinking studies
- Prescription drug misuse studies

Department of Kinesiology Laboratories

- Human Performance Laboratory
- Kinesiology Fitness Research Facility
- Stanley E. Fulton Biomechanics and Motor Behavior Laboratory



José O. Rivera, Pharm.D.

“Mexican-Americans appear to have a higher usage rate of complementary and alternative medicine compared with national trends.”





BRINGING COMPUTING POWER TO INTERDISCIPLINARY RESEARCH

With a strong tradition of collaboration across the University, the Department of Computer Science at UTEP uses its expertise and high-performance computing centers to address problems in many fields, from engineering and environmental science to transportation and geosciences.

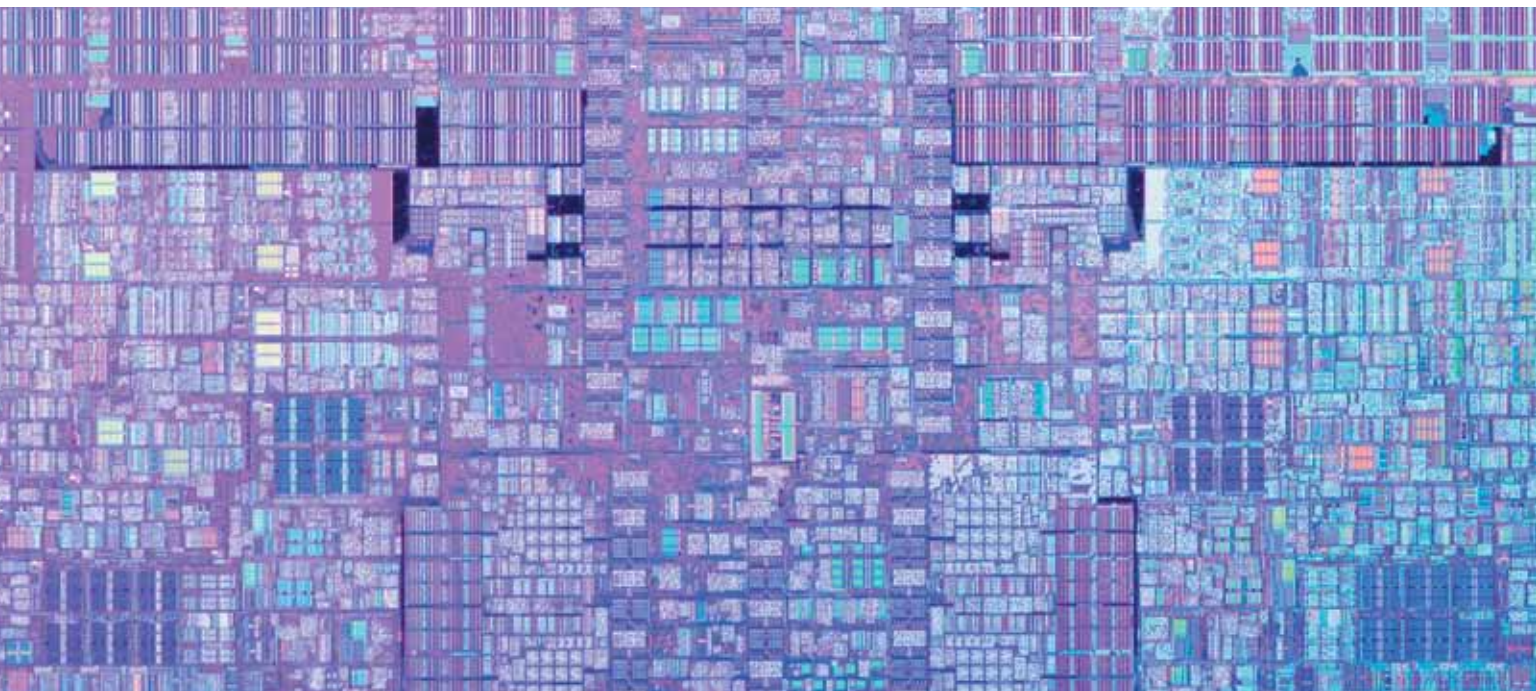
This interdisciplinary spirit can be seen in the new Cyber-ShARE Center of Excellence at UTEP, a facility that brings together experts in computer science, mathematics, and Earth and environmental science to develop software applications, services, and other digital tools for gathering and computing data over the Web for scientific research.

UTEP computer science researchers use computer theory and software engineering to find practical solutions to complex problems. Some examples include:

- Designing adaptable operating systems for high-performance, extreme scale computing systems
- Using spoken dialog to improve human and computer interaction
- Developing a Web-based application for tracking shipments from Mexican maquiladora factories to U.S. ports of entry
- Investigating the use of smart cards for border crossings and tracking health care information

Also, researchers across campus who need much more than desktop computing power have available to them UTEP's High Performance Computing Center, which offers Beowulf-class Linux clusters and symmetric shared-memory multiprocessor systems.

UTEP's computer science researchers are connected to colleagues around the world through the high-performance fiber optic network of Internet2, a research and development consortium of more than 200 universities.



Launching DAiSES

Researchers build a better operating system

Typical computer operating systems are designed to handle the computations and resource requests of multiple applications in a “fair” way across the board. But that means some applications—especially those used in high-performance computing—have to sacrifice performance.

It’s that problem that led Computer Science Professor Pat Teller, Ph.D., to launch DAiSES—Dynamic Adaptability in Support of Extreme Scale Systems—to develop a dynamic operating system, one that monitors the computer’s performance and adapts by evolving operating system modules to provide the best possible environment for applications.

The DAiSES work uses the kernel for Linux, the open-source operating system. The project is supported by a \$1.5 million award from the Department of Energy.



Pat Teller, Ph.D.

“The central theme of our research is to make operating systems truly ‘intelligent’ and automatically and dynamically adaptable.”

Cyberinfrastructure

Systems for accessing immense amounts of data

The Cyber-ShARE Center of Excellence at UTEP, launched in 2007, is a campus facility for researchers and educators around the world to share information and advance their studies.

One current Cyber-ShARE project has geophysics and computational mathematics researchers working together to harness vast amounts of geological data to create accurate 3-D images of earth structure. A second project focuses on improving the collection of data in environmental sciences.

The center is part of a major National Science Foundation initiative to improve the performance of the nation's cyberinfrastructure—the immense amounts of useful data and high-performance computing power shared by researchers over the Internet. The Cyber-ShARE program is funded by a \$5 million grant from the NSF.

“Traditionally, research is done at large institutions throughout the world and it's difficult to share the information others are working on,” says primary investigator Ann C. Gates, Ph.D., Computer Science Professor and Associate Vice President for Research in the Office of Research and Sponsored Projects at UTEP. “But the whole promise of cyberinfrastructure is that it breaks down those boundaries and allows scientists and educators to do state-of-the-art research.”



Ann C. Gates, Ph.D.

“The Cyber-ShARE team envisions a center in which students and faculty from all disciplines can gather to discuss, brainstorm, and search for solutions to problems.”

Man and Machine

Improving computer speech recognition

Whether it is at the desk or on the other end of the phone, a computer isn't an ideal partner for a conversation, says Nigel Ward, associate professor of computer science.

“The range of applications for spoken dialog systems today is very limited: only information access and very simple transactions are commonly supported, and even these are generally disliked and used only when people find it impractical to use the Web,” says Ward.

Ward studies the nuances of human conversation, such as rhythm, timing and intonation, to improve speech-recognition programs. His study of speech also has led him to develop software toolkits for phonetic analysis.

Research Assets

Cyber-ShARE Center of Excellence -

www.cybershare.utep.edu

- Trust and uncertainty management
- 3-D geological imaging
- Optimizing data in environmental research

DAiSES Lab - research.utep.edu/daises

- Enhance OS performance in extreme-scale computer systems

Interactive Systems Group -

www.cs.utep.edu/isg

- Spoken-language human-computer interaction
- Computational linguistics

TRACS Center -

research.utep.edu/tracs

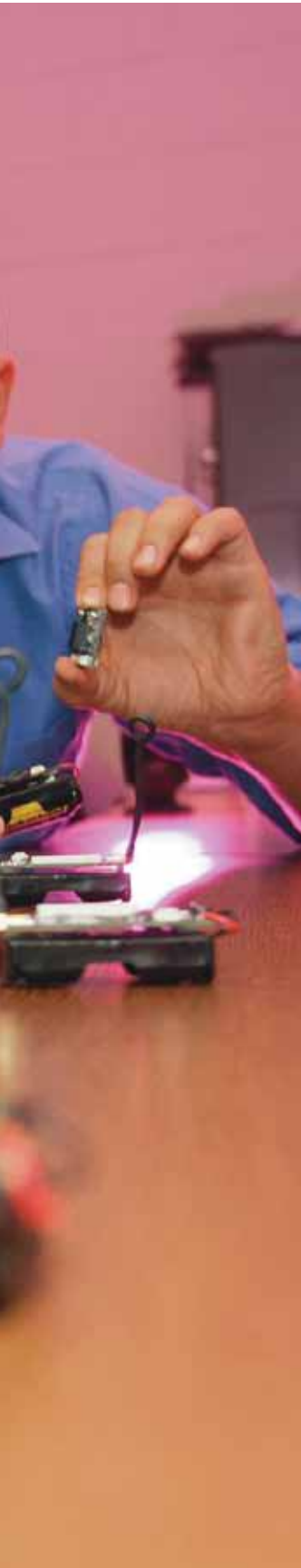
- Electronic money and security
- Interval and fuzzy methods in uncertainty
- Geoinformatics



Nigel Ward, Ph.D.

“Our research in the Interactive Systems Groups could lead to more responsive and accurate spoken dialog systems between customers and computers at the other end of the telephone line.”





UTEP IN IDEAL POSITION FOR GOVERNMENT AND INDUSTRY PARTNERSHIPS

Our border location and proximity to Fort Bliss and White Sands Missile Range makes UTEP uniquely positioned as one of the nation's leading hubs for homeland security and defense research.

UTEP is home to the Center of Excellence for Border Security and Immigration, and the Center for Defense Systems Research. The centers are overseen by the Office of Strategic Initiatives, headed by Vice President for Strategic Initiatives, Ret. Army Brig. Gen. José D. Riojas.

The Border Security and Immigration center is working with partner universities across the country on research projects that focus on surveillance and tracking technologies, border inspection processes, migrant population flows and much more. The center was established in 2008 with a \$6 million grant from the Department of Homeland Security.

Initial projects at the Center for Defense Systems Research include research on miniature tracking sensors and software for visual sensing and image dissemination. Also, Fort Bliss is home to a test brigade for the Army's Future Combat Systems, and this is expected to lead to future research opportunities on defense technologies at UTEP.

Intelligence programs also are a significant part of the defense and homeland security focus at UTEP. The Intelligence Community Center of Academic Excellence was established in 2007 with a grant from the Office of the Director of National Intelligence to boost the numbers of qualified graduates for positions in the intelligence community. The University also offers a Master of Science degree and undergraduate and graduate certificates in Intelligence and National Security Studies.

Additionally, UTEP Associate Professor of Psychology Christian Meissner, Ph.D., is studying law enforcement interrogation methods with support of an award from the Department of Defense. Meissner's group in the Investigative Interviewing Research Laboratory is identifying interrogation techniques that produce accurate information while reducing the likelihood of false confessions.



Ret. Army Brig. Gen. José D. Riojas



Christian Meissner, Ph.D.



MEMS and “Smart Dust” Sensors

Security applications for networked micro-devices

Gerardo Rosiles, Ph.D., assistant professor of electrical and computer engineering, is exploring the use of wireless sensors as a tool for border security and defense applications. His research is supported by an \$850,000 grant from the Department of Defense.

“Picture hundreds or even thousands of small devices scattered by plane or by truck over a place that you want to monitor,” says Rosiles. “They communicate with each other and they organize themselves to deliver the big picture of what is happening in that area. They can be outfitted with just about any kind of sensor available—acoustic, seismic, magnetic, light and pressure.”

The technology of very small devices used in this kind of sensor network is known as MEMS, an acronym for microelectromechanical systems.

Rosiles’ team has used off-the-shelf parts to build matchbox-sized sensors to test the devices’ wireless communications, but the day will likely come when the sensors can be manufactured on a micro scale—perhaps the size of a grain of sand or even smaller.

Researchers use the term “Smart Dust” to describe a hypothetical network of these kinds of sensors.

Research on this kind of MEMS device manufacturing is happening at the W.M. Keck Center for 3D Innovation. Here, Assistant Professor of Electrical and Computer Engineering Eric MacDonald, Ph.D., and Mechanical Engineering Professor Ryan Wicker, Ph.D., are using rapid-prototyping technology to create and test prototypes of MEMS devices.



Gerardo Rosiles, Ph.D.

“Wireless sensor networks have potential applications beyond border security. They also could be used for monitoring land conditions to improve farming, or installed in industrial machinery to catch problems before they become expensive repair jobs.”

FAST Center is Back

NASA spacecraft, unmanned aerial vehicles among new projects

UTEP's Future Aerospace and Technology (FAST) Center, which was active from 1995 to 2001 under a U.S. Air Force Office of Scientific Research contract, is back in business with several high-tech projects.

Lockheed Martin Space Systems has tapped the center for a project involving NASA's Orion Crew Exploration Vehicle, a replacement for the agency's venerable Space Shuttle.

Boeing's Space Exploration division also is working with the FAST Center on project research for the International Space Station, including development of software for the station's power system and a simulation of walking and running in zero gravity.

Other projects in the pipeline include an unmanned aerial vehicle test center, in partnership with the Army Research Laboratory and White Sands Missile Range. The Army's Future Combat Systems program at Fort Bliss also is expected to lead to research opportunities for the center's faculty and students.

"We're right in the middle of a big area in engineering," says Associate Professor of Civil Engineering Cesar Carrasco, Ph.D., director of the FAST Center. "Aerospace engineering is an area that's underrepresented in this area."



Cesar Carrasco, Ph.D.

"Our role as a university is to prepare these students for future careers in the industry."

Research Assets

Center of Excellence for Border Security and Immigration - www.utep.edu/osi

- Surveillance and tracking technologies
- Screening, scanning and inspection processes
- Unconventional security assessments
- Migrant population flows and determinants

Center for Defense Systems Research - www.utep.edu/osi

- Functional advanced manufacturing
 - Miniaturized 3-D embedded sensors
- Software systems engineering
 - Improving dependability through rigorous testing
 - Visual sensing and image dissemination system for monitoring

Future Aerospace and Technology (FAST) Center

- Engineering research and test services

Investigative Interviewing Research Laboratory - iilab.utep.edu

- Eyewitness memory
- Detecting deception
- Interrogations and confessions

Intelligence Community Center of Academic Excellence -

- www.organizations.utep.edu/iped
- Develops core skills in national security, intelligence, foreign area studies, language proficiency and geographical expertise





ENVIRONMENTAL SCIENCE AND RESOURCE MANAGEMENT

Understanding and protecting natural resources

The duality of the Paso del Norte region—a bustling international area surrounded by vast expanses of wild Chihuahuan Desert—creates an ideal living laboratory for studying the impact of human activity on nature.

The environmental issues are as wide-ranging as the distances UTEP scientists travel to find answers. Current investigations include:

- Assessing dust and pollution's impact on air quality and the respiratory health of children
- Understanding the environmental impact of nanomaterials, increasingly being used in cosmetics, clothing, electronics and other products
- Managing the ecological damage caused by invasive plant species such as salt cedar and tumbleweeds
- Examining plant and animal life in extreme environments—from UTEP's 38,000-acre Indio Ranch in remote West Texas to the Arctic and Antarctic regions

UTEP also is taking a lead role in research on the management of water, a precious commodity in this desert region. The University recently established the Center for Inland Desalination Systems, a research facility that will collaborate with the City of El Paso's inland desalination plant, considered one of the world's largest.

UTEP's Center for Environmental Resource Management provides the leadership to coordinate University resources on environmental research relevant to the Paso del Norte region, as well as many community outreach programs dealing with hazardous waste management, and air and water quality.



Polar Explorers

Researchers travel to the ends of the Earth

A school smack dab in the middle of the Chihuahuan Desert may be the last place you would expect to find people who call glaciers, snowdrifts and frozen tundra home for a good part of the year.

But at UTEP's Systems Ecology Laboratory, here they are: a rugged crew of polar researchers led by Craig Tweedie, Ph.D., an assistant professor of biology and environmental science who is an expert on Arctic and Antarctic ecology.

Tweedie's group focuses on ecology in extreme environments. They are investigating the climate's effect on organic matter in Arctic soil and on sea ice in Antarctica.

In summer 2007, they were witness to a stunning summer melt-off of Arctic ice that made headlines around the world. Warm temperatures resulted in the opening of the Northwest Passage over Canada, a sea route that historically has been locked by ice.

"The amount of retreat in Arctic ice is absolutely unbelievable," Tweedie says. An

open Northwest Passage "has a huge capacity to change economic and social structures throughout the region."

Over the 2008 winter break, Tweedie led another group to Antarctica. The trip was part of a program funded by the National Science Foundation to offer research opportunities to minority students and schoolteachers from around the country.

The group studied plant distributions and food habits of penguin species. They also photographed glaciers to compare with historical photos for evidence of retreat or expansion.



Craig Tweedie, Ph.D.

"Our laboratory is focused on understanding the biocomplexity associated with environmental change and plant and ecosystem structure and function in extreme environments – namely Arctic tundra and the Chihuahuan Desert."



Opening the Tap

Texas invests in new UTEP desalination research center

Brackish groundwater—the undesirable salty stuff filling underground aquifers across the country—is looking more and more appealing to communities thirsty for fresh water for drinking, agriculture and industry.

It's why the state of Texas has invested \$2 million of the state's Emerging Technology Fund to create the UTEP Center for Inland Desalination Systems, a research facility that will be tasked with developing cost effective and environmentally friendly desalination technologies.

UTEP and The University of Texas System will match the \$2 million technology fund investment, and an additional \$2 million will be raised in sponsored research from industry partners to develop a world-class research facility.

"We expect to do work that might be used anywhere in the world," says Civil Engineering Professor Tom Davis, Ph.D., a nationally recognized desalination expert who has been tapped to lead the new center.

Davis, who has more than 40 years of research experience and holds 13 patents related to filtering technologies, says the

center will explore ways of transforming brine into products with commercial value. It will also work on developing portable and economical desalination equipment that could be used in remote locations, including in arid regions where military personnel may be deployed.

The center will partner on research with the City of El Paso's inland desalination plant, which taps brackish water from the Hueco Bolson to produce 27.5 million gallons of fresh water daily.



Tom Davis, Ph.D.

"We hope to deal with ways to reduce energy requirements and solve the problems of disposing of waste."



Indio Ranch

**A 38,000-acre living laboratory
in the Chihuahuan Desert**

About 100 miles east of El Paso, tucked away far from civilization, is an environmental researcher's dream: Indio Mountains Research Station, home to 38,000 acres of pristine Chihuahuan Desert.

For years, Indio Ranch, as this little-known UTEP research asset is commonly called, has been the premiere outdoor laboratory for animal and plant research. Anthropologists also have explored the ranch, documenting the trail of ancient indigenous hunters and gatherers who once lived in the region.

"There's really nothing else like it," says UTEP Biology Professor Jerry Johnson, Ph.D., director of Indio Ranch.

The ranch's remote location has enabled Johnson and other researchers to collect long-term data on rattlesnakes, scorpions and other creatures without worry of human activity that could disrupt their projects.



Jerry Johnson, Ph.D.

"In the context of UTEP's increasing commitments to the regional research and education opportunities in the environmental sciences, the station's land will add a dimension of uniqueness unavailable to any other institution on either side of the Rio Grande."



Aquatic Ecology

Managing a precious resource

Ponds, wetlands and other water sources in extreme environments such as the desert or Arctic are one of the focuses of the Aquatic Ecology Laboratory at UTEP. Lab director Vanessa Lougheed, Ph.D., an assistant professor of biology, leads a research group studying the plants and invertebrate creatures that live in these isolated sources of water.

The lab also is studying damage and restoration efforts along the Rio Grande and in the springs and wetland areas around Fort Bliss.

Another project seeks to understand and manage the ecological disruptions caused by invasive species of plants, including salt cedar and tumbleweeds.



Vanessa Lougheed, Ph.D.

“Locally, we are doing research on the development of functional indicators to track restoration efforts at the Rio Bosque Wetlands Park.”





Studying Nanotechnology's Environmental Impact

UTEP participates in \$38 million international project

The UTEP Department of Chemistry is part of a \$38 million international research project to study the impact of nanotechnology—the manipulation of matter at the atomic level—on the environment.

Funded by the National Science Foundation and the U.S. Environmental Protection Agency, the study establishes two Centers for the Environmental Implications of Nanotechnology. One will be at UCLA and the other at Duke University.

The only university in Texas to participate, UTEP joins the UCLA center, which received \$24 million. Selected for its experience in this field of research, UTEP will study the effects of metal nanoparticles on plants such as alfalfa and mesquite.

Chemistry Professor Jorge Gardea-Torresdey, Ph.D., (pictured left, forefront) project principal investigator and chemistry department chairman, says his research team will evaluate how metal nanoparticles impact a plant's biochemistry or germination.

Research Assets

Center for Environmental Resource Management -

research.utep.edu/cerm

- University-wide coordination of environmental research and outreach
- Rio Bosque Wetlands Park
 - Wetland preservation and management
- Energy Center
 - Energy efficiency and passive solar design

Systems Ecology Laboratory -

sel.utep.edu

- Understanding environmental change in extreme environments
- Developing technology to improve monitoring and predicting environmental change

Aquatic Ecology Laboratory -

ael.utep.edu

- Studying isolated ponds and wetlands in extreme environments
- Understanding causes and consequences of damage to aquatic ecosystems
- Controlling invasive plants such as salt cedar and tumbleweeds

Indio Mountains Research Station -

www.utep.edu/indio

- 38,000 acres owned and managed by UTEP

Research includes:

- Reptilian population ecology
- Rattlesnake venom analysis
- Terrestrial and aquatic arthropod ecology
- Plant surveys
- Anthropological sites





GLOBE TREKKING SCIENTISTS UNLOCK THE SECRETS OF THE EARTH

With its roots as a mining school going back nearly 100 years, UTEP has a proud legacy of geological research.

The mountainous Paso del Norte region, with its remnants of ancient volcanic activity, offers plenty of opportunities for studies in geophysics, seismology and environmental geology.

But UTEP expertise is sought all over the world. These include current earthquake research projects based in Alaska, Guatemala and the Himalayas. Seismic studies also have taken UTEP researchers to Eastern Europe, New Zealand and Libya.

The University also is leading the way in the rapid growth of Geographic Information Systems (GIS), the use of computing networks to collect, manage and share geographic information.

UTEP is home to a Regional Geospatial Service Center, one of three such facilities in Texas that provides GIS mapping systems to local emergency responders, including the Texas National Guard. The center also develops geospatial applications to support UTEP research in a variety of areas including border security, economic development and public health.

The center assisted the Texas National Guard and other emergency personnel after Hurricane Ike devastated the Galveston area in September 2008.

"They lost everything, so we sent personnel and equipment to help create data and maps with the location of hospitals and distribution points for food and water," says Center Director and Assistant Professor Raed Al Douri, Ph.D.

The center was established in 2005 with a federal award of \$2 million.



Raed Al Douri, Ph.D.

"We've helped communities before over the Internet, but this is the first time we were on the field after a major hurricane."

Research Assets

Kidd Seismological Observatory

- Five seismic stations in West Texas
- Each station is equipped with Kinematics TH-11 sensors

Pan-American Center for Earth and Environmental Studies -

paces.geo.utep.edu

- Data network for geological sciences research
- Archive of satellite and aircraft imagery
- Gravity and magnetic field data repository

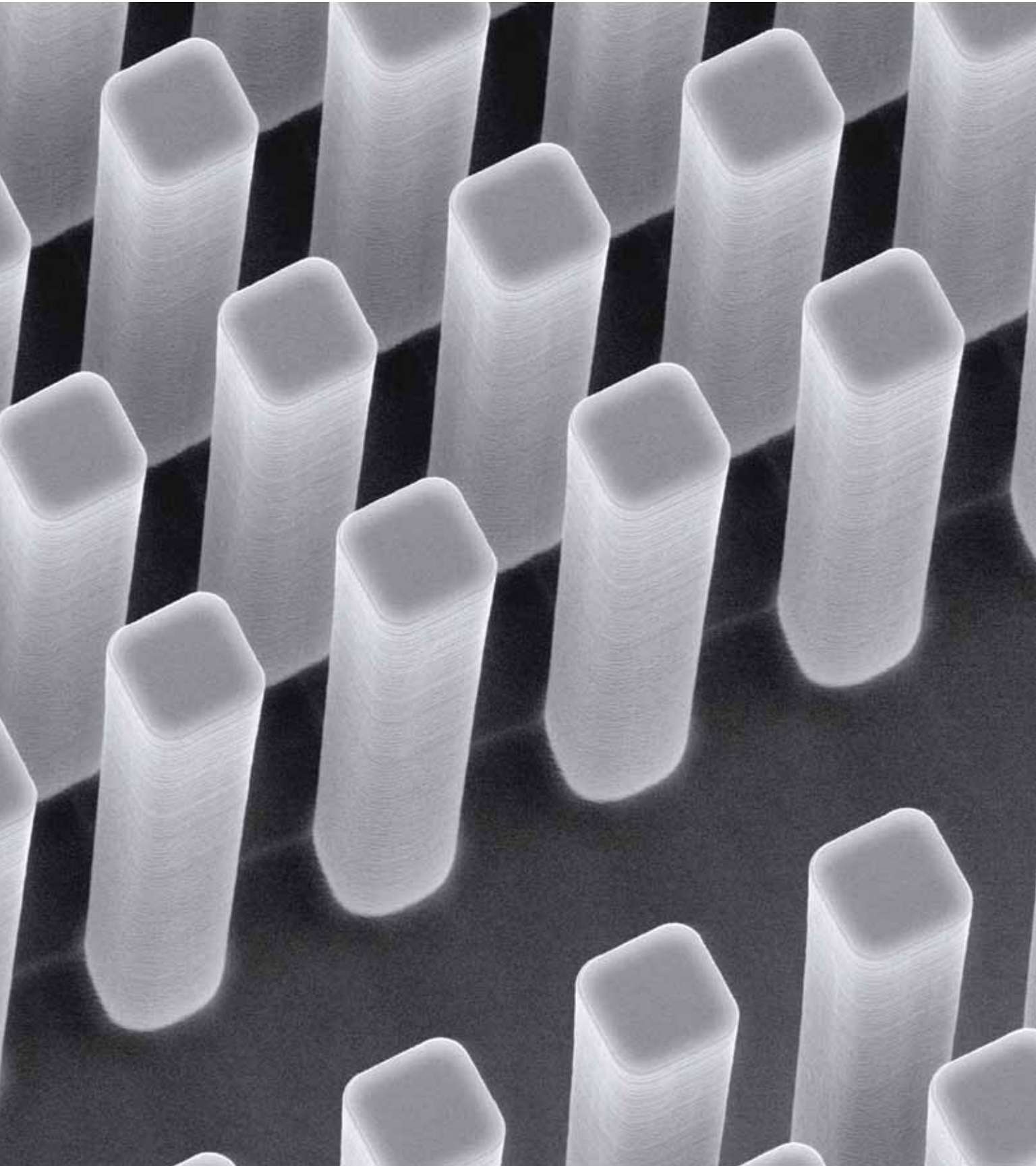
Regional Geospatial Service Center -

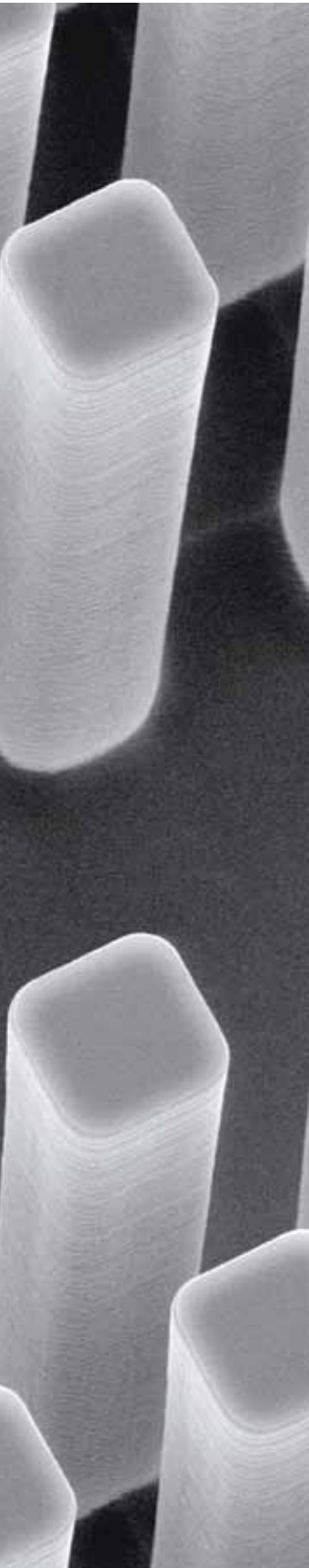
gis.utep.edu

- Maps and other geographic images and data for local emergency responders and Texas National Guard
- Web-based mapping services available to the public

Sedimentology, Aerosols and Environmental Geology Laboratory

- Chemical and granulometric analysis of soils and airborne particles





SHAPING IDEAS AND CREATING ECONOMIC OPPORTUNITY

Materials and manufacturing are two of the most dynamic fields of research at UTEP, where chemists and engineers are turning smart ideas into innovative products with commercial potential. Here are just some of their projects:

- The Materials Research and Technology Institute is creating start-up companies to market environmentally-friendly fuel and materials technologies developed by UTEP researchers.
- Carl W. Dirk, Ph.D., a professor of physical and organic chemistry, has drawn the attention of the art world with a patented light filter that protects delicate works of art from photochemical damage.
- An electrical and computer engineering research team recently produced a million-transistor microchip designed to detect electrical faults in appliances.
- At the W.M. Keck Center for 3D Innovation, research groups are developing micro-scale electronics as well as implantable devices for tissue engineering.
- Semiconductor work is being taken to a microscopic level in the College of Engineering's new NanoMaterials Integration Laboratory.
- Nanoscale research also is being conducted by Associate Professor of Analytical Chemistry Geoffrey Saupe, Ph.D., who is revealing new and unusual behaviors of materials at the nanometer level.

Throughout the University, industry and government agencies are tapping the expertise of UTEP researchers for development of innovative solutions for real-world problems.



Incubating High-Tech Businesses

Start-ups bring jobs and research investment to El Paso

Professor Russell Chianelli, Ph.D., director of the Materials Research and Technology Institute (MRTI), is helping take UTEP research to a new level by finding ways to turn laboratory breakthroughs into potentially profitable products.

Chianelli and Lori Ann Polette-Niewold, his Ph.D. student at the time, formed Mayan Pigments, Inc. in 2005 to market one of their discoveries: an environmentally friendly technology for producing durable paints and pigments.

Other start-ups spawned by technologies developed at the institute reflect Chianelli's research interest in petroleum and biofuels. They include: Refinery Science, Inc., which markets technologies for a cost-effective means of producing clean transportation fuels from low-quality petroleum sources; and Transglobal Oil Corp., which develops methods of using photosynthetic organisms in refinery waste for the production of biodiesel fuel.

Mayan Pigments recently received an investment of \$250,000 from the Texas Emerging Technology Fund.

Chianelli said it has been exciting to see how his and Polette-Niewold's vision of Mayan Pigments has grown and expanded.

"The UTEP environment has been so nurturing," he says. "And this is only the beginning. You don't always have to look to Austin or Houston for energy innovation. It's here in El Paso."



Russell Chianelli, Ph.D.

"MRTI also seeks to support and assist the Materials Science and Engineering academic program and develop commercial opportunities and generate local businesses that provide jobs for UTEP graduates."



Catching Rays

Light filter protects masterpieces

It's a Catch-22 for museums: drawings, watercolors and other delicate masterpieces often must be kept hidden away in dark storage rooms, because displaying them would expose them to damage from light.

But UTEP Chemistry Professor Carl W. Dirk, Ph.D., believes he's found a way to free the precious works from their gloomy museum cells.

Dirk has invented a light filter that removes a significant amount of damaging light, without leaving patrons in the dark.

"We can actually slice out parts of the visible light spectrum that you don't need to see the object," Dirk says.

The invention has drawn the interest of the Getty Conservation Institute, which is partnering with Dirk and the Georgia O'Keeffe Museum in Santa Fe, N.M., to create a special set of filters for a display of O'Keeffe's art.

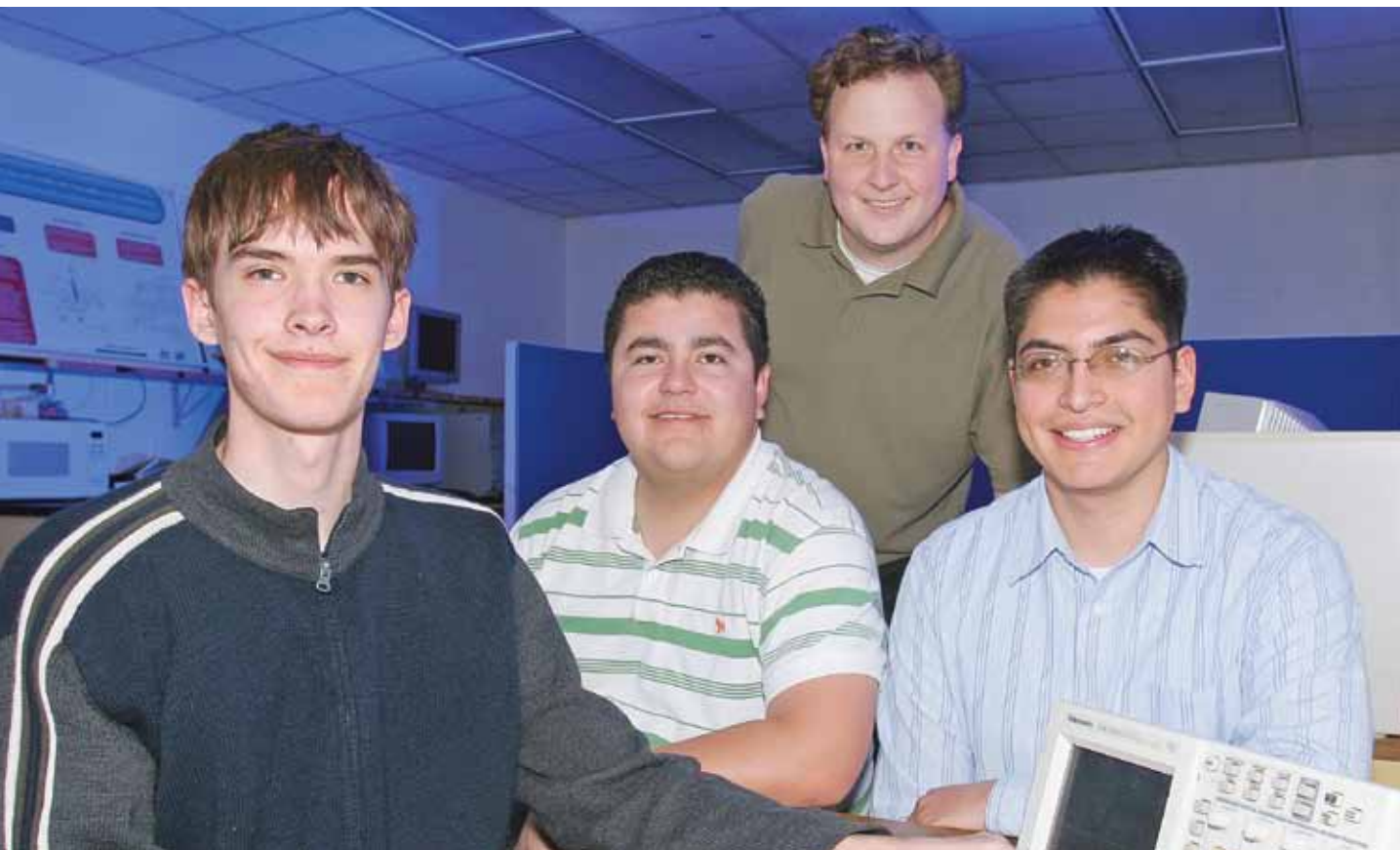
Dirk's research also was highlighted at the California Science Center in Los Angeles in an exhibit titled FADE: The Dark Side of Light.

"It is a special privilege for academic scientists to work on projects like this. Developing a practical solution for this lighting problem has been a high point for my career," says Dirk.



Carl W. Dirk, Ph.D.

"Scientists usually work on abstract things. This is rewarding because people can understand it and appreciate it."



A Million on One

Team designs record-breaking microchip

Researchers led by Assistant Professor of Electrical and Computer Engineering Eric MacDonald, Ph.D., produced a microchip designed to prevent appliance fires by detecting electrical faults.

About the size of a pencil eraser, the chip is loaded with one million transistors, each 200 times thinner than a human hair. The number of transistors is the most ever for a UTEP chip design, and among the largest produced by a Texas university, MacDonald says.

David Nemir, a former UTEP professor who operates El Paso-based engineering company X-L Synergy, approached MacDonald with the concept for the chip. Nemir and former UTEP computer engineering instructor Jan Beck developed a complex mathematical algorithm for detecting and shutting down electrical arc faults.

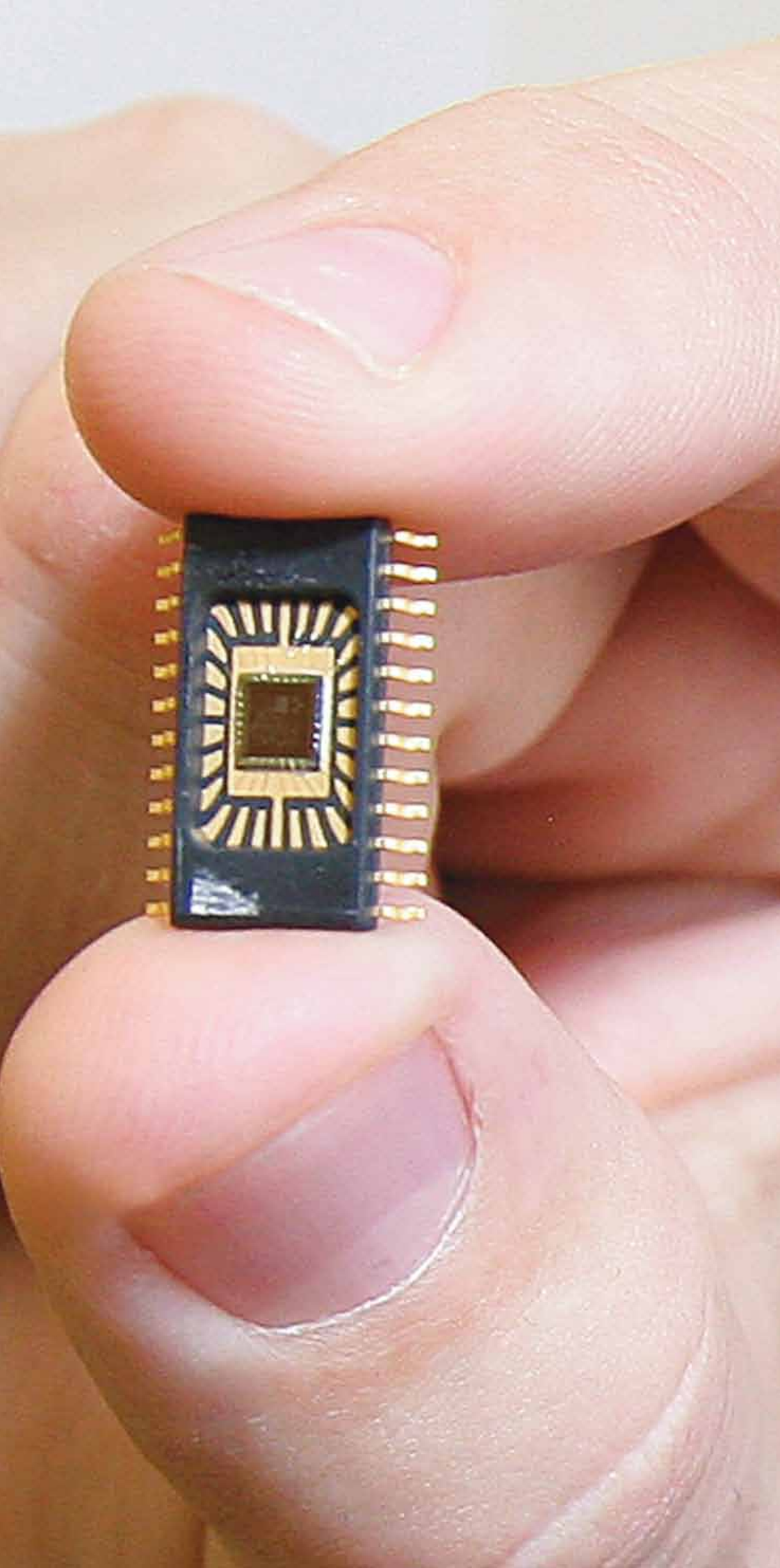
“(Nemir) wanted to prove that the algorithm worked, and the project gave me an opportunity to offer a group of graduate students some real industry experience,” says MacDonald.

The unique chip performs the calculation in real time, eliminating delays between the discovery of the arc and shutdown of the unit.



Eric MacDonald, Ph.D.

"I'm looking forward to more student success stories as the college expands its chip-development capabilities."



Research Assets

Materials Research and Technology Institute -

research.utep.edu/mrti

- Interdisciplinary research
- Business incubator
 - Mayan Pigments, Inc.
 - Refinery Science, Inc.
- Materials Corridor Partnership Initiative
 - Energy efficient, environmentally friendly materials for sustainable economic development

NanoMaterials Integration Laboratory -

research.utep.edu/nanomil

- Nanotechnology applied to semiconductor materials and devices
- Integration of nanoscale matter with millimeter-scale assemblies

Research Institute for Manufacturing and Engineering Systems -

rimes.utep.edu

- Model-based systems engineering
- Systems architecture
- Trade-off studies
- Reliability analysis
- Risk management and analysis

W.M. Keck Center for 3D Innovation -

research.utep.edu/wmkeck

- Advanced imaging, modeling and manufacturing
 - Stereolithography
 - 3-D Printing
 - Fused Deposition Modeling
 - Selective Laser Sintering



ENGINEERS PROVIDE SERVICES TO GOVERNMENT AGENCIES

The City of El Paso, the El Paso Metropolitan Planning Organization and the Texas Department of Transportation all have one thing in common: they turn to UTEP for answers to their transportation engineering questions.

The College of Engineering’s Center for Transportation Infrastructure Systems, directed by Civil Engineering Professor Soheil Nazarian, Ph.D., is where most of the research happens.

The center brings together more than 50 engineering students involved in a variety of projects, including the testing of road building materials,

the design of engineering instrumentation and the planning of effective traffic management systems.

The Texas Department of Transportation recently awarded CTIS more than \$1 million for four projects. They include a system to eliminate pushed and rutted pavement caused by large vehicles that stop; developing ways to predict the corrosion of metal retaining wall reinforcements; and two projects investigating the use of recycled materials in road construction.

“These two projects will not only reduce the cost of road construction, but they

also have positive environmental impact since they promote reuse of materials that otherwise had to be landfilled,” says Nazarian.

Closely associated with CTIS is UTEP’s Border Intermodal Gateway Transportation Laboratory, directed by Ruey Long (Kelvin) Cheu, Ph.D., associate professor of civil engineering. As its name suggests, the lab studies the domestic and international movements of cars, trucks, trains and airplanes, as well as pedestrians and freight.

Projects at the BIG lab include traffic simulation models for U.S.-Mexico border crossings and bus rapid-transit planning and analysis for Texas cities.

Street-smart invention

Researchers led by Nazarian invented a portable seismic pavement analyzer (PSPA) that is being used by transportation and aviation agencies as well as the military to assess the quality of pavements during and after construction. With this device, engineers can measure the properties of pavement layers and structures at a level of certainty and detail that has not been available to the industry before.

Nazarian used high-frequency seismic and sonic technology to develop the PSPA, which is marketed to transportation agencies, engineering firms and the military by Geomeia Research and Development.

This technology was honored with a Top 10 Innovations award by the Texas Department of Transportation and brings in patent income to UTEP and the inventors.



Soheil Nazarian, Ph.D.



Kelvin Cheu, Ph.D.





Research Assets

Center for Transportation Infrastructure Systems – ctis.utep.edu

- Materials, design and construction
- Transportation planning
- Instrumentation
- Non-destructive testing

Border Intermodal Gateway Transportation Laboratory – www.utep.edu/biglab

- Domestic and international movements of vehicles, people and freight
- Emergency service operations and transportation security





ATTRACTING TALENTED STUDENTS TO SCIENCE AND ENGINEERING FIELDS

Whether it is protecting the environment or improving the health and safety of residents, UTEP is committed to using its research strengths to benefit the Paso del Norte region.

But perhaps the most valuable result of our research can be seen in the scientists, engineers, health professionals and others who earn their degrees and go on to teach, build and heal.

UTEP is proud to be involved in a tremendous number of efforts designed to recruit and retain new researchers, particularly ethnic minorities and others who traditionally have been underrepresented in the fields of science, technology, engineering and mathematics.

Inspiring New Researchers





U.T. System LSAMP

The Louis Stokes Alliance for Minority Participation program seeks to increase the number of underrepresented minority students pursuing careers in science, technology, engineering and mathematics careers. Qualified sophomores and juniors participate in summer research academies, and key faculty and administrators are involved in identifying, nurturing, mentoring and monitoring the progress of LSAMP students.

IPY-ROAM

The International Polar Year – Research and Educational Opportunities in Antarctica for Minorities program offers university students and high school teachers from throughout the United States opportunities to gain hands-on experience in field research in Antarctica.

Intelligence Center for Academic Excellence

The Intelligence Center’s mission is to prepare students of all backgrounds for positions in the intelligence community. Graduates become proficient in the study of national security, intelligence, foreign area studies, language proficiency, geographical expertise and related competencies.

Pathways to the Geosciences

The Pathways program seeks to increase the number of Hispanic students who earn undergraduate and graduate degrees in the geosciences. Pathways brings together high school students and teachers in a summer research experience designed to introduce the geosciences and their connections with other disciplines such as biology, chemistry and physics.

MBRS-SCORE

The Minority Biomedical Research Support and Support of Continuous Research Excellence programs at UTEP take an interdisciplinary approach to solving health problems while increasing the number of underrepresented minorities in biomedical sciences.

RISE Scholars

The Research Initiative for Scientific Enhancement program provides stipends to qualified students in biological sciences and engineering to perform undergraduate research. The students are paired with a faculty mentor during the research experience.

El Paso T-STEM Center

The T-STEM Center assists math and science teachers in developing high quality curriculum and instruction programs to ensure high academic achievement in mathematics and science in K-12 students.



Future Facilities of UTEP Research Programs



Scheduled to open in spring 2011, the College of Health Sciences/School of Nursing building is a \$60 million, 130,000-square-foot facility that will include classrooms, simulation laboratories and research space. The heart of the facility will be a 16,000-square-foot center where students will train using interactive patient mannequins.



UTEP's new Chemistry and Computer Science Building is expected to open in 2011. The \$70.2 million building will feature 140,000 square-feet of classroom and laboratory space.



Provost/Vice President for Academic Affairs and College Deans



Richard S. Jarvis, Ph.D.

Provost/Vice President for Academic Affairs
Research expertise: Higher Education
Administration, Geography, Geomorphology



Robert L. Anders, Dr PH

Dean - School of Nursing
Research expertise: Health Disparities,
Psychiatric Mental Health Nursing,
Nursing Administration, Health Care Outcomes for
the Mentally Ill



Kathleen Curtis, PT, Ph.D.

Dean - College of Health Sciences
Research expertise: Prevention of
Secondary Disabilities in Spinal Cord
Injury; Aging and Health Issues in Women
with Disabilities; Role Conflict and Professional
Socialization; Regional Health Disparities



Howard Daudistel, Ph.D.

Dean - College of Liberal Arts
Research expertise: Criminology,
Criminal Justice, Evaluation
Research, Higher Education
Administration and Policy



Robert Nachtmann, D.B.A.

Dean - College of Business Administration
Research expertise: Corporate Finance,
International Finance, Interface of
Law, Accounting and Finance



Richard Schoephoerster, Ph.D.

Dean - College of Engineering
Research expertise: Biofluid Mechanics, Flow
and Device Related Mechanisms of Thrombosis,
Cardiovascular Device Development



Dennis L. Soden, Ph.D.

Dean - University College
Research expertise: Public Policy, Policy
Analysis, Leadership Studies, American
Government, Research Methods



Anny Morrobel-Sosa, Ph.D.

Dean - College of Science
Research expertise: Condensed Matter, Physics,
Chemistry, Materials Science/Engineering,
Superconductivity, Biomaterials



Josefina V. Tinajero, Ed.D.

Dean - College of Education
Research expertise: Second Language
Acquisition, L1-L2 Literacy, Two-Way Dual
Language Programs, Teacher Preparation;
Gender Equity



Patricia D. Witherspoon, Ph.D.

Dean - Graduate School
Research expertise: Communication and
Organizational Leadership, Communication
and the Leadership of Organizational Change

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Research Guide

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