

College of Engineering

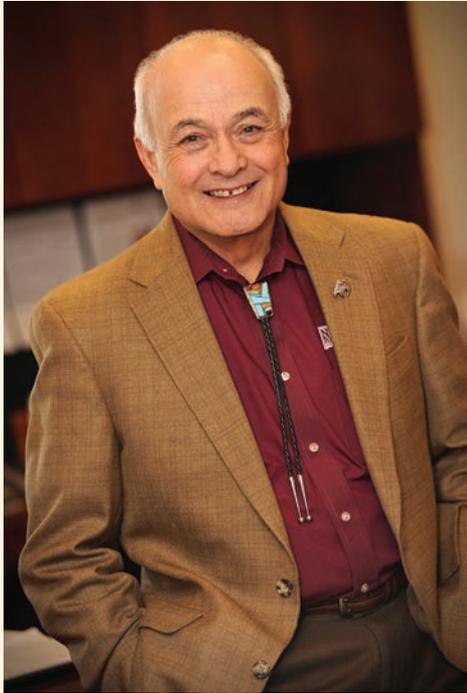


2013-2014:
HIGHLIGHTS
of the YEAR

New Mexico State University
All About Discovery!
nmsu.edu



A Message FROM the DEAN



The New Mexico State University College of Engineering's 125-year legacy is one of the hallmark features of this great land-grant university. Over the decades, we have continued to graduate outstanding engineers and enjoy an exceptional reputation because we evolve our curriculum in order to meet changing needs. As the engineering industry shifts its focus on innovation, our faculty, as their predecessors did, are changing to better serve students, industry and the state of New Mexico—and far beyond.

One example is the Aggie Innovation Space Presented by Intel Corporation, which opened earlier this year. The center is a learning environment that invites innovation, creativity and entrepreneurship. Open to all engineering students, it is equipped with 3-D printers and scanners, computers featuring state-of-the-art engineering design software, prototyping materials, white boards and mentors who are on hand to assist.

You might have heard that NMSU is “All About Discovery” and nowhere on campus is that more evident than at the College of Engineering. Professor Phillip De Leon, Klipsch School of Electrical and Computer Engineering, offered a Mobile Application Development course for the first time this past spring. The class has produced several apps published to Apple's App Store and helped launch a new startup company co-founded by two engineering graduate students.

Associate Professor Delia Julieta Rosales-Valles, Department of Industrial Engineering, is taking students into local businesses, giving them real-world experience solving manufacturing problems to support industry competitiveness and economic development.

Our entrepreneurial focus expands the choices available to our graduates and gives them the tools and opportunities necessary to create their own businesses. Many of our students can—and do—create their own company or invention. Our innovative graduates help make up a high-level workforce in New Mexico, but they also have worldwide opportunities. Wherever they go, they are competitive.

This all comes back to the legacy of our outstanding faculty. The NMSU College of Engineering is constantly evolving to meet the needs of the engineering industry. Our renowned faculty members are at the top of their fields and provide an excellent engineering education. The entire College of Engineering family is devoted to helping Aggie Engineers create, innovate and discover.

Sincerely,

A handwritten signature in black ink that reads "Ricardo B. Jacquez". The signature is fluid and cursive.

Ricardo B. Jacquez, Ph.D., P.E.
Dean and Regents Professor

ON THE COVER: Mechanical engineering student Jesse Wilkinson demonstrates the quad copter that took third place in the American Society of Mechanical Engineers regional Student Design Competition in Lubbock, Tex.

College Academic Profile

Degrees Offered

Aerospace Engineering (B.S., M.S. and Ph.D.)
Chemical Engineering (B.S., M.S. and Ph.D.)
Civil Engineering (B.S., M.S. and Ph.D.)
Electrical and Computer Engineering (B.S., M.S. and Ph.D.)
Engineering Physics (B.S.)
Engineering Technology (B.S., majors in Civil, Electronics and Computer, Information or Mechanical)
Industrial Engineering (B.S., M.S. and Ph.D.)
Information and Communication Technology (BICT)
Mechanical Engineering (B.S., M.S. and Ph.D.)
Surveying Engineering (B.S.)

College of Engineering Leadership

Ricardo B. Jacquez, *Dean*
Sonya L. Cooper, *Associate Dean of Academics*
Martha C. Mitchell, *Associate Dean of Research*
Patricia A. Sullivan, *Associate Dean of Outreach and Public Service*
Jeffrey S. Beasley, *Engineering Technology and Surveying Engineering Department Head*
Ian H. Leslie, *Mechanical and Aerospace Engineering Department Head*
Peter T. Martin, *Civil Engineering Department Head*
Edward Pines, *Industrial Engineering Department Head*
Satish Ranade, *Klipsch School of Electrical and Computer Engineering Head*
David A. Rockstraw, *Chemical and Materials Engineering Department Head*

Accreditation

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

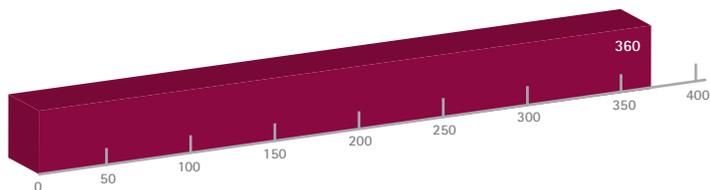
Commission of the Accreditation Board for Engineering and Technology
www.abet.org



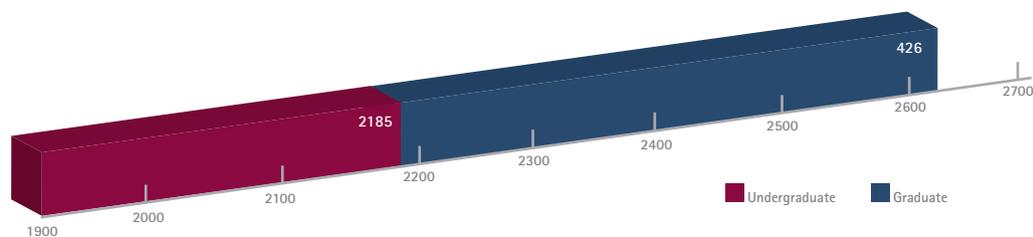
SONYA L. COOPER
College of
Engineering Associate
Dean of Academics

College Statistics

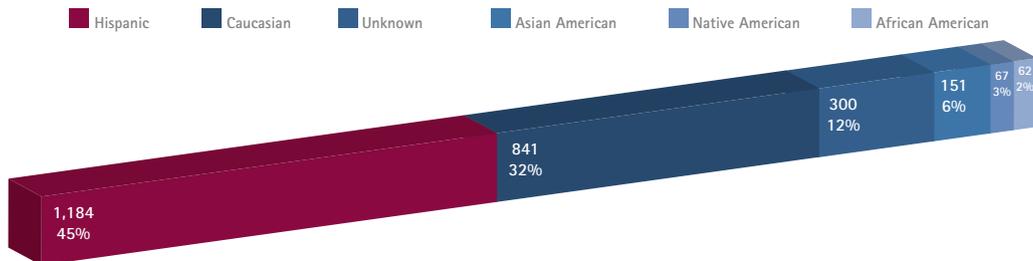
NEW FRESHMAN ENROLLMENT, FALL 2013



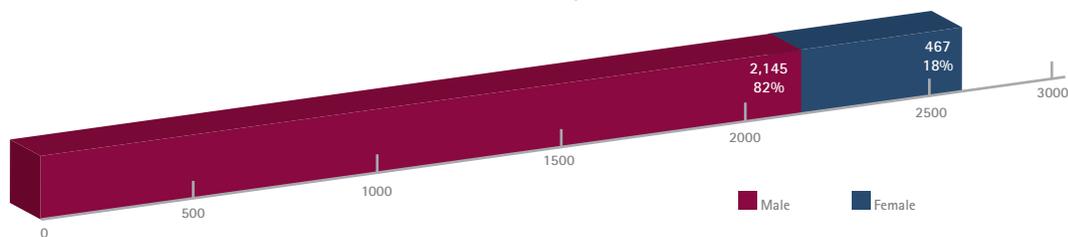
TOTAL STUDENT ENROLLMENT, FALL 2013



STUDENT ETHNICITY, FALL 2013



STUDENT GENDER, FALL 2013



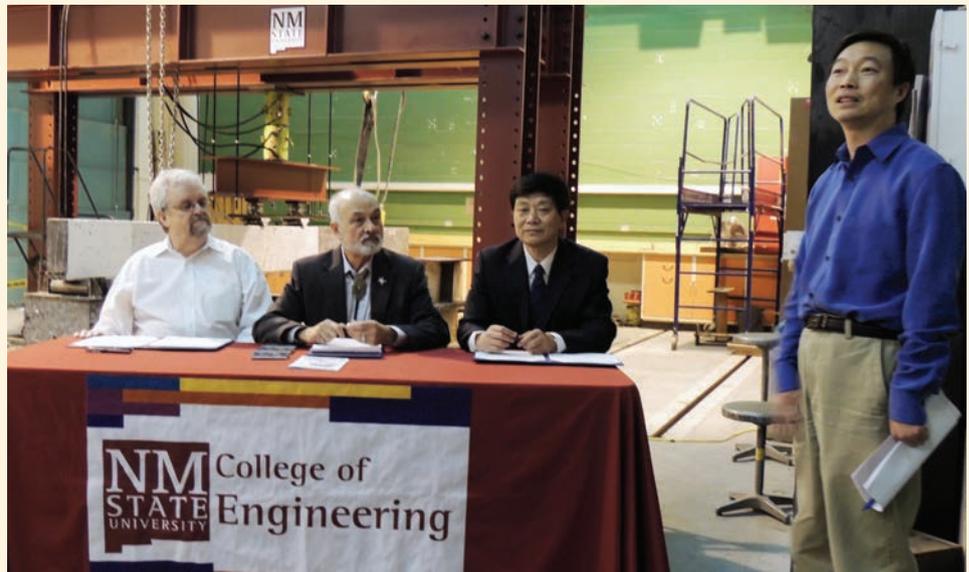
NMSU enters into a collaborative doctoral program with Chinese university

This past year, the College of Engineering and the North China University of Technology (NCUT) College of Architecture and Civil Engineering entered into a memorandum of understanding. The agreement initiated a collaborative doctoral program in civil engineering, later followed by dual bachelor's and master's programs.

“Collaborative programs with foreign institutions are wonderful ways to expose students to global issues, thus preparing them to be progressive engineers,” Sonya Cooper, associate dean, said. “We all face the same problems, but have different ideas about how to solve them. These collaborative opportunities with students and faculty will broaden the scale of how we incorporate global advances and identify solutions.” Cooper is responsible for academics and for developing memoranda of understanding with foreign universities.

The agreements enable NMSU and NCUT civil engineering students to study three years in their home country followed by one to two years at the respective partner institution for bachelor's and master's degrees. The doctoral program will allow Chinese students to obtain a doctorate in civil engineering (awarded by NMSU's College of Engineering) by working with faculty at NMSU and in China. Students must fulfill all the requirements of NMSU's civil engineering doctoral program, with the opportunity to conduct experimental research at NCUT's laboratories. Located in the western part of Beijing, NCUT has more than 10,200 undergraduate students and 200 graduate students.

NMSU's College of Engineering currently has undergraduate and graduate degree agreements with the Universidad Autónoma de Chihuahua and the East China University of Technology. Faculty are currently negotiating with universities in Russia and Pakistan to develop similar collaborative programs.



(Left to right) Civil Engineering Department Head Peter Martin, College of Engineering Dean Ricardo B. Jacquez and NCUT College of Architecture and Civil Engineering Dean Tiejun Qu sign a memorandum of understanding initiating a joint doctoral program in civil engineering. Engineering Technology Associate Professor Ruinian Jiang (right) coordinated the effort and translated at the ceremony in the Structures Materials Laboratory.

Research

From Fulbright fellows to undergraduate students, members of the college are engaged in research endeavors that address today's most pressing challenges. Their efforts are improving the quality of life for people throughout New Mexico and beyond: a fundamental part of NMSU's land-grant mission.

NMSU is ranked by the Carnegie Foundation as a RU/H (Research University with High research activity) institution. Engineering's faculty-driven research, advanced scholarship and interdisciplinary collaborations across departmental, college and university boundaries are key factors in reaching our institutional goals.

College of Engineering Core Research Areas

Aerospace: We are leading the future of aerospace engineering with the only degree-granting aerospace program in the state, offering degree programs through the graduate level. Some current projects include systems monitoring materials behavior, biomimetrics to understand the mechanisms that allow birds and fish to generate thrust, computer simulation of structural vibrations, nano-satellites, unmanned aerial vehicles and the development of robotics to control aerospace vehicle maneuvers.

Energy Production and Distribution: We are building on our expertise in microgrids, 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 provides innovative research in alternative energy and water. For nearly 50 years, our Electric Utility Management Program has been developing students with the engineering skills and business acumen to serve as leaders in this complex industry.

Communication: We are 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. In 1987, NMSU was designated 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: We have had a long history of research and collaboration with industry



MARTHA C. MITCHELL
College of
Engineering Associate
Dean of Research

through our Bridge Research Center, launched in 1972. The center offers the only Bridge Safety Inspection training program in the nation and fosters research in new technologies for improving highway safety, evaluation methods and performance of our nation's bridges.

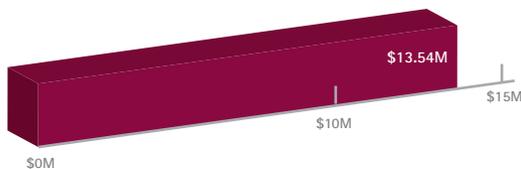
Water: Our expertise in ensuring water quality and quantity crosses a number of disciplines that address local issues in the arid desert Southwest but have worldwide application. As a partner in the National Science Foundation's Urban Water Engineering Research Center, we are working to reinvent America's

aging and inadequate water infrastructure. Projects across campus include riparian zone management, the use of algae for wastewater treatment and energy production, development of the use of brine in landscaping and management of urban drainage systems.

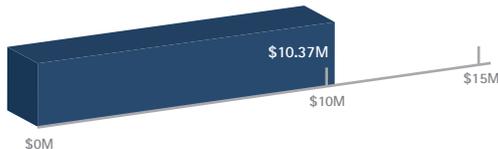
Biomedical: We are making inroads in biomedical research across disciplines. Our engineering research earned a U.S. patent on a reduced-gravity technology to train astronauts. The technology also holds the promise of assisting people with physical disabilities or injuries by helping them offload weight for training and rehabilitation. Another project is introducing new technology in the standard instrumentation used in flow cytometry. It may open up a whole host of biological

research applications. Yet another researcher is developing novel methods for characterization and modeling of bone structure. His work has important implications for the development of improved materials for surgical bone implants. Meanwhile, industrial engineering researchers are working toward finding efficiencies for medical delivery systems.

RESEARCH EXPENDITURES
for 2013/2014



NEW RESEARCH AWARDS
for 2013/2014



Staff

Tenured Faculty: 51
Tenure-track Faculty: 23
Research Faculty and Staff: 35

National Faculty Awardees

Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring: **Ricardo B. Jacquez**

Department of Energy PECASE Award: **Jeanine Cook**

National Science Foundation CAREER Award: **Charles Creusere, Gabe Garcia, Jessica Houston**

Endowed Chairs

Frank Carden Endowed Chair for Telemetering and Telecommunications: **Charles Creusere**

Ed and Harold Foreman Endowed Chair in Civil Engineering: **Nirmala Khandan**

PNM Endowed Chair for Utility Management: **Satish Ranade**

Endowed Professorships

John Clark Distinguished Professorship: **Phil King**

Robert Davis Distinguished Professorships in Chemical Engineering: **David Rockstraw and Shuguang Deng**

Ed Foreman Distinguished Professorship in Civil Engineering: **Zohrab Samani**

Harold Foreman Distinguished Professorship in Civil Engineering: **Peter Martin**

International Foundation for Telemetering Professorship in Electrical and Computer Engineering: **Deva Borah**

William Kersting Endowed Chair in Power Systems Engineering: **Sukumar Brahma**

Paul W. and Valerie Klipsch Distinguished Professorships in Electrical and Computer Engineering: **Kwong Ng, Jaime Ramirez-Angulo and David Voelz**

Mechanical and Aerospace Engineering Academy Professorship: **Igor Sevostianov**

Robert G. Myers Endowed Professorship in Mechanical Engineering: **Ian Leslie**

John Kaichiro Nakayama and Tome Miyaguchi Nakayama Professorship for Research Excellence: **Ou Ma**

John Kaichiro Nakayama and Tome Miyaguchi Nakayama Professorship for Teaching Excellence: **Phillip De Leon**

Wells-Hatch Endowed Professorship in Civil Engineering: **David Jáuregui**

To be named

Dwight and Aubrey Chapman Distinguished Professorship in Mechanical Engineering

Forrest Mooney Endowed Professorship in Aerospace Engineering

Research

Intellectual Property Activity

U.S. Patents Awarded:

- Extended optimal filters for adaptive radar systems using binary codes.
Inventors: Alejos, Dawood
- Method, technique and system for detecting Brillouin precursors at microwave frequencies for enhanced performance in various applications.
Inventors: Dawood, Mohammed, Alejos
- Speaker model-based speech enhancement system.
Inventors: Boucheron, De Leon

U.S. Patents Pending: 4

U.S. Provisional Patents Filed: 6

Invention Disclosures Filed: 5

Key University Research Collaborations

Army High-Performance Computing Research Center

Stanford University (Lead)

NASA, Investigation of Composition of Cosmic Rays

New Mexico State University (Lead)

National Science Foundation Engineering Research Center, Re-inventing America's Urban Water Infrastructure

Stanford University (Lead)

National Science Foundation Louis Stokes Alliance for Minority Participation

New Mexico State University (Lead)

National Science Foundation Pathways to Innovation

Stanford University (Lead)

Office of Naval Research and Bureau of Reclamation, NMSU Water Security Program

New Mexico State University (Lead)

U.S. Dept. of Commerce Border Manufacturing Technology Initiative

University of Arizona (Lead)

Engineering Outreach and Public Service

The Carlsbad Environmental Monitoring and Research Center

is a division of the College of Engineering. CEMRC includes environmental and general radiochemistry laboratories, a special plutonium-uranium lab, an *in vivo* bioassay facility and mobile laboratories to perform a wide range of environmental and radiochemistry work, characterization, monitoring and feasibility studies. The facility provides support to the Waste Isolation Pilot Plant, Los Alamos National Laboratory, Sandia National Laboratories and Washington Tru Solutions.



Russell Hardy, director of the Carlsbad Environmental Monitoring and Research Center, in a room where volunteers are scanned for radioactive materials as part of the Lie Down and Be Counted Internal Dosimetry Services Project.

The Institute for Energy and the Environment

is a multidisciplinary research organization focusing on issues related to energy, water and the environment. Along with the WERC Consortium for Environmental Education and Technology Development, IEE/WERC activities encompass research, analytical services, technology development and deployment, and dissemination of information through public outreach.

The Manufacturing Technology and Engineering Center was established in 2000 to provide manufacturing, engineering and proof of concept and prototype refinement for businesses. M-TEC leverages research facilities, expertise and statewide resources, including the NMSU Engineering New Mexico Resource Network, NMSU Arrowhead Center and the New Mexico Manufacturing Extension Program.

The Southwest Technology Development Institute provides applied research and development services to private- and public-sector clients to support advancement and integration of renewable energy. SWTDI was established in 1977 as the New Mexico Solar Energy Institute, and has active research programs in energy and related systems. SWTDI provides training and contract engineering services for systems analysis, hardware development and evaluation, feasibility studies, computer modeling and informational kiosks.

Engineering New Mexico Resource Network

The Engineering New Mexico Resource Network is the outreach and public service division within the College of Engineering. The program delivers a range of engineering-based outreach and public service programs to businesses, government agencies, teachers and K–16 students across the state. Engineering New Mexico leverages a network of resources to advance the state's economy by enhancing the ability to attract and retain high-tech/high-wage employment opportunities through professional development, engineering assistance and engaged and aligned STEM workforce-development programs.

During the past year, 9,816 students participated in a variety of K–16 STEM programs that fostered critical thinking, communication skills, team-centered engagement, innovation and entrepreneurship. More than 750 individuals received professional development, certificate programs and short courses. Some 95 businesses received technical assistance to enhance competitiveness with targeted solutions to engineering/design problems, facility design and layout, ergonomics and manufacturing and prototype development.

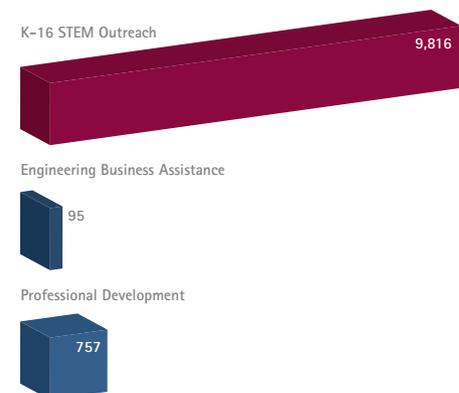
Engineering New Mexico leads the college's efforts to bridge business and industry needs with student learning by incorporating innovation and entrepreneurship into the engineering educational experience at NMSU. Through the new Aggie Innovation Space Presented by Intel and other corporate partners, Engineering New Mexico has developed unique and engaging co-curricular programs to challenge undergraduate students to solve real-world problems through business-sponsored one-day design challenges, non-credit pop-up workshops to jump-start student learning, access to 3-D printing and other design tools, and a peer mentoring program to enhance the transition of knowledge from the classroom into the workplace. The program engaged more than 10 corporate partners this past year in various capacities to augment engineering education at NMSU. Engineering New Mexico also serves as the NMSU lead for a National Science Foundation funded program, Pathways to Innovation, that is led by Stanford University to integrate innovation and entrepreneurship into the engineering curriculum.

For more information about the Engineering New Mexico Resource Network, visit enr.nmsu.edu/outreach.shtml.



PATRICIA A. SULLIVAN
Associate Dean for
Outreach and Public
Service and Director
of the Engineering
New Mexico Resource
Network

2013/2014 ENGINEERING OUTREACH



Engineering New Mexico Resource Network

NMSU Engineering selected for NSF Pathways to Innovation

NMSU is one of 12 universities from across the country selected to take part in the National Science Foundation's first cohort of the Pathways to Innovation program.

Led by the National Center for Engineering Pathways to Innovation (Epicenter), housed at Stanford University, the Pathways to Innovation program was created to help universities incorporate innovation and entrepreneurship into undergraduate engineering education to strengthen regional and global competitiveness.

A recent report published by the U.S. Department of Commerce states that the majority of job creation in our country during the past two decades has occurred in young startup companies. "While the U.S. remains the global leader in innovation and entrepreneurship, there is constant competition from around the world to maintain that leadership. And as global competition continues to grow, it is critical that the institutions driving innovation improve their ability to develop products and services with market relevance and economic value."

A team of NMSU faculty and administrators are working with Epicenter to augment engineering education at the curricular and

extracurricular levels. As a cohort institution, NMSU receives access to faculty training, successful models for integrating innovation and entrepreneurship into the curriculum, best practices to measure program effectiveness through proven assessment tools, a national network of engineers and entrepreneurs, and membership in a peer network of schools with similar goals.



(Left to right) Chemical Engineering Professor Jessica Perea-Houston, Industrial Engineering Department Head Edward Pines, College of Engineering Associate Dean Patricia Sullivan, Engineering Technology Professor Rolfe Sassenfeld and Electrical Engineering Professor and holder of the Nakayama Professorship in Teaching Excellence Phillip De Leon are leading the NMSU Pathways to Innovation program.

NMSU students are the direct beneficiaries of institutional participation in the program, including involvement in a national peer-led University Innovation Fellows program.

"Today's engineering students need to graduate with more than just technical skills," Tom Byers, director of Epicenter and professor

at Stanford University, said. "Engineers need the tools and attitudes to help them identify opportunities and bring their ideas to life."

"This program is another example of how we are taking a leadership role at NMSU," Patricia A. Sullivan, associate dean of the College of Engineering and director of the Engineering New Mexico Resource Network, said. Sullivan

said NMSU was invited to the program because of the innovation and entrepreneurship efforts already in place within the college. "The NMSU engineering program is often recognized for staying on top of industry needs and our participation will ensure that our graduates remain competitive," Sullivan said.

The Epicenter program is "an opportunity for us to showcase the things we're doing and jumpstart relevant changes to our curriculum," said Edward Pines, department head of industrial engineering and enterprise adviser for Arrowhead Center's Arrowhead Innovation Network.

Sullivan and Pines serve as the NMSU Pathways team leaders. Faculty members include Phillip De Leon, Klipsch School of Electrical and Computer Engineering; Jessica Houston, chemical engineering; and Rolfe Sassenfeld, engineering technology and surveying engineering.

College of Engineering officially opens Aggie Innovation Space

This past year, NMSU and Intel officials signed a memorandum of understanding at the official grand opening of the Aggie Innovation Space to foster innovation and entrepreneurship by offering students access to a new facility equipped with state-of-the-art resources.

The facility was made possible through a donation of \$70,000 from Intel and \$50,000 through the NMSU President's Performance Fund. These funds were leveraged with additional contributions from other corporate partners and engineering alumni.

"Intel has a long history of supporting STEM education throughout the state. Being a part of the NMSU Aggie Innovation Space is an exciting opportunity to continue that tradition of inspiring students to collaborate, explore and discover ideas that lead to new engineering solutions while cultivating these critical skills," Intel New Mexico Corporate Services Site Manager Brian Rashap said.

The space is a gathering point where students can connect to work on real-world projects. They also have access to experienced mentors, new technologies and the latest engineering design software and tools. The facility is equipped with 3-D printers, an electronics station, programmable development boards, robotics kits, software and low-resolution prototype materials.

"We're trying to discover how this university can be of greater service in developing our economy and developing businesses in New Mexico, and it all starts with a good idea, oftentimes from a student, frequently from a faculty member," NMSU President Garrey Carruthers said.

The space is already showing results: aerospace engineering student Sam Pedrotty (now graduated) used it to develop low-cost

that can control a robot, eliminating the need for expensive computer equipment, which he hopes to share with K-12 schools to increase student access to robotics technology.

Corporate partnerships with Sandia National Laboratories/Lockheed Martin, Western Refining and Halliburton have also contributed to the development of new co-curricular programs to augment student learning by bridging classroom learning with real-world application.

"The Aggie Innovation Space provides students the environment and community to develop their ideas and make them a reality," said mechanical engineering technology senior Caleb Roy. "The space brings engineering students together from all disciplines and the peer atmosphere helps us to move our projects to the next level."

"The College of Engineering has become a hub for innovation and entrepreneurship," said Ricardo B. Jacquez, dean of the College of Engineering. "We have a great team of faculty, staff

and corporate partners who are committed to working with our students to foster creativity and innovation, and the excitement the space is generating is amazing."

Collaboration with NMSU's Arrowhead Center enhances opportunities for staff and students to commercialize their ideas into business start-ups and licensing opportunities.



Students receive assistance in robotics design and programming from Ken Ruble, Aggie Innovation Space program manager.

rocket components and advanced his project as a tenant in Arrowhead Center's Studio G incubator. He developed a business start-up accompanied by a STEM curriculum developed in partnership with the College of Education for middle- and high-school students. Electrical and mechanical engineering student Dakota Burrow used the space to develop a phone app

Chemical and Materials Engineering

Specialized microscope system enhances nanoscale research

Researchers at NMSU are looking at materials on the smallest of scales and making big discoveries. Their work has become even more extensive with the acquisition of a state-of-the-art high-resolution atomic force microscope (AFM) system.

AFM allows for the manipulation of materials on the nanoscale—less than one billionth of a meter in size—that have unique properties that could enable the manufacturing of a wide range of products that are smaller, cost less and perform better.

Faculty members Hongmei Luo and Shuguang Deng (chemical engineering), Igor Sevostianov (mechanical and aerospace engineering), Sergei N. Smirnov (chemistry and biochemistry), and Cynthia G. Zoski (chemistry and biochemistry) received an award from the National Science Foundation for the acquisition of the instrument in 2012. It is housed in the Core University Research Resources Laboratory (CURRL) and is accessible to all NMSU researchers, regardless of discipline.

“Most investigations take advantage of the very high spatial resolution of this type of microscope, which scans with an extremely sharp tip over the surface of a sample. The atomic force microscope maps just the virtual surface of samples under ambient conditions and provides material property characteristics as well as size and shape of nanometer-scale objects,” said Peter Cooke, director of CURRL.

“It is especially useful for measuring physical properties of composite thin films and

small objects like macro-molecules deposited on atomically smooth substrates. The revolutionary capability of the instrument to rapidly scan surfaces at high spatial resolution creates the possibility of measuring rapid changes in materials at atomic and near-atomic dimensions,” Cooke said.

Luo is using the microscope in her research on developing an approach to create high-quality films of nearly any metal oxide,

“Atomic force microscopy is a young and rapidly expanding field of research.”

ranging in thickness from ten nanometers to hundreds of nanometers. Luo’s work could lead to more cost-effective ways to create metal-oxide films that are used in the production of electronic and optical devices.

“Metal oxides have many valuable properties and a wide variety of applications. We hope to use this less-expensive method to produce materials that are comparable in quality to those prepared by other techniques,” said Luo.

Luo and her group in the Thin Films and Nanomaterial Laboratory are also exploring the use of nanostructured materials for lithium-ion batteries, supercapacitors and solar cell applications.

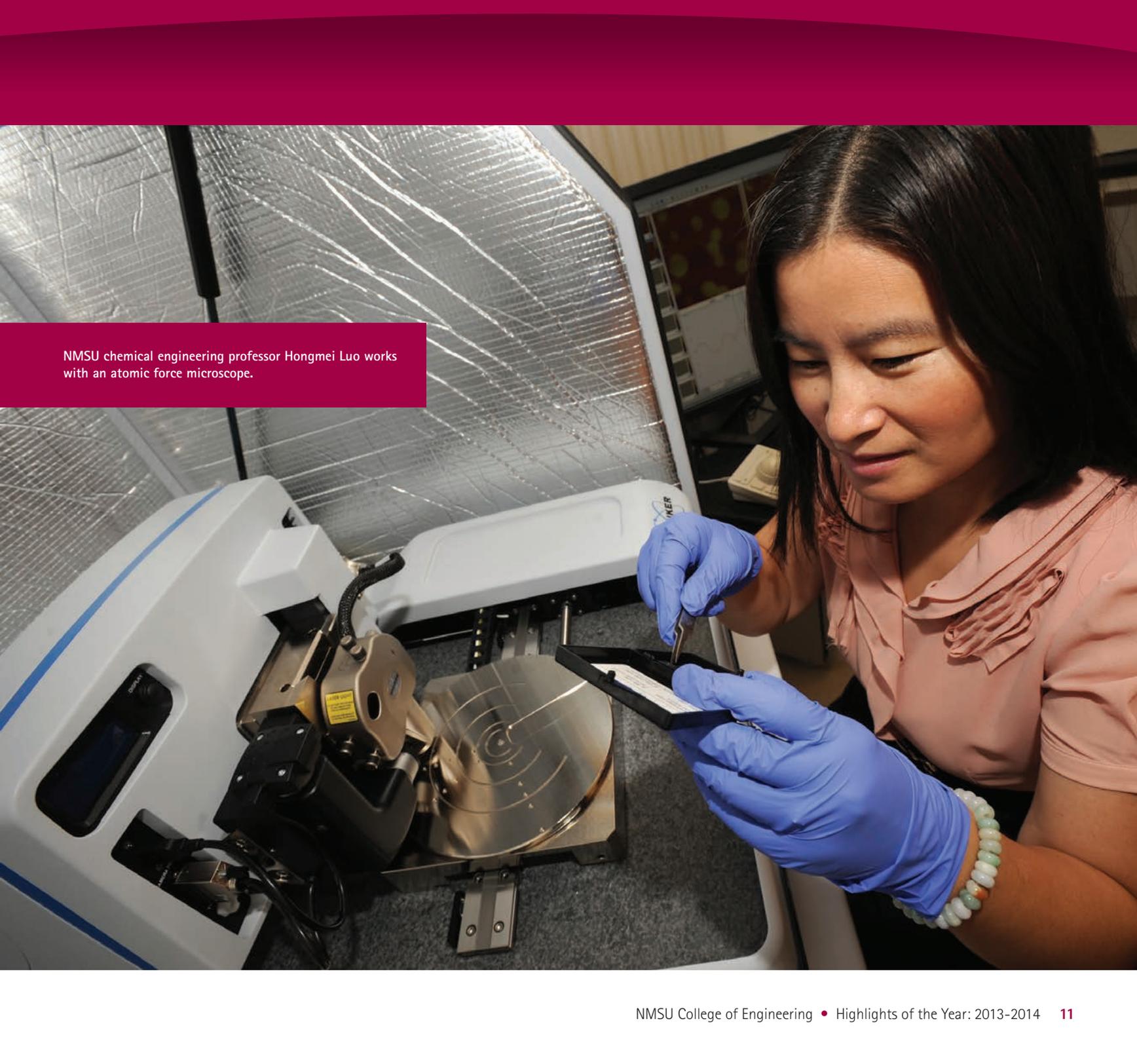
Deng is working with Toro Energy, a California company developing energy conversion technologies that incorporate nanomaterials. The firm is working on the next generation of proton exchange membrane fuel cells, which boast a much higher thermodynamic conversion efficiency than internal combustion engines or power generation plants.

Sevostianov said the mechanical engineering micromechanics research group will study the connections between materials’ microstructure and their overall mechanical and physical properties—elastic, electrical, thermal, etc.

“For this goal we combine methods of microscopy with standard mechanical and physical tests. AFM provides us a new opportunity,” he said.

Faculty from the Colleges of Arts and Sciences and Agricultural, Consumer and Environmental Sciences will also expand their research and teaching into nanoscience and nanotechnology by employing the unique capabilities of the AFM.

“Atomic force microscopy is a young and rapidly expanding field of research, so the availability of this readily accessible and state-of-the-art tool provides a tremendous boost to research and training at NMSU,” said Cooke.

A woman with long dark hair, wearing a light pink short-sleeved shirt and blue nitrile gloves, is focused on her work. She is holding a small, dark rectangular object with tweezers in her right hand and another similar object in her left hand. She is standing in front of a large, white and blue piece of scientific equipment, which is an atomic force microscope (AFM). The AFM has a prominent circular metal component in the center. The background is a cleanroom environment with silver, reflective insulation panels. The lighting is bright and even.

NMSU chemical engineering professor Hongmei Luo works with an atomic force microscope.

NMSU studies treatment, uses for wastewater from fracking

Department of Civil Engineering researchers, led by Assistant Professor Pei Xu, are working to find safe and beneficial uses for produced water—a waste stream generated in oil and gas exploration and production.

“Oil and gas are buried underground and are mixed with water for extraction,” Xu said. “When we get oil and gas out of the ground, we also have the produced water that is the byproduct.” In the U.S., the quantity is substantial.

Produced water management is a significant challenge for the oil and gas industry. Based on a survey conducted by Argonne National Laboratory, approximately 98 percent of produced water generated from onshore production is deep-well injected, which is costly for producers and wastes water resources, especially since much of our oil and gas exploration is in arid or semi-arid areas such as Texas, New Mexico, Colorado and Wyoming.

Xu begins by examining the characteristics of produced water—levels of salinity and organic and inorganic contaminants—and how to remove those contaminants.

“After we have a very good understanding of the water’s characteristics, then our focus shifts to developing treatment technologies,” Xu said.

Xu and her team are currently working with produced water from Permian Basin operations, though produced water from other areas may have different characteristics.

They are using several technologies to treat the water, including reverse osmosis and electro dialysis membrane systems. Both remove salt, leaving a freshwater stream as well as a concentrate stream that requires disposal.

A problem with these technologies is that the membranes can be fouled quickly by the particulate matter in the water. To address this, the team is developing pretreatment technologies to remove contaminants from the

“**Produced water management is a significant challenge for the oil and gas industry.**”

water so the membranes can be operated for a longer time and more cost effectively.

Civil engineering graduate students Zach Stoll and Josue Magana are working on biological processes to remove organic contaminants from the water.

One challenge of biological treatment is that the highly saline environment kills microbes that remove the organic contami-

nates. Certain microbes that can tolerate high salinities exist in nature but aren’t normally found in produced water. “Our work focuses on trying to acclimate the microbes to highly saline produced water so they remove the organics,” said Stoll.

Magana is experimenting with microbiological approaches to treat the flow-back water that contains different types of viscous guar gums. These gums are used as a gelling agent in hydraulic fracturing to maintain the structure of the fracture to extract the oil and gas.

“We’re looking at using it as a source of food so the microbes can maintain their metabolism and degrade all the other organics that are toxic to humans and the environment,” Magana said. “There are billions of gallons of water used in the hydraulic fracturing process, and if we can reclaim or reuse some of this we could potentially save energy and water.”



Civil Engineering Assistant Professor Pei Xu, center, works with graduate students Guanyu Ma, left, and Xuesong Xu in her laboratory.

Electrical and Computer Engineering

Researchers launch smart-grid epicenter

For the next five years, a multidisciplinary team of researchers at NMSU will focus on intelligent technologies for smart grids.

The \$5 million, five-year grant from the National Science Foundation's Center for Research Excellence in Science and Technology will establish the Interdisciplinary Center of Research Excellence in Design of Intelligent Technologies for Smart Grids (iCREDITS). Klipsch School of Electrical and Computer Engineering Head Satish Ranade and Computer Science Department Head Enrico Pontelli will lead iCREDITS as co-directors, forming a coalition of experts in electrical engineering, computer sciences, mathematics, management and education to study the development and use of smart grids.

Like solar panels, smart grids allow consumers to be producers of energy as well as users. They utilize digital data and communications technology to predict energy usage patterns and operate automatically—thus promoting sustainability.

"Smart grids are a combination of communications, computers and intelligent controls that lead to improvement in how electricity is moved around and improvement in efficiency, which leads to saving money and can improve reliability," said Ranade.

"Smart grids represent the future of the electrical generation and distribution infrastructure, and present a number of challenges that the research community is trying to address," Pontelli said. "Smart grids try

to make a directional relationship between power plants and customers by predicting when customers need electricity. If they had that information, production would be more efficient."

The center will focus its efforts on energy, communication, coordination and monitoring. One of its core goals is to increase the number of trained scientists and engineers in smart grid technologies. The staff is in

“**Like solar panels, smart grids allow consumers to be producers of energy as well as users.**”

the process of establishing an undergraduate minor and a master of science degree in smart grid technologies.

The College of Engineering is currently researching how to better control, manage and protect electricity grids, while the College of Arts and Sciences is providing expertise in modeling communication, control and data mining.

"It allows you to design things in a smarter way and the ultimate promise is that—whether an electricity customer wants to do something with the information or not—it would be nice for customers to know that right now you're using electricity at a premium time and the cost is high," Ranade said.

Research will focus on energy delivery, monitoring and pattern discovery, and agent-based coordination and communication. The center will also focus on education of K–12 students, including recruitment, training and retention of female and Hispanic students.

"I think this has a lot of potential and could create new job opportunities in the state," said Pontelli. He hopes NMSU will become an innovator in the smart-grid industry and the first institution in the Southwest to offer training programs and a graduate degree track.

"There are a lot of statistics that show that the demand for people with this kind of expertise is very high and going to explode in the next few years. It's going to be a very marketable skill, and we want to help meet that demand with our programs," said Pontelli.

To learn more about the research center, <http://icredits.nmsu.edu>.



Satish Ranade, Electrical and Computer Engineering Department Head and holder of the PNM Endowed Chair for Utility Management, will be joined by other members of the department in a collaborative research project with the Computer Science Department.

Engineering Technology and Surveying Engineering

New course bridges business, engineering

When Luke Nogales started teaching engineering technology at NMSU, he integrated some ideas from the corporate world.

Before coming to NMSU, Luke was an innovator at Procter & Gamble in the firm's Disruptive Innovation department and the New Business Creation organization—both part of the Baby Care unit—and on the Natura Pet team in the Pet Care unit.

At NMSU, Nogales introduced a pilot class in the fall of 2013. In ET480—Innovation and Product Development—he taught methods to evaluate and move ideas forward into viable businesses. He modeled his class after the Lean LaunchPad course originally developed at Stanford by serial entrepreneur and startup guru Steve Blank. Lean LaunchPad had some similarities to the methods used by Procter & Gamble, but was open to the public domain.

“I didn't see a lot of avenues for students to learn about entrepreneurship in class,” said Nogales. “I bounced the idea around and received a lot of support.”

The method involves searching for a viable business model that considers all of the potential stakeholders, from business partners to end users.

“It helps reduce risk by minimizing the cost of starting a business while increasing the chances of success through validation of a concept before you move forward,” said Nogales.

The class was about 70 percent engineering students, while the remainder was business

students. The students were asked to develop and present a business idea. Six ideas were selected by Nogales and fellow students to advance for business model and prototype development.

“It was surprising to see how much the different groups of students learned from one another,” said Nogales. “Engineering students were clueless about marketing. They were afraid of sales and accounting was a foreign

“If we want to develop engineering rock stars, this is what will help them get there.”

language to them. The business students had never seen the process of transforming raw materials into a prototype from their own idea.”

Among the more successful ideas was a device to pick up goatheads; the irksome, thorny seeds of a weed. Another was an app for the wine industry to track materials entering and leaving the manufacturing facility,

providing a low-cost alternative to current systems that fulfill the legal record-keeping requirements of the industry.

Key to the class was the involvement of outside experts who made presentations and advised the students: Susanna Kass, Entrepreneur in Residence at NMSU's Arrowhead Center, global business executive and product launch expert; Scott Maloney, tech executive; Terry Lombard, NMSU technology licensing associate; Beto Pallares, venture capitalist; and various NMSU faculty members.

Nogales also teaches core mechanical engineering technology courses and is an enterprise adviser at NMSU's Arrowhead Center, providing consulting to startup companies.

“It is essential to integrate business and engineering education,” said Nogales. “If we want to develop engineering rock stars, this is what will help them get there.”



Assistant Professor Luke Nogales provides direction to engineering technology students working in the lab.

Industrial Engineering

Clinic scheduling research improves quality of care

Imagine going to the doctor's office and seeing the doctor right away.

Yu-Li Huang, assistant professor of industrial engineering, and six of his students are hoping to make that happen.

They are working on a project for Presbyterian Healthcare Services in Los Lunas, NM, to make outpatient scheduling more efficient, improve patient access and reduce patient waiting.

Huang said two problems they found at the clinic were appointment scheduling and the amount of time doctors spend charting.

"We found that the physicians in this clinic tend to spend about 20 percent of their time doing charting," Huang said. "I think two hours of charting time can be reduced by providing a better computer interface."

Huang said that they are not far enough along in the project to give their recommendation to the clinic for scheduling, but that reducing charting time should be implemented before he can provide a recommendation on scheduling.

"One of the key elements for the type of scheduling I do is to improve the patient's quality of service and access to care," Huang said. "I have the theoretical base and I want to use this clinic as a pilot to see if the theoretical base can actually be implemented."

If this project is successful, Presbyterian will implement the solutions at other clinics in its system.

Huang has worked on similar projects—one in the radiology department at Mimbres

Memorial Hospital in Deming and another at the Women's Health Center in Las Cruces.

He said that the Women's Health Center had an issue with scheduling and sought a better system to reduce stress on their midwives, improve access to care and reduce patient waiting time. Huang noted that the reduction in patient waiting time was significant; the average waiting time—originally 40 to 45 minutes—was cut to 10 to 15 minutes.

“One of the key elements ...is to improve the patient's quality of care.”

To come up with a successful solution, Huang looks at the data and considers the amount of time the physician spends with the patient and the variation in the treatment time.

For the Women's Health Clinic, Huang used a method that considers many different constraints to come up with an optimal solution. For Presbyterian, he is using a grid

scheduling system based on minimizing costs. He looks at the average amount of time a physician spends with a patient, then schedules appointments based on that amount of time while also considering variations.

For example, if the system determines the minimum appointment length should be 15 minutes, returning patients will be scheduled thusly. Other appointments requiring more time, such as new patient appointments, are scheduled in 15-minute increments. A new patient, for example, might get a 30-minute appointment.

"The point of the grid system is interchangeability," Huang said. "For the non-grid appointment system, where a return visit is scheduled for 15 minutes, if I put a new patient into a 15-minute slot, the physician's delay will compound throughout the day. On the other hand, if I put the return visit patient into a new patient slot...the physician may be idle, so there will be underutilized medical resources."



As a doctoral student at the University of Michigan, Yu-Li Huang studied three clinics and his redesigned schedule reduced patient waiting as much as 56 percent.

Mechanical and Aerospace Engineering

State-of-the-art engineering research capability funded by grant

Three College of Engineering researchers secured a grant to purchase an integrated system that will greatly expand their defense-related research and structure modeling.

Department of Mechanical and Aerospace Engineering Assistant Professors Young Lee and Fangjun Shu and Associate Professor Mingjun Wei have been working on various collaborative projects for two years. The new equipment will allow expanded capabilities in laser-assisted nonintrusive experimentation and data-driven reduced-order modeling of multidisciplinary phenomena occurring in structural and fluid dynamics.

Fluid-structure interactions are a crucial consideration in the design of many engineering systems, such as aircraft. The fluid forces of air flowing over airplane wings, for example, could make them susceptible to fatigue, possibly with catastrophic consequences.

The new equipment enables them to expand their research capability, which is currently limited to single-point measurements and 2-D measurements.

“With this equipment, we can perform measurements in 3-dimensional space for structures and fluids, and,” said Lee, “we can perform advanced multidisciplinary research on fluid-structure interactions by establishing data-driven—yet physics-based—reduced-order models.”

Lee’s research expertise is in nonlinear dynamics and structural vibrations, aeroelasticity, nonlinear system identification and

time-delayed systems, Shu’s research focuses on experimental fluid dynamics, bio-inspired flow, biofluids, microfluidics and turbulent flow. Wei’s research explores computational fluid dynamics, reduced-order models, fluid control and optimization, micro-air vehicles and aeroacoustics.

The purchased equipment includes a Polytec PSV-500 Scanning Vibrometer System

“With this equipment, we can perform measurements in 3-dimensional space for structures and fluids.”

for structural vibrations tests, a LaVision 3-D Particle Image Velocimetry System for flow field measurements and analysis and a 3-D scanner system with ATOS Core Essential 2MP for generating CAD data to generate computational meshgrids. Each can be used independently; two or all subcomponents can be linked to perform fluid and structure

measurements.

“Our top priority is Department of Defense-related research,” Lee said. “One of the serious applications of DoD interests could be blast protection of structures, which involves timescales in the microsecond to second range. You need a really, really fine timescale to get good accuracy for microscale-second resolution, and hence a longer computational time for a greater number of iterations to converge to the accurate answer. Also, such phenomena are strongly nonlinear and nonstationary. Our novel research methodology with this newly acquired equipment reduces such efforts by extracting the most important phenomena from the measured data and from existing computational data, making future applications much easier.”

Engineering students also will benefit from the new system, including its use in classes taught by Lee, Shu and Wei; Senior Capstone Design projects; and extracurricular activities such as the American Institute of Aeronautics and Astronautics Design, Build and Fly Competition and the NanoSat program.

“As for student education, these 3-D measurements can generate more realistic visualization of vibrations or fluid phenomena,” Lee said. “We plan to add a 3-D TV, then we can feed these 3-D measurements, 3-D visualizations, into 3-D TV so students can really see what happens in structural fluidity and dynamics.”



NMSU Mechanical and Aerospace Engineering Professors Mingjun Wei, Young Lee and Fangjun Shu recently secured a large grant to fund research in structural and fluid dynamics.

Faculty Spotlight

Edward Pines named to Quality New Mexico Board

Industrial Engineering Associate Professor and Department Head Edward Pines was named to the Board of Directors for Quality New Mexico, an assignment that dovetails with his commitment to improve the industrial engineering curriculum using concepts of quality improvement and assessment.

Quality New Mexico comprises businesses across the state seeking performance excellence. The organization uses the Baldrige Criteria for Performance Excellence to conduct organizational assessments to help businesses identify their strengths, gaps and opportunities for improvement.

Pines said their goal is to make New Mexico the state of quality. "It's good to interact with people who are working on improving the delivery of manufactured goods, services, healthcare and banking," Pines said.

College of Engineering Associate Dean Patricia Sullivan said that Pines' work in industrial engineering aligns very well with the mission of Quality New Mexico.

"Industrial engineering is a discipline that studies how people, equipment, machinery, software and systems all work together to efficiently produce products and services," Pines said.

To keep the industrial engineering curriculum current with industry needs, the department is involving junior- and senior-level students in industrial projects for local

businesses.

Pines spearheaded the entrepreneurship minor launched in fall 2014, a collaboration involving industrial engineering, engineering technology and business management.

"The classes on entrepreneurship are focused on how to take an idea and make it into a business. What we're trying to do is get people interested in developing ideas and

"The classes on entrepreneurship are focused on how to take an idea and make it into a business."

turning them into real products and services," Pines said.

He co-teaches a senior design class with mechanical and aerospace engineering Associate Professor Young Ho Park where he runs a small fund and invests in projects to give students the experience of developing ideas and seeking investors.

Pines also teaches two popular distance education graduate courses. The focus of

Advanced Engineering Economy is financing large projects. Topics in Engineering Administration cover subjects such as intellectual property and how businesses are constructed to do engineering projects.

"They're topics that a lot of people use on a daily basis," he said.

Pines was recently appointed as a representative for NMSU's Institutional Review Board, which reviews proposals for research that includes human subjects. He is the co-lead for the Pathways to Innovation program, enterprise adviser for the Arrowhead Innovation Network and the director of distance education programs for the College of Engineering.

Pines joined the NMSU faculty in January 1994 after completing his doctorate at Pennsylvania State University, and has more than 10 years of industrial experience in engineering and management in the aerospace and electronics industries. He has been the Industrial Engineering Department head for 14 years.

"He exemplifies the land-grant mission of teaching, research and service," Sullivan said. "His role on the Quality New Mexico board directly aligns with efforts across the college to support outreach and public service."



Industrial Engineering Department Head Edward Pines uses industrial engineering concepts to improve quality in his department and in New Mexico.

Student Spotlight

He's a sophomore. He's a senior. He's Dakota Burrow.

Dakota Burrow just completed his first year at NMSU. And he's technically a senior.

Burrow started taking college courses at the age of 15 as a sophomore in high school and entered NMSU in fall 2013 with 78 credits. He could graduate early, but he plans to take full advantage of his scholarships and graduate in 2017 with two degrees: mechanical and electrical engineering.

The 19-year-old was the Mayfield High School Class of 2013 valedictorian, had a 4.52 high school GPA and was a National Merit Scholar and National Hispanic Scholar. He was awarded NMSU's President's Associates Excellence Scholarship.

His history of accomplishments continues at NMSU. He was selected to do an internship at MIT's Lincoln Laboratories this past summer, a position offered to only top students. There, he worked on several projects; his favorite involved instrumental boots for soldiers in the field.

"Soldiers in the field usually carry more than 50 pounds of equipment. Most of the disabilities suffered by soldiers are back injuries due to the loads they have to carry," he said. "We were working with a boot insert that collects positional primary forces on the foot. The data is fed back via radio. I tested real-time data with MATLAB.

"The best part of the experience was definitely the people and becoming comfortable in the environment. It's good to get out of your comfort zone," he said. "It

definitely motivated me to work harder at school."

Burrow is a member of Engineer's Council and is a College of Engineering Ambassador. He is also a member of the student chapter of the American Society of Mechanical Engineers.

The ASME team took third place in the regional Student Design Competition in Lubbock, Tex., on April 4 with their quad copter. The goal of this year's competition—

“Burrow chose NMSU because he felt welcomed and people know who he is.”

Lighter than Air UAV—was to build a small, unmanned air vehicle that could put out a fire.

"I am very proud of our quad copter. It was engineered and not put together with pieces that were purchased here and there," said Burrow. "We owe a lot to Ken Ruble and the Aggie Innovation Space. He suggested that we design the pieces in house. The 3-D printers opened up a whole range of things

we could do. It was beautiful." (*See the quad copter on the front cover.*)

In addition to these activities, Burrow will continue working with a robotics program he started for elementary school students called WARP, or the Weekly After-school Robotics Program. WARP has helped more than 60 elementary students get a taste of STEM (science, technology, engineering and mathematics) at a very young age. Burrow takes the students' creativity with Legos and channels it into Lego robotics through WARP.

He developed a method to control robots with a cell phone, eliminating the need for expensive computer equipment and enabling more students to be involved with robotics. He applied for a Launch Grant from NMSU's Arrowhead Center.

"I didn't win, but I'm pleased that I was a finalist for the \$25,000 award," he said.

Before coming to NMSU, universities across the country offered Dakota Burrow more than \$1 million in scholarships.

Burrow said that he chose NMSU because he "felt welcomed" and people know who he is and he could get real-world experience through the college's hands-on curriculum.

"They help and support me here," Burrow said.



Dakota Burrow entered NMSU with 78 credit hours. Now in his second year and technically a senior, he's majoring in mechanical and electrical engineering.

Faculty Accomplishments

Chemical Engineering Assistant Professor **Jessica Perea-Houston** was named an International Society for Advancement of Cytometry Scholar.

Albuquerque Business First selected **Patricia A. Sullivan**, associate dean, as a Woman of Influence for 2014 from among 30 honorees deemed “top women leaders ... shaping New Mexico’s economy and showing leadership in times of change.”

College of Engineering faculty members who have generated \$500,000 or more in research funding during fiscal year 2013 were **Abbas Ghassemi**, WERC Consortium; **Russell Hardy**, Carlsbad Environmental Monitoring and Resource Center; **David Jáuregui**, Civil Engineering; **Charles Creusere**, Klipsch School of Electrical and Computer Engineering; **Ruinian Jiang**, Engineering Technology; and **Andrew Rosenthal**, Southwest Technology and Development Institute.

Assistant Professors of Engineering Technology **Rolfe Josef Sassenfeld** and **Luke Nogales** were selected to participate in the National Academy of Engineering’s fifth Frontiers of Engineering Education symposium in Irvine, Calif., in October 2013.

Satish Ranade, head of the Klipsch School of Electrical and Computer Engineering, received the 2013 New Mexico Association of Energy Engineers Energy Executive of the Year Award.

Associate Dean of Academics **Sonya Cooper** was chosen as a Girl Scouts of the Desert Southwest’s 2013 New Mexico Woman of Distinction.

Jessica Perea-Houston, chemical engineering, and **Steven Stochaj** and **Wenxin Liu**, both of electrical and computer engineering, received Early Career University Research Council Awards for Exceptional Achievements in Creative Scholarly Activity.

Steven Stochaj, professor of electrical and computer engineering, received the NMSU Excellence in Academic Advising Award.

David A. Rockstraw, Chemical and Materials Engineering Department head, was elected and seated to the following positions in the National Society of Professional Engineers: Board of Directors, House of Delegates and Education Foundation Trustee.

Associate Dean of Outreach and Public Service **Patricia A. Sullivan** completed the year-long Leadership New Mexico Core Program, founded to identify leaders in New Mexico and deepen their knowledge of the challenges and opportunities facing the state.

Julio Martinez, chemical engineering assistant professor, received a Faculty Fellowship in Israel for summer 2014, a competitive academic fellowship that invites full-time university and college faculty members to participate in a two-week Summer Fellowship in Israel.

“**Patricia Sullivan is leaving a lasting legacy in New Mexico by ensuring NMSU fulfills its land-grant college mission to educate the rural population of New Mexico.**”

–**Anthony J. Medina**
Sandia National Laboratories,
campus executive for NMSU



Steven Stochaj, electrical and computer engineering professor, was honored with the Distinguished Career University Research Council Award for Exceptional Achievements in Creative Scholarly Activity and also with the Excellence in Academic Advising Award.

Student Achievements

The Concrete Canoe Team placed second at the American Society of Civil Engineers Regional Conference in Fort Collins, Colo., and placed 13th at the national competition in Johnstown, Pa.

The National Center for Engineering Pathways to Innovation named industrial engineering student **Mauricio Garcia** the first-ever University Innovation Fellow from NMSU.

Leila Karimi, a chemical engineering Ph.D. candidate who researches brackish water desalination for the Institute for Energy and the Environment, was awarded the International Desalination Association's 2013 \$10,000 Channabasappa Memorial Scholarship.

Students, faculty and alumni in the student organization **Engineering Without Boundaries** spent part of their summer in 2013 rehabilitating an old bridge in Santa Teresa, Nicaragua, that caused dozens of accidents from people falling through the bridge. After the group was done, the bridge was safe for people to cross.

Chemical engineering master's candidate **Joshua Hill** was awarded a \$40,000 fellowship at Sandia National Laboratories.

Five engineering students earned spots in nationally competitive research programs: **G. Jake Manning** was accepted into the Army High Performance Computing Research Center's 2013

Summer Institute. **Joshua Michalenko**, **Jennifer Hu**, **Francisco Sanchez** and **Cynthia Rojas** were accepted into the Research Experiences for Undergraduates.

Electrical engineering graduate students **Steven Berard**, **Taylor Burgett** and **Jake Gutierrez**, working with the Doña Ana County Illegal Dumping Partnership Program, created a smartphone application for Las Cruces residents to report illegal dumping.

The New Mexico Space Grant Consortium awarded \$5,000 NASA research grants to the following students:

- **Joshua Gomez**, chemical engineering, "Optimization of Algal Activated Charcoal for Use in NASA Environmental Control and Life Support System."
- **Joshua Michalenko**, electrical engineering, "A Method to Connect Fragmented Coronal Loops in Extreme Ultraviolet Images."
- **Timothy Nunley**, engineering physics, "Band Gap Analysis of Germanium Alloy Films."
- **Jesse Sharp**, aerospace engineering, "Passive Exoskeleton with Reduced Gravity Offloading and Classroom Wind Tunnel Teaching Aide."

NMSU's American Society of Mechanical Engineers student chapter took third place in the regional Student Design Competition in Lubbock, Tex. with their quad copter. The theme of this year's competition was Lighter than Air UAV.

“You redefined the meaning of hospitality and you reinforced my belief that in the most unexpected of times, the best relationships are forged.”

–**Brejesh Aiyer**
Vellore Institute of Technology in Vellore, Tamil Nadu, India, Mini Baja's administration team lead

Engineering students from the Vellore Institute of Technology in Vellore, Tamil Nadu, India, traveled more than 8,000 miles to participate in the Society of Automotive Engineers Mini Baja Collegiate Design Competition. They partnered with NMSU's Mini Baja team which accepted delivery of their car and equipment along with providing a space to work on the car. The two teams prepared for the competition together.



Children from Nicaragua test out the new foot bridge built by Engineering Without Boundaries from NMSU.

Donor Spotlight

Alumnus establishes endowment for EUMP graduate students

Retired from a long and fulfilling career in power engineering, NMSU alumnus William Charles said that NMSU made his career possible. He and his wife Patricia recently donated \$25,000 to the College of Engineering to establish the William and Patricia Charles Endowed Fellowship.

The endowment will fund graduate student fellowships in the Electric Utility Management Program in the Klipsch School of Electrical and Computer Engineering. Mr. and Mrs. Charles have also pledged an additional gift to grow the endowment to \$50,000 over the next few years. The recipient will be recognized as the William and Patricia Charles Fellow in Power Engineering.

William Paul Charles was one of the first graduates from the Electrical Utility Management Program. Before beginning the graduate program, he worked at White Sands and NMSU's Physical Science Laboratory. Upon completion of the power engineering graduate program, Charles went to work for Shell where he ran their internal co-generation facilities and distribution network.

Charles said that he and his wife were happy to be able to give back to the College of Engineering through the new graduate fellowship.

EUMP is a graduate engineering program developed specifically to prepare engineering managers to work in the electric utility industry. It is one of the only power engineering programs in the country to blend electrical engineering with regulatory economics.



(Left to right) Engineering Dean Ricardo B. Jacquez, Klipsch School of Electrical and Computer Engineering Head Satish Ranade and Patricia and William Paul Charles celebrate the establishment of a new graduate fellowship.

Significant Gifts

The college received \$250,000 from the estate of Forrest Mooney to establish the **Forrest Mooney** Endowed Professorship in Aerospace Engineering. Mooney, a mechanical engineering alumnus, retired following a long career in the aerospace industry. A native of Hatch, NM, he left this estate gift to ensure quality faculty are retained at NMSU to educate future engineers.

More than \$20,000 was raised for engineering scholarships at the Fourth Annual Volt Information Sciences Slide Rule Golf Tournament sponsored by Volt Information Sciences company founder and NMSU alumnus **Jerome Shaw**.

A \$50,000 gift from **Western Refining** provided for updating the chemical engineering Unit Operations Laboratory as well as funding scholarships and other college activities.

A \$10,000 grant from the Halliburton Foundation allowed faculty members to attend a Lean LaunchPad for Educators course at the University of California, Berkeley. They learned ways to incorporate innovation into curricula by learning successful methods for new business startups from entrepreneurs.

A \$20,000 gift from **Lockheed Martin**, operating contractor for **Sandia National Laboratories**, was received as part of a Memorandum of Understanding with the College of Engineering to support STEM education programs.

TRAX International, LLC gave \$25,000 to fund \$10,000 in scholarships; \$10,000 in electrical engineering, mechanical engineering and engineering technology capstone projects; and \$5,000 toward the New Mexico BEST Robotics competition.

Intel Corp. made a gift of \$50,000 to support the Aggie Innovation Space with a pledge of an additional \$10,000 per year for the next three years to provide replacement of consumables, materials and supplies.

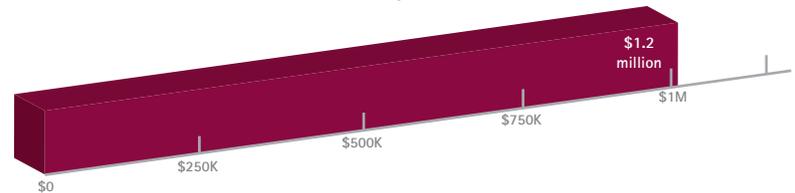
The Boeing Co. gave \$58,000 to support scholarships, NM BEST Robotics and engineering capstone design projects.

Richard and Cynthia Leza made a gift of \$18,000 to establish the Kenneth White endowed scholarship for students in civil engineering and to grow the Mr. and Mrs.

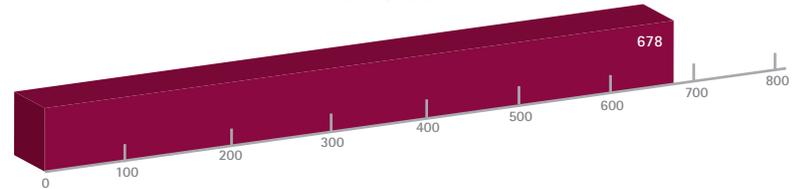
COLLEGE ENDOWMENT:
\$29.22 M

TOTAL GIFTS RECEIVED 2013/2014:
\$1.46 M

TOTAL VALUE OF SCHOLARSHIPS AWARDED
2013/2014



NUMBER OF SCHOLARSHIPS AWARDED
2013-2014



Note: This incorporates all financial aid processed through the College of Engineering.

Richard Leza endowed scholarship. Richard is an NMSU civil engineering alumnus.

The family of Joseph Genin made a gift of \$30,000 to create the Joseph Genin Memorial Scholarship in mechanical and aerospace engineering. Genin was a former dean of the college and longtime faculty member in the Mechanical and Aerospace Engineering Department.

Donor Spotlight

Gifts that go beyond dollars

Not all support to the College of Engineering comes in the form of monetary gifts. Some of most valued contributions are human in nature.

This past fall, representatives from Cummins Inc. spent two days reviewing student résumés just prior to NMSU's annual career fair. Joined by representatives from Chevron-Phillips Chemical and Sandia National Laboratories, most of them engineering alumni, they reviewed more than 200 student résumés, providing students with invaluable help in preparing to meet with employers.

"It was a great opportunity to see what they look for in a résumé," said senior mechanical engineering student Ember Krech. "It was helpful to receive direct feedback about a whole range of things, from format to what kind of experience is needed." Krech is now speaking with an employer about opportunities that might include graduate school.

"Cummins is a fantastic company to work for and has been a great employer for Aggie graduates and interns. The Campus Recruiting Team is grateful for the support we've received from NMSU, so we like to give back to the school and provide our industry experience at Résumania," said Gabriel Moreno, Cummins senior product validation engineer.

Their presence at NMSU career fairs means these companies are hiring Aggie engineers; Cummins hired 19 NMSU engineers this past spring.

Corporate donations and long-standing relationships with each of these companies



Engineering alumni Gabriel Moreno, engineering technology '11, and Christopher Galvan, electrical '12, show off a Cummins diesel engine at Résumania.

are equally valued. Cummins supports the NMSU Mini Baja team. Several years ago, Cummins donated a 6.7 liter diesel engine.

Sandia National Laboratories has a memorandum of agreement with the college to form collaborative research opportunities with faculty and graduate students. Sandia supports NMSU's STEM outreach activities and two graduate fellowships. This past spring, Sandia sponsored NMSU's first-ever Aggie Innovation Design Challenge.

ChevronPhillips Chemical has funded undergraduate engineering scholarships on an ongoing basis. They have a long history of hiring Aggie engineering talent.

"These partnerships ensure relevancy in our curriculum and are great opportunities for student to transition into the workplace as interns, co-op students and as permanent hires following graduation," said Ricardo B. Jacquez, dean of the College of Engineering.

College of Engineering Advisory Council

Sylvia Acevedo, CommuniCard, LLC

Adelmo E. Archuleta, Molzen-Corbin & Associates (Emeritus)

Edmund G. Archuleta, El Paso Water Utilities

Frank Bates, El Paso Electric Co. (retired CEO)

Thomas M. Beall, V-F Petroleum, Inc. (retired CEO)

Michael Beck, Associated Contractors of New Mexico

Leonard Bloom, Western Refining, Inc.

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John C. Galassini, Sunshine Mining Corp.

Brian Rashap, Intel Corp.

Arthur D. Hurtado, Altamira Technologies Corp.

Carl O. Johnson, Northrop Grumman Corp.

Lester L. Lyles, The Lyles Group (retired Air Force General, Emeritus)

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Robert G. Myers, Robert G. Myers Co.

Joseph Perea, ExxonMobil Lubricants and Specialties

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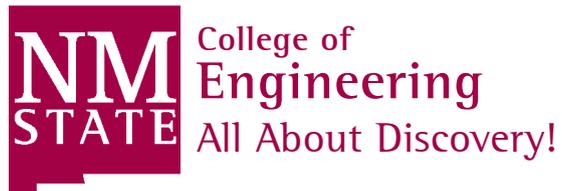
Jerome Shaw, Volt Information Sciences, Inc.

Albert Thomas, Bohannon-Huston, Inc.

Elizabeth Webster, EEA Consulting Engineers

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College of Engineering
PO Box 30001, MSC 3449
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575.646.2913
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