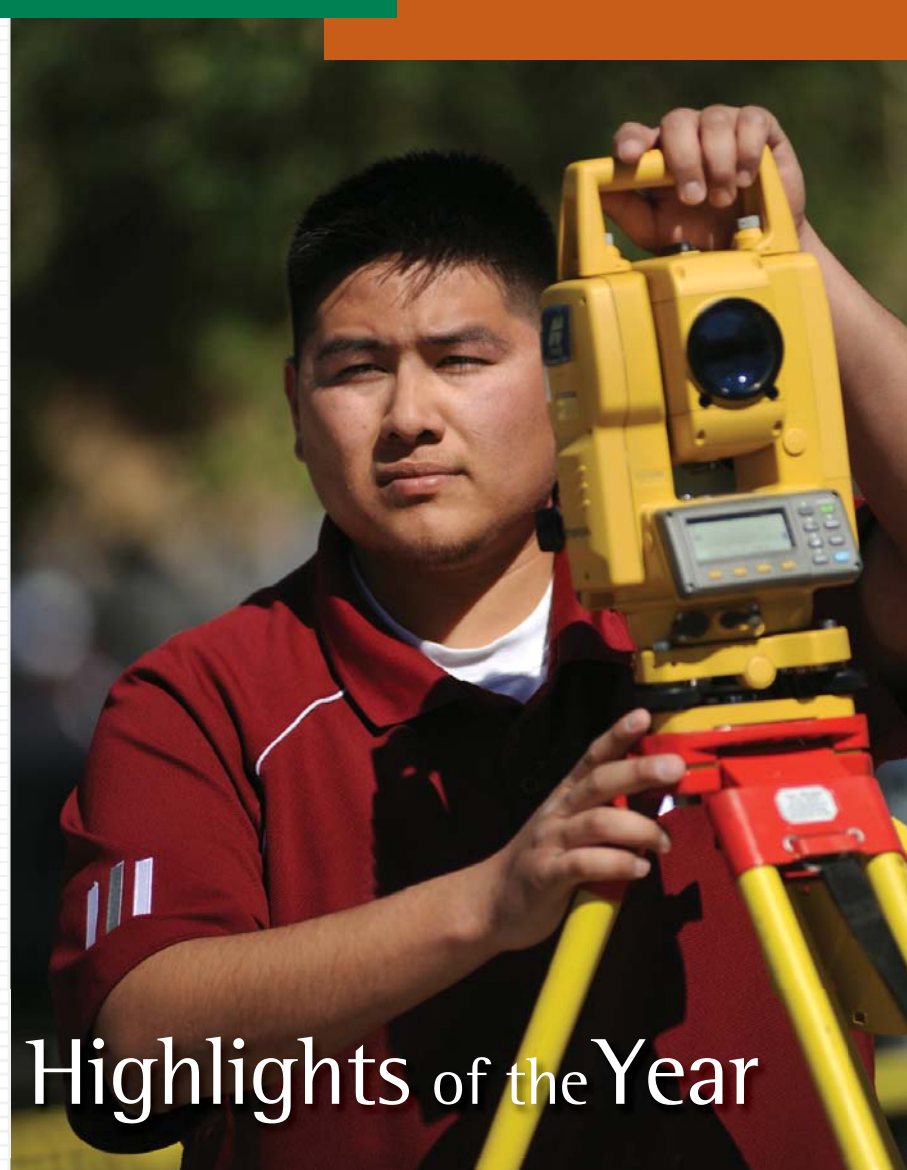


2009-2010: Highlights of the Year





**Ricardo B. Jaquez, PE, Ph.D.**  
College of Engineering  
Dean and Regents Professor

**On the cover:** Lance Aspaas was the recipient of the Lonnie Lee Abernethy III Memorial Endowed Scholarship for 2009-2010 and is a senior in civil and surveying engineering. Aspaas is a descendant of the Navajo Nation and from the people of the Pueblo of Jemez.

## A Message **from the Dean**

It is my pleasure to present the accomplishments of the College of Engineering at New Mexico State University as I embark on my new appointment as dean. My tenure at NMSU began some 27 years ago and my excitement and pride in this institution are as fresh today as they were when I began this adventure.

I hope that the pages that follow give you a glimpse into the strengths of our college.

The past year represents our best year ever in terms of new grants and contracts with a 37 percent increase over the past year.

Our faculty members continue to distinguish themselves as leaders, researchers and educators of the highest caliber. Our students are fortunate to have such strong mentors, as they, too, have many achievements of which to be proud.

The foundation of our success is largely due to the support of our friends, partners and alumni. Their support insures that we can provide an outstanding educational experience for our students, keep our laboratories and equipment on par with industry

standards, and help us retain highly qualified faculty.

The following pages provide an overview of the successes that reflect the nature and makeup of our college. More importantly, the stories contained herein reflect the human element that makes the NMSU College of Engineering truly a unique and wonderful place to live, learn and thrive.

I hope you enjoy reading about some of the highlights of the year. I look forward to the challenges and opportunities that await the college and I assure you, I will do my best to build on an already great institution.

Sincerely,

A handwritten signature in blue ink that reads "Ricardo B. Jaquez". The signature is fluid and cursive, with a large, sweeping flourish at the end.

**Ricardo B. Jaquez, PE, Ph.D.**  
Dean and Regents Professor

# College Profile

## Degrees Offered

- Aerospace Engineering (BS, MS and Ph.D.)
- Chemical Engineering (BS, MS and Ph.D.)
- Civil Engineering (BS, MS and Ph.D.)
- Electrical and Computer Engineering (BS, MS and Ph.D.)
- Engineering Physics (BS)
- Engineering Technology (BS, with emphasis in Civil, Electronics and Computer, Information, or Mechanical)
- Industrial Engineering (BS, MS and Ph.D.)
- Information and Communication Technology (BICT)
- Information Engineering Technology (BIET)
- Mechanical Engineering (BS, MS and Ph.D.)
- Surveying Engineering (BS)

## Staff

Tenured Faculty .....	58
Tenure-Track Faculty.....	18
Research Faculty and Staff .....	89
National Science Foundation Career Awardees.....	5
Endowed Chairs.....	4
Endowed Professorships.....	15

## College of Engineering Leadership

- Ricardo B. Jacquez, Dean
- Krist Petersen, Associate Dean of Academics
- Rudi Schoenmackers, Associate Dean of Research
- Patricia A. Sullivan, Assistant Dean of Development and External Relations
- Thomas D. Burton, Mechanical and Aerospace Engineering Department Head
- Jeffrey S. Beasley, Engineering Technology and Surveying Engineering Department Head
- Paul M. Furth, Interim Electrical and Computer Engineering Department Head
- Adrian T. Hanson, Interim Civil Engineering Department Head
- Martha C. Mitchell, Chemical Engineering Department Head
- Edward Pines, Industrial Engineering Department Head
- Abbas Ghassemi, Director, Institute for Energy and the Environment

## College of Engineering Accreditation

Baccalaureate programs in civil, chemical, electrical and computer, engineering physics, industrial, mechanical, and surveying engineering are accredited by the Engineering Accreditation Commission of ABET, Inc. Baccalaureate programs in civil, electronics and computer, and mechanical engineering technology are accredited by the Technology Accreditation Commission of ABET, Inc.

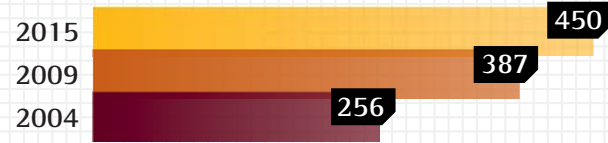
**Commission of the Accreditation Board for Engineering and Technology**

111 Market Place, Suite 1050  
Baltimore, MD 21202-4012  
Telephone 410-347-7700

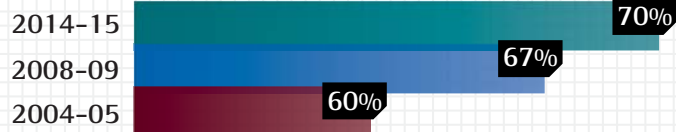
# College Statistics

Numbers for 2004-2005 in the following charts are the baseline for goals outlined in the College of Engineering strategic plan. Numbers for 2015 are targeted goals.

### New Freshman Enrollment

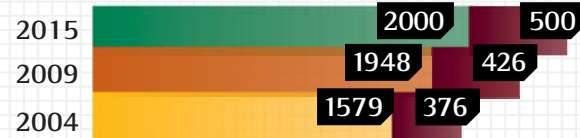


### Freshman to Sophomore Retention



### Total Enrollment

GRADUATE



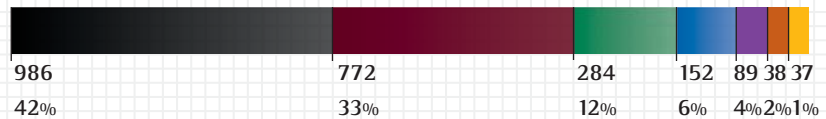
### Six-Year Graduation Rate

\* GOAL FOR 2015



### Fall 2009 Student Ethnicity

- Hispanic
- Caucasian
- International
- Unknown
- Native American
- African American
- Asian American

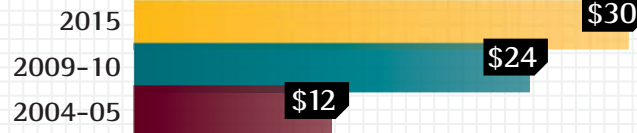


### Fall 2009 Student Gender

■ Male ■ Female



### College Endowment (in millions)

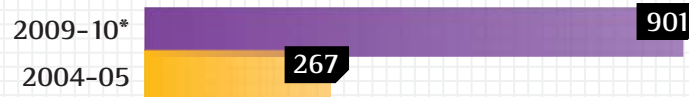


### Total Gifts Received (in millions)



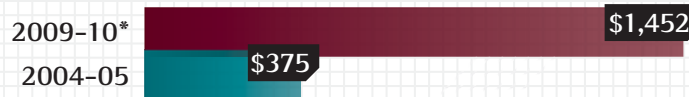
### Number of Scholarships Awarded

\* This incorporates all financial aid processed through the College of Engineering.



### Total Value of Scholarships Awarded (in thousands)

\* This incorporates all financial aid processed through the College of Engineering.



# Research

## Strategic Research Areas

**Aerospace:** NMSU is leading the future of aerospace engineering with the only degree-granting aerospace program in the state and newly added graduate-level degree programs. Some current projects include systems that monitor materials behavior, biomimetrics to understand the mechanisms that allow birds and fish to generate thrust, computer simulation of structural vibrations, nanosatellites, unmanned aerial vehicles, and the development of robotics to control aerospace vehicle maneuvers.

**Energy:** We are building on our expertise in fuel-cell technology, renewable resources and electric power systems engineering to address the growing nationwide demand for power. We are examining ways to develop alternative sources of energy and utilize traditional fossil resources to provide cost-effective, distributed electricity to our communities. Our Institute for Energy and the Environment is providing innovative research in alternative energy and water. Our Electric Utility Management Program has been developing students with the engineering skills and business acumen to serve as leaders in this complex industry for nearly 40 years.

**Information Sciences:** NMSU is at the forefront of this important area, with funded research in wireless networking, remote sensing, sensor networks, target recognition, speech processing, space communications, and antenna design. Our strengths in information

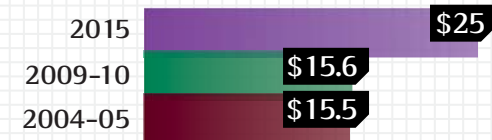
sciences draw from expertise in computer networking, communications, digital signal processing, integrated circuit design, microwave engineering, and optics. NMSU was designated in 1987 as the first Telemetry Center of Excellence by the International Foundation for Telemetry for the study of telemetry systems, advanced communications, advanced modulation, coding, data transport and equalization techniques.

**Transportation:** NMSU has a long history of research and collaboration with industry through our Bridge Research Center, launched in 1972, working to improve the safety and performance of our nation's bridges. The program offers the only Bridge Safety Inspection training program in the nation. This program fostered our world-renowned research in "smart bridge" technology that incorporates fiber optics to monitor bridge performance. Our research also extends to new technologies for improving highway safety, evaluation methods and performance.

**Water:** Our expertise in ensuring water quality and quantity crosses a number of disciplines that address local issues for our arid region but have worldwide application. Such research includes novel methods of desalination, cost-effective methods to remove arsenic from drinking water and the use of satellite data to measure agricultural crop evapotranspiration. Our goal is to combine innovation and technology to provide clean, affordable water today and in the future.

## Research Expenditures

(in millions)



## New Research Awards and Renewals

(in millions)



# Key University Research Collaborations

Army High Performance Computing Research Center  
Stanford University (Lead)  
**New Mexico State University**  
University of Texas at El Paso  
Morgan State University  
High Performance Technologies, Inc.

Department of Homeland Security  
Center of Excellence in Border Security and Immigration  
University of Arizona (Lead)  
**New Mexico State University**  
Arizona State University  
San Diego State University  
University of Minnesota  
University of Washington  
West Virginia University  
Others

National Alliance for Advanced Biofuels and Bioproducts  
Donald Danforth Plant Science Center (Lead)  
Los Alamos National Laboratory  
**New Mexico State University**  
University of Arizona  
Texas A&M University  
Pacific Northwest National Laboratory  
Others

The Wind Alliance  
Texas Tech University (Lead)  
**New Mexico State University**  
University of Houston  
Texas A&M University  
Rice University  
University of Texas  
University of Iowa  
University of California, Davis  
Florida State University  
BP Wind Energy  
Shell Wind Energy  
TECO Westinghouse  
Vestas Technology  
Others

Office of Naval Research and Bureau of Reclamation  
NMSU Water Security Program  
**New Mexico State University (Lead)**  
General Electric

NASA, Investigation of Composition of Cosmic Rays  
**New Mexico State University (Lead)**  
University of New Hampshire  
Stanford University  
Goddard Space Flight Center

National Science Foundation Louis Stokes Alliance for Minority Participation  
**New Mexico State University (Lead)**  
New Mexico Highlands University  
Eastern New Mexico University  
New Mexico Tech  
University of New Mexico  
Western New Mexico University  
Central New Mexico Community College  
Diné College  
Luna Community College  
New Mexico Junior College  
New Mexico Military Institute  
New Mexico State University-Alamogordo  
New Mexico State University-Carlsbad  
New Mexico State University-Doña Ana  
New Mexico State University-Grants  
Northern New Mexico College  
San Juan College  
Santa Fe Community College  
Southwestern Indian Polytechnic Institute  
University of New Mexico-Gallup  
University of New Mexico-Los Alamos  
University of New Mexico-Valencia

# Engineering Extension and Educational Outreach

The College of Engineering is dedicated to advancing the economy of the state of New Mexico. In keeping with the land-grant mission of NMSU, the college fulfills the essence of the Morrill Act by formalizing the delivery of hands-on, customized training, technical assistance and services impacting New Mexico and beyond. Extension and outreach are based on programmatic and faculty strengths in partnership with an extensive network that spans state and local government agencies, industry and national laboratories.

Areas of priority include programs that support K-16 STEM education as well as professional development and continuing education for the engineering workforce. Energy initiatives focus on alternative energy technology development and deployment, energy efficiency and power delivery. Environmental efforts are helping to improve water quality and quantity and to encourage pollution prevention within the state. Manufacturing and agricultural engineering assistance is provided to improve processes and mechanization, incorporate new technologies and develop products that will benefit the state's economy.

Statewide, the College of Engineering has reached nearly 7,000 students participating in K-16 STEM programs. Nearly 3,000 individuals have been trained through professional development, certificate programs and short courses. And more than 1,000 businesses have received technical assistance.

## 2009/2010 Engineering Extension and Educational Outreach



## Engineering Extension Organizations

The Institute for Energy and the Environment is a major contributor toward the College of Engineering extension and outreach efforts. IEE is a multidisciplinary research organization focusing on issues related to energy, water, and the environment. Combining the resources of the Carlsbad Environmental Monitoring and Research Center, the Southwest Technology Development Institute, and the WERC Consortium for Environmental Education and Technology Development, IEE activities encompass research, analytical services,

technology development and deployment, and dissemination of information through public outreach.

The Manufacturing Technology and Engineering Center supports economic development in New Mexico by providing education, engineering, technical and other extension services to constituents at NMSU and throughout the state. M-TEC provides manufacturing, engineering and product development services for small businesses along with improving the technical workforce through new program development, training and outreach activities. The center leverages facilities, expertise and other resources at NMSU.



## Professional Development

- Electric Utility Management Professional Engineer Refresher Course
- Bureau of Indian Affairs Water Resources Technician Training
- Bridge Inspection Training
- Quality Concrete School
- Institute for Energy and the Environment Water Quality Teacher Training
- Project Lead the Way Teacher Training
- Southwest Technology Development Institute Photovoltaic/National Electric Codes Training
- Manufacturing Technology and Engineering Center Training

## Engineering Extension Business Assistance

- Engineering Technology and Surveying Engineering Outreach Projects
- IEE P2/E2 Assessments
- SWTDI Engineering Assistance
- IEE Re-Energize America Conference
- M-TEC Business Assistance Projects

## K-16 STEM Outreach

- Project Lead the Way
- Pre-freshman Engineering Program
- Boosting Engineering, Science and Technology
- New Mexico Alliance for Minority Participation Programs
- Reaching the Pinnacle
- IEE Pollution Prevention and Water Programs
- WERC Environmental Design Contest



Bureau of Reclamation Commissioner Michael L. Connor, an NMSU civil engineering alumnus, and NMSU President Barbara Couture signed an agreement recently to conduct advanced water treatment research at the Brackish Groundwater National Desalination Research Facility in Alamogordo.

## NMSU teams with Bureau of Reclamation desalination effort

New Mexico State University has partnered with the Bureau of Reclamation on a \$5 million cooperative agreement to develop technologies that will provide the citizens of New Mexico and the southwestern region with more affordable, potable water.

Through the agreement, NMSU and the bureau will conduct advanced water treatment research at the Brackish Groundwater National Desalination Research Facility in Alamogordo, using the facility as a laboratory to investigate new technologies that are cost effective, easy to deploy, have low maintenance, and are reliable. The research is focused toward enabling small communities and rural areas in New Mexico to maintain their way of life and not feel forced to move to areas with more water resources. Education and outreach materials and events will be developed and presented in various venues.

Another goal is to offer formal and informal classes to students at NMSU in order to educate and train them in water-related degrees so they may continue the work being laid down through this cooperative agreement.

"We really have a lot of depth and breadth in water research, water education, water policy and water issues. This grant will culminate all of that together and put New Mexico State University at the center of inland water research as related to brackish water," said Abbas Ghassemi, director of NMSU's Institute for Energy and the Environment and WERC, an NMSU-based consortium for Environmental Education and Technology Development.

"A lot of universities claim that they are national centers, but they don't have that national facility. NMSU will have that national presence working with the agencies charged with water augmentation," Ghassemi said.

# Aerospace

## NMSU awarded \$1.68 million grant from National Science Foundation

An NMSU multidisciplinary research team, led by Ou Ma, a mechanical and aerospace engineering professor, was awarded a four-year, \$1.68 million grant from the National Science Foundation to develop new reduced-gravity simulation technology for aerospace and biomechanics research. The grant will also fund a new reduced-gravity simulation facility.

Ma is leading a multidisciplinary team of investigators to create and test an innovative design of an adaptive, passive reduced-gravity simulator. His partners include Robert Paz, associate professor of electrical and computer engineering; Son Tran, associate professor of computer science; and Ed Pines, professor and department head of industrial engineering. A team of student researchers are also working on the project.

The research holds a dual purpose. The simulator design, based on robotics and passive gravity compensation technologies, could offload any amount of a person's body weight. By studying test subjects using the simulator, the team could gain a greater understanding of the dynamics of the human body, leading to better

insight into the modeling and simulation of physical human bodies. This has a potential of helping neuro-rehabilitation of patients with walking disabilities. From an aerospace perspective, it could enhance manned space exploration by providing a reliable, easy-access and low-cost new astronaut training technology.

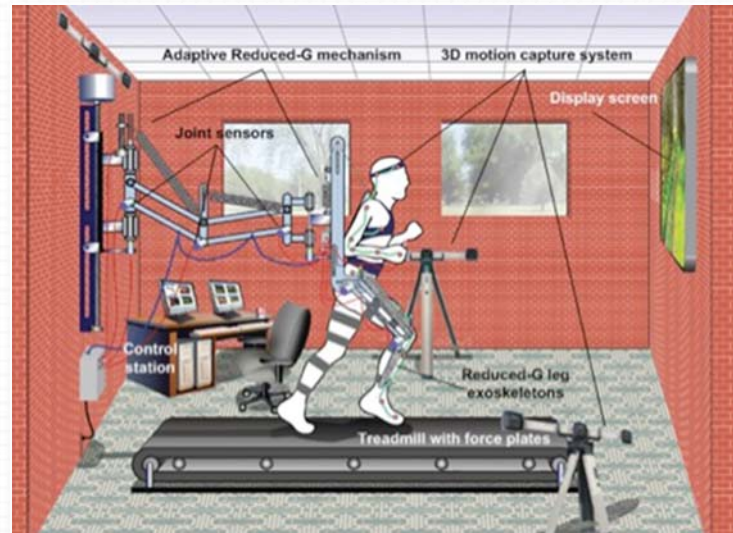
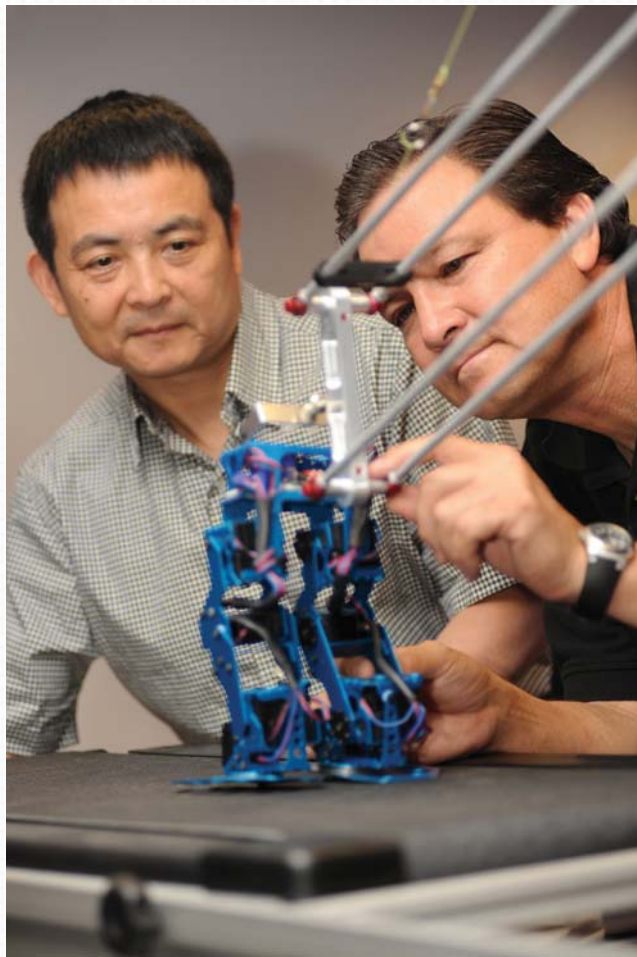
Ma had been developing the concept of the simulator for some time, supported by seed money from the NASA Experimental Program to Stimulate Competitive Research (EPSCoR), awarded to him by the New Mexico Space Grant Consortium, as well as by a NASA Graduate Student Research Fellowship grant awarded to him for his graduate student Jesse McAvoy. The NSF grant will allow Ma's team to design a full-scale prototype of the simulation system and study the new technology with real human subjects.

Ma's field of research includes dynamics and controls for robotics applications. He spent more than 10 years working in aerospace industry developing space robotics technology prior to coming to NMSU in 2002.

He also is working on other robotics and unmanned aerial vehicle-related projects sponsored by the NSF, NASA, the Army Research Office and NMSU's Physical Science Laboratory.

In this project, Paz will apply electrical and control engineering to develop an auto-adaptation capability for the simulator, which will allow the simulator to automatically adapt to different individuals. Tran's work involves software and human body dynamics database development, and Pines will provide expertise in the areas of ergonomics and human factors.

The grant allows Ma to hire a full-time research engineer, and support two graduate students and several undergraduate students to work on the project. Additionally, a new laboratory equipped with state-of-the-art instrumentation for biomechanics and human performance research will be constructed in Jett Hall on the NMSU campus. This unique lab will help Ma and his team to conduct cross-disciplinary research and provide students with additional hands-on learning experience in the biomechanics and aerospace sciences.



A new laboratory, equipped with state-of-the-art instrumentation for biomechanics and human performance research, will be constructed in Jett Hall on the NMSU campus with the help of a grant from the National Science Foundation. This is an artist's rendering of the proposed lab.

Ou Ma (left), professor of mechanical engineering and Ken Ruble, staff engineer, show a passive reduced-gravity simulator that could be used for new astronaut training and neuro-rehabilitation of patients with walking disabilities.

# Energy

## NMSU researcher receives wind-energy funding

Sukumar Brahma, assistant professor in the Klipsch School of Electrical and Computer Engineering's Electric Utility Management Program at NMSU, is among 28 research groups receiving \$13.8 million in federal funding for new wind energy projects.

The Electric Utility Management Program at NMSU is one of only 10 or so power engineering programs in the nation and is actively involved in ongoing research being conducted nationwide to address the growing demand for reliable renewable energy resources.

Brahma has been awarded \$273,000 to investigate short circuit models for wind turbine generators. His research is one of nine projects that were awarded to universities nationwide. Brahma will be investigating how wind farms respond to severe electrical disturbances in the power system caused by short-circuits.

“Nationally, the penetration of wind-generated power is relatively low, so this issue has not been well-

researched. The President's plans call for 20 percent of power generated by 2030 to be generated by wind. At that level, this problem needs serious consideration,” said Brahma.

In partnership with Sandia National Laboratories, Brahma will create simulation-based mathematical models to test different scenarios.

“I've been working on this problem for a while to determine the impact of various renewable sources of power connected to a grid when disturbances occur. This project will be specific to wind-generated power,” said Brahma.

There is already significant wind-generated energy produced in New Mexico. In 2003, the New Mexico Wind Energy Center went online. The center is the seventh-largest wind generation project in the United States and is located 170 miles southeast of Albuquerque and 20 miles northeast of Fort Sumner. The

facility can produce up to 200 megawatts of power, or enough electricity to power 94,000 average-sized New Mexico homes. Florida-based FPL Energy owns and manages the facility, while the Public Service Company of New Mexico purchases all of its output.

The new DOE-funded projects will help address market and deployment challenges including wind turbine research and testing and transmission analysis, planning, and assessments.

DOE's 2008 Wind Technologies Market Report details \$16 billion in investment in wind projects made in the U.S. in 2008—making the United States the world leader in annual wind energy capacity growth, as well as cumulative wind energy capacity. Wind power contributed 42 percent of all new U.S. electric generating capacity in 2008; for the fourth consecutive year, wind power was the second-largest new resource added to the U.S. electrical grid.



Sukumar Brahma, assistant professor in the Klipsch School of Electrical and Computer Engineering, is investigating the impact of wind farms as they integrate with the power grid by developing short-circuit models of wind turbine generators.

# Information Sciences

## Upward-looking camera systems yield information about meteoric events

NMSU researchers are developing a new technology that may lead to greater understanding of meteoric events that occur in the Earth's atmosphere by recording images of events that occur in the night sky.

In the fall of 2009, Electrical and Computer Engineering associate professor David Voelz and research assistant professor Laura Boucheron received a three-year award from the National Nuclear Security Administration (NNSA). The \$825,000 award is funding the development of a field network of an all-sky camera system intended to monitor, track, and analyze atmospheric meteors and other events.

The system will provide a database that can assist satellite operators in separating natural events from man-made events. Astrophysicists can use the information received from the cameras in the study of meteor phenomenology.

"We will be able to get trajectories, velocity, and brightness," Voelz said. "From this information the meteor's parent object and its orbit around the Sun can be determined." Beyond the science, the information collected is also useful for threat analysis for orbiting

spacecraft and in corroborating observations of meteors and fireballs by other systems such as Earth-observing satellites or radio receivers.

Seven cameras are up and running; two are mounted on the roof of Thomas & Brown Hall at NMSU; the others are located in Albuquerque and Socorro.

Voelz and Boucheron are using small, inexpensive, off-the-shelf black-and-white security video cameras that are mounted into a custom environmental housing, fashioned from PVC pipe, with an acrylic dome for viewing. The upward-looking, wide-angle view cameras run all the time like in a security application; however, they are not sensitive enough to capture meteor events in the light of day. The software that determines the events and connects to the network is custom.

The data collected is standard video streamed onto the computer. When an event occurs, the computer marks the time and moves the short event video segment, typically a few seconds, to an event folder to be saved. Later, the video and still frames, made by adding up the video frames, can be analyzed

The cameras trigger on objects that change position

from frame to frame, so they record planes, satellites, birds, bugs, car lights, etc., along with meteors.

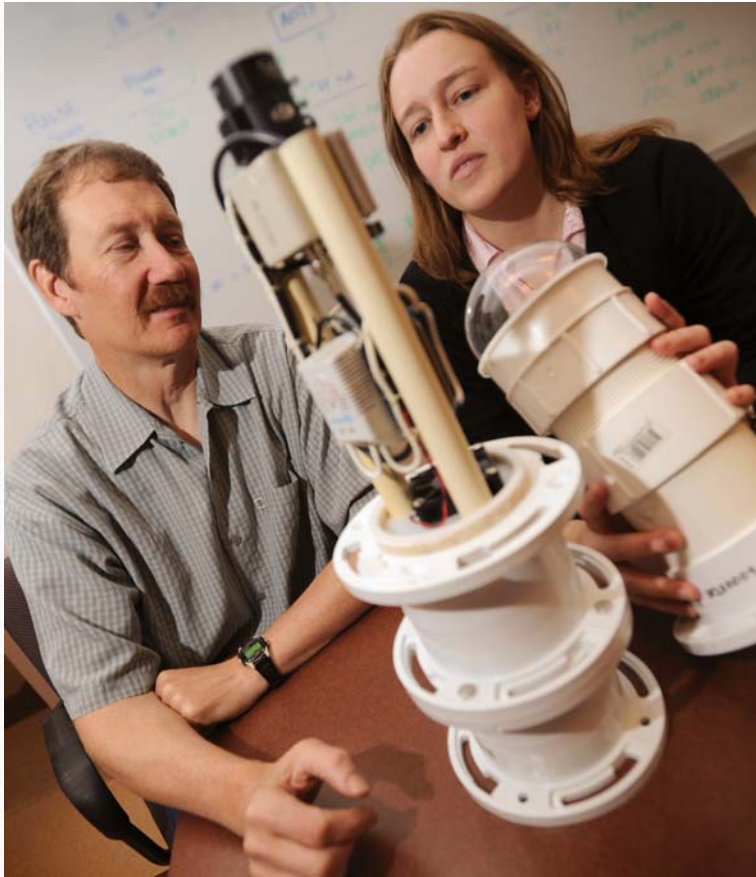
"After the data makes it to our server we will be able to automatically remove some of the false-trigger data by correlating events from cameras in different locations," said Voelz. "Removing planes and satellites is a little harder, but there are ways to separate them from the meteors; for example, planes tend to blink and we can look for that," Voelz said.

Eventually, Voelz and Boucheron hope to network with other cameras throughout the world.

"There are cameras all over the world. There are about 70 cameras in clusters throughout the U.S.—there are some in Colorado, Florida, California, and Alabama. But they are not networked together," said Voelz.

"If we can get things running and get useful information, we hope that NMSU will become the center for receiving meteor event information and that in turn will bring in more cameras and more interested scientists," Voelz said.

For a first-hand look at Voelz and Boucheron's research, visit [skysentinel.nmsu.edu](http://skysentinel.nmsu.edu).



Electrical engineering professors David Voelz, left, and Laura Boucheron examine an all-sky camera unit. The camera unit is used along with numerous other similar cameras to provide a ground-based, all-sky camera network to monitor natural meteor events and to generate a database of events for satellite calibration and meteor science.

# Transportation

## NMSU civil engineers apply bridge safety expertise

Travelers in New Mexico who drive across bridges have good reason to be assured of their safety: the state's bridges are routinely inspected by engineers who have been trained by nationally renowned experts from NMSU's Bridge Inspection Program. In fact, many bridges throughout the nation have been inspected by NMSU-trained transportation professionals.

Civil engineering faculty members, in concert with the New Mexico Department of Transportation, have conducted bridge inspection training for NMDOT since 1972, as well as the Federal Highway Administration since 1986. All bridge inspectors are required to have this training.

The foundation for the bridge program at NMSU is undergraduate and graduate-level education, on-the-job experience and research focused on the transportation industry.

Under the supervision of professional engineers, civil engineering students conduct bridge inspec-

tions on six-month, one- or two-year intervals, depending on the configuration and/or condition. NMDOT co-op students inspect and rate several hundred bridges throughout the state, while summer interns are involved in the design, construction, inspection and load rating of bridges.

"We inspect many of the prestressed concrete girder, reinforced concrete slab, steel girder bridges and other special structures throughout the state," said David Jáuregui, civil engineering associate professor and director of the Bridge Inspection Program.

NMSU's civil engineering department also conducts special, in-depth inspections of bridges owned by Los Alamos National Laboratory and the U.S. Army Corps of Engineers.

The inspection results are documented by undergraduate students and preliminary reports are reviewed by the professional engineer.

"This is where quality control comes in," said

Jáuregui. "If inconsistencies or questionable results are found, students go back to the professional engineer for clarification. Final reports are reviewed by a professional engineer before submission to the district where the bridge is located and to the NMDOT general office who determine if any and to what extent repairs are needed."

NMSU civil engineers are also involved in research to develop improved methods for structural health monitoring of bridges.

Graduate students are using state-of-the-art computer techniques to determine load ratings of bridges based on information derived from design plans. Information is entered to create a computer model of the bridge which then provides an estimate of bridge capacity. This method has been used to evaluate highway bridges and nearly 80 railroad bridges.

"This can be challenging because some of our railroad bridges were constructed in the late 1800s," said Jáuregui. "The design drawings are very old



and difficult to interpret. A lot of engineering judgment is involved.”

The NMSU bridge research team has also developed methods that incorporate field testing and computer analysis methods to capture the three-dimensional behavior of bridges. NMSU is collaborating with the University of Vigo, Spain to develop automated inspection tools using close-range photogrammetry for vertical clearance and crack size measurements.

The advanced evaluation techniques have also been used in a Sandia National Laboratories structural health monitoring project. Andrew Daumueller, a Ph.D. candidate, is using diagnostic field testing and finite element analysis to evaluate railroad bridges that are fracture critical and evaluating the remaining fatigue life of those structures.

Jáuregui said the new evaluation tech-

niques could be used starting with the construction of a new bridge to create a baseline and track the bridge behavior over its service life to help engineers inspect, evaluate and better manage the state’s bridge inventory.

“It’s more quantitative—most bridge inspection is visual,” said Jáuregui. “It’s a good investment to insure the safety and serviceability of our bridges in the long-term.

“Tied all together, a student who graduates from NMSU with a master’s degree in structural engineering can accumulate many years of practical experience,” said Jáuregui. “There are very few people who are qualified to do this kind of work and there is a definite need in light of our failing infrastructure. This work often goes unnoticed, but it is very important to insure the safety of the traveling public.”



Civil engineering associate professor David Jáuregui leads the NMSU Bridge Inspection program, responsible for inspecting numerous bridges in New Mexico and training inspectors from throughout the nation.

# Water

## Researchers develop new technologies to provide clean water

A group of NMSU engineering researchers are developing low-cost technologies to remove salt and other contaminants from water. Their work could have world-wide application in treating industrial waste water and providing clean drinking water.

Under the direction of Shuguang Deng, professor of chemical engineering, research is being conducted for ConocoPhillips, a project that began in Oct. 2008. The goal of the research is to remove salt from brackish water for recycling oil field-produced water for beneficial uses in the process.

“We are trying to find the optimal configuration for using membrane distillation desalination technology,” said Lucy Mar Camacho, a chemical engineering postdoctoral fellow. “We are evaluating various temperatures, pressures, flow rates and types of membranes to find the most efficient configuration.”

The process of membrane distillation involves addition of heat to the water which vaporizes water molecules that move through a permeable membrane, condense and leave contaminants behind.

Another method, reverse osmosis, is widely used for water filtration, explains Camacho. Because it requires prime-quality electrical energy and energy recovery devices it can be expensive when used on small or large scale applications.

“The membrane distillation process requires lower temperatures and is much less expensive to use,” said Veera Gnaneswar Gude, a chemical engineering postdoctoral fellow. “The waste heat generated from the oil production process is around 80-95 degrees centigrade and no external heat is required. When you process one million gallons of water per day, the cost of this process is very competitive.”

Chemical engineering master’s candidate Sai Reddy Pinappu has been investigating different types of membranes and has developed a zeolite-filled composite membrane specifically for this project.

“Commercially produced polymer membranes are currently used for membrane distillation,” said Pinappu. “Inclusion of zeolites into polymer

membranes improves the permeability and selectivity properties of the membrane. We are investigating the production of membranes to be used specifically for membrane distillation”

The long life-time of the tested zeolite membranes also contributes to the cost-effectiveness of this process. Pinappu’s research has shown these membranes to last more than 100 hours of continuous use, which is significant for industrial use when processes run continuously.

Saketa Yarla Gadda, a chemical engineering master’s candidate, has shown the membrane distillation desalination process is also successful in removing uranium, arsenic and fluoride. These contaminants are commonly found in groundwater throughout New Mexico, making it unsuitable for human consumption.

Bench-scale tests using water samples provided by ConocoPhillips and other tests revealed that the membrane distillation process removes more than 95 percent of salt. Additional tests on simulated

water samples show a high rate of removal of organic compounds and heavy metals, such as selenium. The process renders water with total dissolved solids (TDS) of less than 10 parts per million—much less than is required by the U.S. EPA for drinking water standards, said Gude.

Based upon these results, the researchers are proposing a pilot-scale test with the goal of eventual industrial-scale use by ConocoPhillips.

But the membrane distillation desalination process has the potential to be used beyond the oil fields. The group demonstrated that it can be used to clean drinking water contaminated with salt and heavy metals.

“This technology could be used throughout the world for the purification of sea or brackish water and waste water for drinking and industrial reuse,” said Gude. “It really has universal application.”



Saketa Yarla Gadda (left), Lucy Mar Camacho, Sai Reddy Pinappu and Veera Gnaneswar Gude are working together to develop better ways to remove contaminants from water.

# Faculty

## Telemetry and telecommunications chair awarded to Creusere

Charles D. Creusere, associate professor at the Klipsch School of Electrical and Computer Engineering, was named the Frank Carden Chair in Telemetry and Telecommunications. He is preceded in this honor by chair namesake Frank Carden, William Osborne and Stephen Horan who recently retired as department head of the Klipsch School of Electrical and Computer Engineering.

As chair, Creusere will serve as the director of the Telemetry Center of Excellence at NMSU, charged with promoting and stimulating technical growth in telemetry and telecommunications and the associated arts and sciences.

“Dr. Creusere’s credentials are an excellent fit for this responsibility. The telemetry program at NMSU is extremely important to the goals of our foundation for engineering education. Few universities have specific programs in telemetry and Chuck’s work at NMSU will be important to the entire telemetry industry,” said J. William Rymer, president of the International Foundation for Telemetry.

Creusere received his bachelor’s degree in electrical

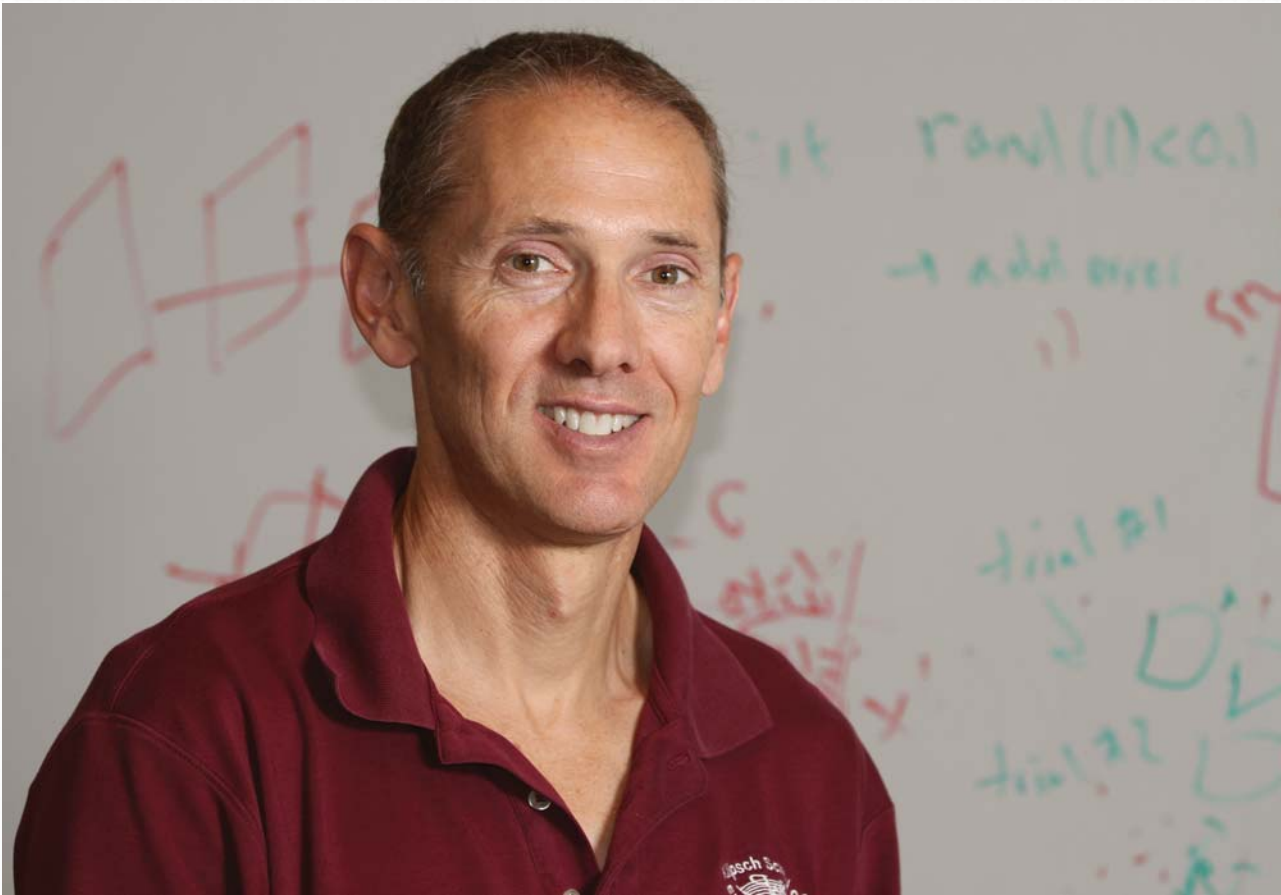
and computer engineering at the University of California, Davis. He went on to receive his master’s and doctoral degrees in electrical and computer engineering at the University of California, Santa Barbara. After receiving his bachelor’s degree, he went to work for the Naval Weapons Center, China Lake, CA, where he designed and tested the guidance electronics for the Laser Guided Training Round which was later transitioned to Loral for production. In 1989, he was awarded a fellowship from the Department of Defense to attend graduate school in Santa Barbara where he worked with Professor Sanjit Mitra in the area of multirate filter banks. After returning to China Lake in 1993, Creusere joined the Research Department and much of his research focused on applying wavelets to problems of interest to the Navy, in particular image and video compression.

Creusere joined the faculty at NMSU in 2000 and his current research interests include audio, image, and video processing, in particular as these apply to distributed and remote sensing systems. He is also a member of several technical program committees for

the IEEE. Creusere was the associate editor for IEEE Transactions on Image Processing from 2002 to 2005 and began serving as the associate editor for IEEE Transactions on Multimedia in 2008.

The International Foundation for Telemetry has supported the Klipsch School through the establishment of graduate fellowships and was key in establishing the Frank Carden Chair in Telemetry and Telecommunications in 1990, which has played a central role in the development of a nationally-recognized program in this important area. The Carden chair was the first-ever chair to be established at NMSU.

Creusere held the International Foundation for Telemetry Professorship in Electrical and Computer Engineering, awarded in 2008. He stepped down from the professorship in January when he assumed the chair. He will hold this competitively selected position for three years, with the possibility of renewal for an additional three years. He will receive a salary supplement along with approximately \$30,000 annually to support related teaching, research and service activities.



As Frank Carden  
Chair in Telemetering  
and Telecommunications,  
Charles Creusere will  
play a central role in  
leading a nationally  
recognized program.

# Students

## Engineering students take first in robot challenge

A team of electrical and computer engineering students from NMSU won first place at the First Annual Mercury Remote Robot Challenge, held at Oklahoma State University in Stillwater in April. Not only did they design and build their robot, they also maneuvered it remotely—through an obstacle course that was in another building.

Seniors Michael Chenoweth, Timothy Penn, Larry Powell, and Salvador Sanchez comprised the NMSU team. They competed against three OSU teams (two undergraduate and one graduate team) as well as against two undergraduate teams from Benemerita Universidad Autonoma de Puebla, Puebla, Mexico.

NMSU boasted the only penalty-free run, as well as the fastest overall course completion time of 3 minutes 7 seconds, approximately 50 seconds faster than the next fastest team.

The robot was the senior capstone design project that is a graduation requirement for all

electrical engineering students. The group began working on the robot during the fall 2009 semester, collectively logging approximately 800 hours toward completion of the project. They finished early, in February, giving them ample time to practice driving. It also allowed them to make improvements, such as hand-crafting plexiglass fenders to prevent wires from rubbing on the wheels.

“What really set their robot off from the others was that they programmed it to take commands from a game controller, rather than a keyboard,” said Laura Boucheron, electrical engineering research assistant professor and adviser to the capstone group.

The robot is equipped with range finders that can detect its distance from objects, as well as a video camera that provides visual information. Chenoweth, the robot “driver,” viewed this information on his computer screen to guide the robot through the maze in the competition, while the other

members of the team watched the race in person.

None of the team members had ever built a robot before. They scavenged many of the parts for the robot and bought other items off-the-shelf. The only special-order part was a winch servo used to move the camera. They had duplicate parts for all of the pieces, which was good planning as the winch servo needed to be replaced a week before the competition.

Penn was responsible for the coding and networking. Powell was responsible for the power, drive train and chassis. Sanchez completed the software programming and Chenoweth worked on the camera and controller.

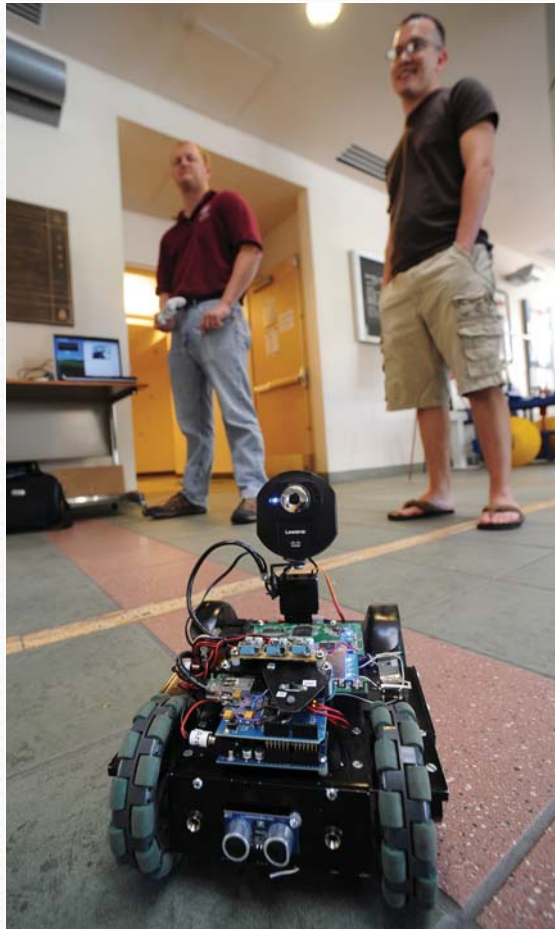
“The most challenging part was networking the interface with motors,” said Penn, who had no previous networking experience. “Our big break was when we were able to use the router as a wireless card. The others used computers embedded in their system.”

Although aesthetics were not considered in the

competition, the NMSU team took great pride in making their robot look good along with functioning well.

“It was a quarter-inch sheet of plate aluminum before we started,” said Powell. “I hand cut every piece, and drilled and tapped every screw. I even made custom axles.”

All four of the students received an A+ on their capstone design course. Additionally, all of them are set with plans for the future. Following graduation, Penn went on to pursue a master’s degree at the Air Force Institute of Technology at Wright Patterson Air Force Base; Chenoweth was hired by the Space and Naval Warfare Systems Center in San Diego; and Powell went to work for General Dynamics in Scottsdale, Ariz. Sanchez, who will graduate in December, is hoping to pursue his master’s degree at UCLA.



Michael Chenoweth, Timothy Penn, Salvador Sanchez, and Larry Powell took first place in the First Annual Mercury Remote Robot Challenge that requires a human-controlled device to maneuver through an obstacle course in minimal time.

# Gifts

## Torrez makes a difference for College of Engineering

Donors play a vital role at New Mexico State University, making funding available for various scholarships and clubs, and allowing for the flexibility necessary to help students continue their studies.

Eloy Torrez, an NMSU alumnus and donor, has made many contributions that have made a great difference at NMSU's College of Engineering.

"We are very fortunate that Mr. Torrez recognizes that the needs of the college change over time," said College of Engineering Dean Ricardo Jacquez. "He works with us on an annual basis to identify uses for his gifts that will benefit the college the most. Having this kind of flexibility in a gift is truly invaluable."

This year, Torrez has provided support for the Engi-

neering Achievement Scholarships, the Electrical and Computer Engineering Academy, the William Kersting Professorship in Power Systems Engineering, engineering student organizations such as E-Council, the George Lucky Scholarship, and the Klipsch School of Electrical and Computer Engineering.

Torrez is president of Solutions Energy Technology Infrastructure, which has been listed in the *Hispanic Business Magazine* 500 every year since 2001 and has been recognized as the second fastest-growing Hispanic-owned business. Founded in 1996, SEI provides engineering, construction, facility operations and maintenance, plus energy saving and security technologies to the Department of Defense and other

federal government agencies.

Torrez earned a bachelor of science in electrical engineering from NMSU in 1970 and a master of science in engineering from the University of California at Los Angeles in 1976. Torrez is a member of the Klipsch School of Electrical and Computer Engineering Academy, which is comprised of alumni and corporate partners who work to advance the mission of the department. He also was named one of 100 Outstanding Alumni for the NMSU College of Engineering Centennial in 1988.

In 2009, Torrez shared his business experiences with NMSU students as a speaker in the Verge Entrepreneurship Lecture Series.





Eloy Torrez, electrical engineering alumnus, works with the college each year to determine how his gift will best benefit its students and programs.



Valerie Klipsch and Ed Foreman, another generous supporter of the College of Engineering, enjoy homecoming festivities.

## Klipsch name lives on in the College of Engineering

The late Paul W. Klipsch and his wife Valerie have been ardent supporters of the College of Engineering for many years. The Klipsch School of Electrical and Computer Engineering is named for Paul W. Klipsch. Paul passed away in 2006 and Valerie continues to be a great friend of the college. Over the years, four departmental professorships and endowed scholarships that support more than 40 students each year have been established in the Klipsch name.

Paul Klipsch pioneered audio systems using scientific principles to develop a corner horn speaker that sounded more lifelike than all predecessors. In 1978, he was awarded the Audio Engineering Society's Silver Medal for his contributions to speaker design and distortion measurement. He was inducted into the Audio Hall of Fame in 1984. In 1997, he was inducted into the Engineering and Science Hall of Fame,

an honor shared by Thomas Edison, George Washington Carver, the Wright brothers and others.

Paul Klipsch graduated with a bachelor's degree in electrical engineering in 1926 and a Doctor of Laws in 1981. He earned a master's degree in electrical engineering from Stanford University in 1934. He was born in 1904.

The Paul W. and Valerie Klipsch Museum, located in NMSU's engineering complex, is a tribute to them. They have given NMSU a considerable amount of memorabilia from the audio engineering field spanning more than eight decades. Exhibits at the museum include historical photos of Paul, many of his working papers containing his calculations and research results, and original publications containing articles by, or about him. The museum also contains many awards received by Paul, antique audio equipment owned by him, and various speaker designs.

## Faculty and Staff Honors

- The Las Cruces Public School Board of Education honored Electrical and Computer Engineering Professor Sheila Horan, who has since retired, for her many contributions to STEM education. Horan had been an integral part of Tombaugh Elementary School since it opened its doors in 1990 where she became a strong supporter of STEM education programs. She volunteered her time with the After School Enrichment Program for 18 years; sponsored the school's annual chess tournament for 17 years; and established the Science Intern Program at Tombaugh in 1993.
- J. Phillip King, associate professor of civil engineering, received an American Association for the Advancement of Science fellowship in Science and Technology Policy. King worked as an AAAS Energy, Environment, Agriculture and Natural Resources Fellow for the National Science Foundation's Division of Civil, Mechanical and Manufacturing Innovation. He is among 190 scientists and engineers who spent a year working in federal agencies or congressional offices to learn about science policy while providing valuable science and technology expertise to the government.
- Mechanical and aerospace engineering Professor Ou Ma spent the spring 2010 semester with the German Space Agency, known as DLR, which is Germany's counterpart to NASA. Ma participated in the development of a new facility called the European Proximity Operation Simulator to be used to test satellite rendezvous and docking in orbit. Ma was awarded a research fellowship through a new program to allow outstanding scientists and researchers to conduct special research at DLR sites in Germany.
- NMSU faculty and staff whose research projects generated funding of \$1 million or more during the 2008-2009 fiscal year were honored in March. Among them were five researchers from the College of Engineering: James Conca, director of the Carlsbad Environmental Monitoring and Research Center; Abbas Ghassemi, associate dean and director of the Institute for Energy and the Environment; Ricardo Jacques, dean of the College of Engineering and director of the New Mexico Alliance for Minority Participation; Eric Johnson, professor of electrical and computer engineering; and Andrew Rosenthal, senior program manager for the Southwest Technology Development Institute.

## Significant Gifts to the College

- ConocoPhillips made a combined donation of \$22,500 to the NMSU Colleges of Business and Engineering. The donation is just one of the many ConocoPhillips has made during its 24 years of consecutively giving to NMSU.
- Halliburton presented the College of Engineering with a \$15,000 gift to establish the Halliburton Global Scholars Program. Through the program, the college will award 10 merit-based scholarships in the amount of \$1,500 each to juniors and seniors with a minimum GPA of 3.5. Half of the scholarships will be awarded to underrepresented ethnic minorities and female students.
- The New Mexico BEST Robotics program administered by the College of Engineering received a \$5,000 gift from Jacobs Technology, Inc. It is the second year that Jacobs has supported the program. BEST, which stands for Boosting Engineering, Science and Technology, is an annual robotics competition for middle- and high-school students.
- The Freeport-McMoRan Copper & Gold Foundation Scholarship Program rewarded the academic efforts demonstrated by Benjamin Carter, John Giusto, Isaac Harder, and Aaron Turner for the fall 2009 semester. The scholarship is awarded to students enrolled full-time in engineering or mining-related degrees. Recipients are also eligible for a 10 to 14-week summer internship.
- The New Mexico Chapter of the American Concrete Institute made a gift of \$20,000 to establish an endowed scholarship to benefit civil engineering students in the NMSU College of Engineering. The scholarship will be awarded to full-time students with a grade point average of 3.0 or greater. The chapter has also supported the Samuel P. Maggard civil engineering scholarships at NMSU for many years.
- Siemens PLM Software made an in-kind software grant valued at \$27.5 million to the college. It is the second largest in-kind corporate contribution ever received by the school. The software will be used by industrial and mechanical engineering students for senior design courses and graduate research projects.

## Student Achievements

- The New Mexico State University concrete canoe took first place during the annual American Society of Civil Engineers 2010 Rocky Mountain Regional Conference hosted at NMSU in April. The canoe team represented the region at the National Concrete Canoe Competition in June at California Polytechnic State University, San Luis Obispo, taking eleventh place.
- For the second year in a row, a group of NMSU students skipped the usual festivities associated with spring break and did some back-breaking work instead. The students and their faculty adviser constructed a new well for the 80 or so residents of Ruiz De Ancones, near Chihuahua, Mexico. The 11 students are members of NMSU Engineers without Borders, NMSU Organization of Aggie Students Inspiring Sustainability and NMSU Aggies go Global.
- Doug Weathers, Angel Veloz and James Fleeman designed, built, programmed and delivered a rocket payload in a short six week effort to be included in New Mexico Space Grant's annual student rocket launch in May.
- Jeremy Bruggemann and Gerardo Martinez attended the Next-generation Suborbital Research Conference in Boulder, Colo. in February as representatives for their team's award winning proposal. They won first place in the 2010 Student Suborbital Experiment Competition for "Experimental Validation of a Robotics-Based Inertial Property Identification Algorithm for Orbiting Spacecraft."
- Mohammad Ghassemi, a recent New Mexico State University electrical engineering graduate, has won a Gates Cambridge Scholarship for 2010. The scholarship, funded by the Bill and Melinda Gates Foundation, pays the full cost for students from outside the United Kingdom to pursue graduate study and research at Cambridge University in England.
- Engineering graduate student Dorothy Lanphere was one of the recipients of the Mike Watts Outstanding Leadership Graduate Fellowship for the spring 2010 semester. The fellowship is awarded to graduate students who demonstrate high academic standing and leadership qualities.
- Great Minds in STEM honored Brandon Grelle, a mechanical engineering student with a HENAAC Scholarship at the 2009 HENAAC Conference in Long Beach, Calif. Grelle was awarded the grant by his sponsor, NASA Johnson Space Center, and Great Minds in STEM. These awards recognize student leaders who maintain a 3.0 or higher GPA while contributing to the Hispanic community in science, technology, engineering and mathematics.



NMSU civil engineering students rowed "Billy the Kid," their concrete canoe, to first-place victory in the regional American Society of Civil Engineers competition and to eleventh place in the national competition.

## College of Engineering Advisory Council

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