2014-15: Highlights of the Year

COLLEGE of ENGINEERING

NM STATE UNIVERSITY

All About Discovery!

New Mexico State University
engr.nmsu.edu

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Greetings from the Dean's office

The NMSU College of Engineering fulfills the mission of a land-grant university by blending outstanding academic programs with high-impact research. NMSU graduates, along with research discoveries and innovations, drive the economic engine of New Mexico and beyond.

The foundation of this mission is student achievement and we have invoked a number of initiatives designed to improve student success. Last year, we implemented a common freshman-year program aimed at improving both the academic experience and transition to college for first-time students. The program earned great reviews from students and instructors alike, and boosted freshman to sophomore retention from 63 to 78 percent.

This summer we offered a Lean LaunchPad workshop for transfer students to the College of Engineering. The program challenged students to identify a problem based on customer needs and test alternative solutions. The goal of the workshop was to provide the students the opportunity to meet peers, network and interact with faculty prior to the start of classes.

Summer outreach programs run by the college increased the number of first-time freshman students by 6.6 percent over the past year. This, coupled with retention efforts, help build a pathway to an engineering degree for all interested students.

Student success is directly linked to research opportunities. This year we celebrate two highly visible research programs.

Work continues on the CREST Interdisciplinary Center of Research Excellence in Design of Intelligent Technologies for Smart Grids, awarded to NMSU in 2014. Professor and co-principal investigator Satish Ranade believes discoveries made through this program will lower utility costs and promote conservation for consumers throughout the nation.

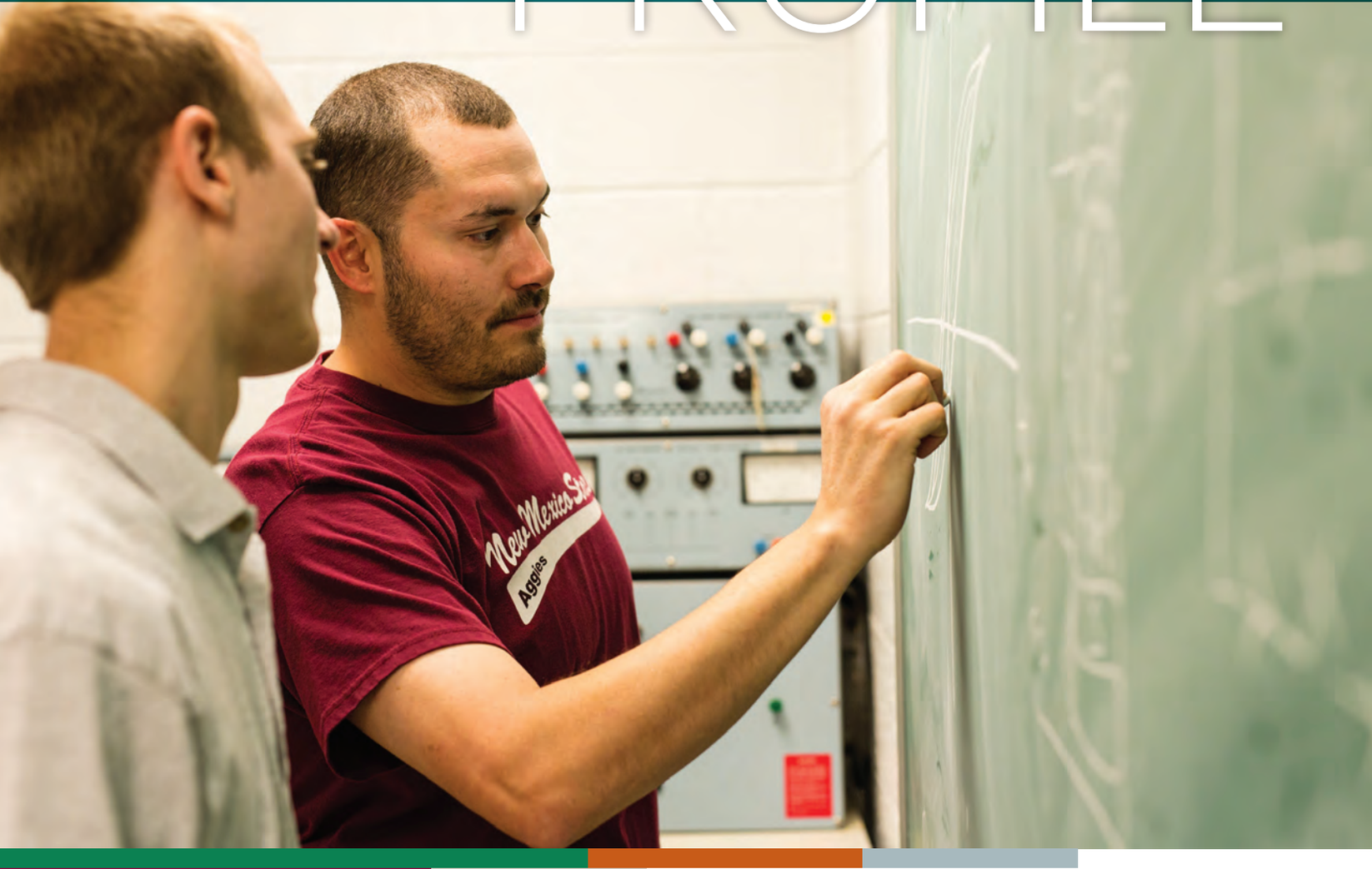
More recently, NMSU engineering was named a partner university in a new National Science Foundation Engineering Research Center to pioneer advances in geotechnical engineering that promise solutions to some of world's biggest infrastructure development and environmental challenges. This multi-decade, $18.5 million program joins industry, universities — led by Arizona State University — and government partners to establish the Center for Bio-mediated and Bio-inspired Geotechnics. Associate Professor and co-principal investigator Paola Bandini leads efforts on campus. Discoveries made through this program will have a large positive impact on the civil infrastructure of New Mexico for the next century.

These strides forward are heavily dependent upon the support of donors and corporate partners, without whom we could not achieve our goals and pursue efforts that allow us to participate in life-changing education and research. We are most grateful to those who support our mission of engineering excellence.

Sincerely,

Steven J. Stochaj
Interim College of Engineering Dean

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 (B.I.C.T.)
Mechanical Engineering (B.S., M.S. and Ph.D.)
Surveying Engineering (B.S.)

Leadership

Steven J. Stochaj, Interim 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
Thomas W. Jenkins, Engineering Technology and Surveying Engineering Department Head
Gabe V. Garcia, Interim Mechanical and Aerospace Engineering Department Head
David V. Jáuregui, Civil Engineering Department Head
Edward Pines, Industrial Engineering Department Head
Satish Ranade, Electrical and Computer Engineering Department Head
David A. Rockstraw, Chemical and Materials Engineering Department Head
Stefan Zollner, Engineering Physics

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

Fall 2014 Enrollment Statistics

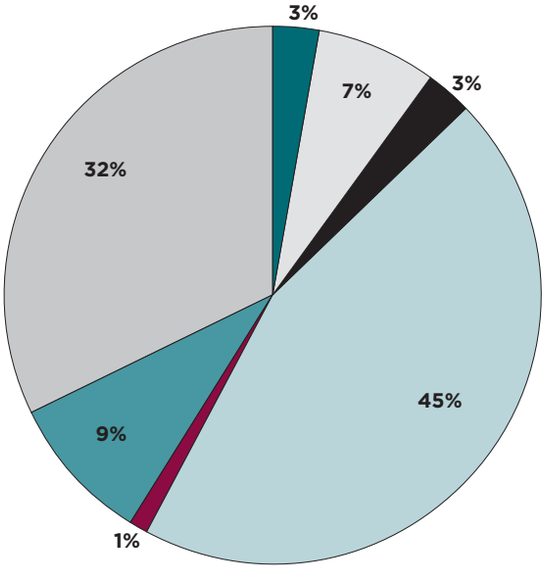
335 New Freshmen

Total Enrollment **2,610**

2,150 Undergraduate Students

Graduate Students **460**

Student Ethnicity



- American Indian (74)
- Asian (182)
- African American (70)
- Hispanic (1,174)
- Native Hawaiian or Other Pacific Islander (6)
- Unknown (243)
- Caucasian (861)

Sonya L. Cooper
College of Engineering Associate Dean of Academics

Martha C. Mitchell
College of Engineering Associate Dean of Research

Patricia A. Sullivan
Associate Dean for Outreach and Public Service

Student Gender
F 19% (499)
M 81% (2,111)

RESEARCH

From Fulbright fellows to undergraduate students, members of the College of Engineering are engaged in research endeavors that address today's most pressing challenges. In doing so, their efforts are improving the quality of life for people throughout New Mexico and beyond, a fundamental tenet of NMSU's identity as a land-grant institution.

NMSU is ranked by the Carnegie Foundation as a RU/H (Research University with high research activity) institution. College of Engineering faculty-driven research, advanced scholarship and interdisciplinary collaborations across departmental, college and university boundaries are key contributors toward our institutional goals.

Core Research Areas

- **Aerospace:** Current projects include systems monitoring materials behavior, biomimetrics, computer simulation of structural vibrations, nanosatellites, unmanned aerial vehicles and robotics controls.
- **Energy Production and Distribution:** Research includes microgrids, fuel-cell technology, renewable resources and electric power systems engineering.
- **Communication:** Current research in wireless networking, remote sensing, sensor networks, target recognition, speech processing, space communications and antenna design; computer networking, communications, digital signal processing, integrated circuit design, microwave engineering and optics; telemetry systems, advanced communications, advanced modulation, coding, data transport and equalization techniques.
- **Transportation:** Current research and collaboration on bridge and highway safety, evaluation methods and performance.
- **Water:** Research involves water quality and quantity, water infrastructure, algal wastewater treatment and energy production, riparian zone management, management of urban drainage systems and development of the use of brine in landscaping.
- **Biomedical:** Current projects in reduced-gravity technology for training and rehabilitation, instrumentation used in flow cytometry, characterization and modeling of bone structure, and the study of efficiencies for medical delivery systems.

$11.81 million
Research Expenditures for 2014/2015

$10.76 million
New Research Awards for 2014/2015

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

National Faculty Awardees

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
Dwight and Audrey Chapman Distinguished Professorship in Mechanical Engineering
Igor Sevostianov
Robert Davis Distinguished Professorships in Chemical Engineering
David Rockstraw
Ed Foreman Distinguished Professorship in Civil Engineering
Peter Martin
Harold Foreman Distinguished Professorship in Civil Engineering
Zohrab Samani
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
Forrest Mooney Endowed Professorship in Aerospace Engineering
(TBA)
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 DeLeon
Wells-Hatch Endowed Professorship in Civil Engineering
David Jáuregui

Key University Research and Collaborations

Army High-Performance Computing Research Center
Stanford University (Lead)
Army Research Laboratory Micro Autonomous Systems and Technology
BAE Systems Inc., (Industrial 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)
U.S. Economic Development Agency, Innovation Frontier Southwest
University of Arizona (Lead)

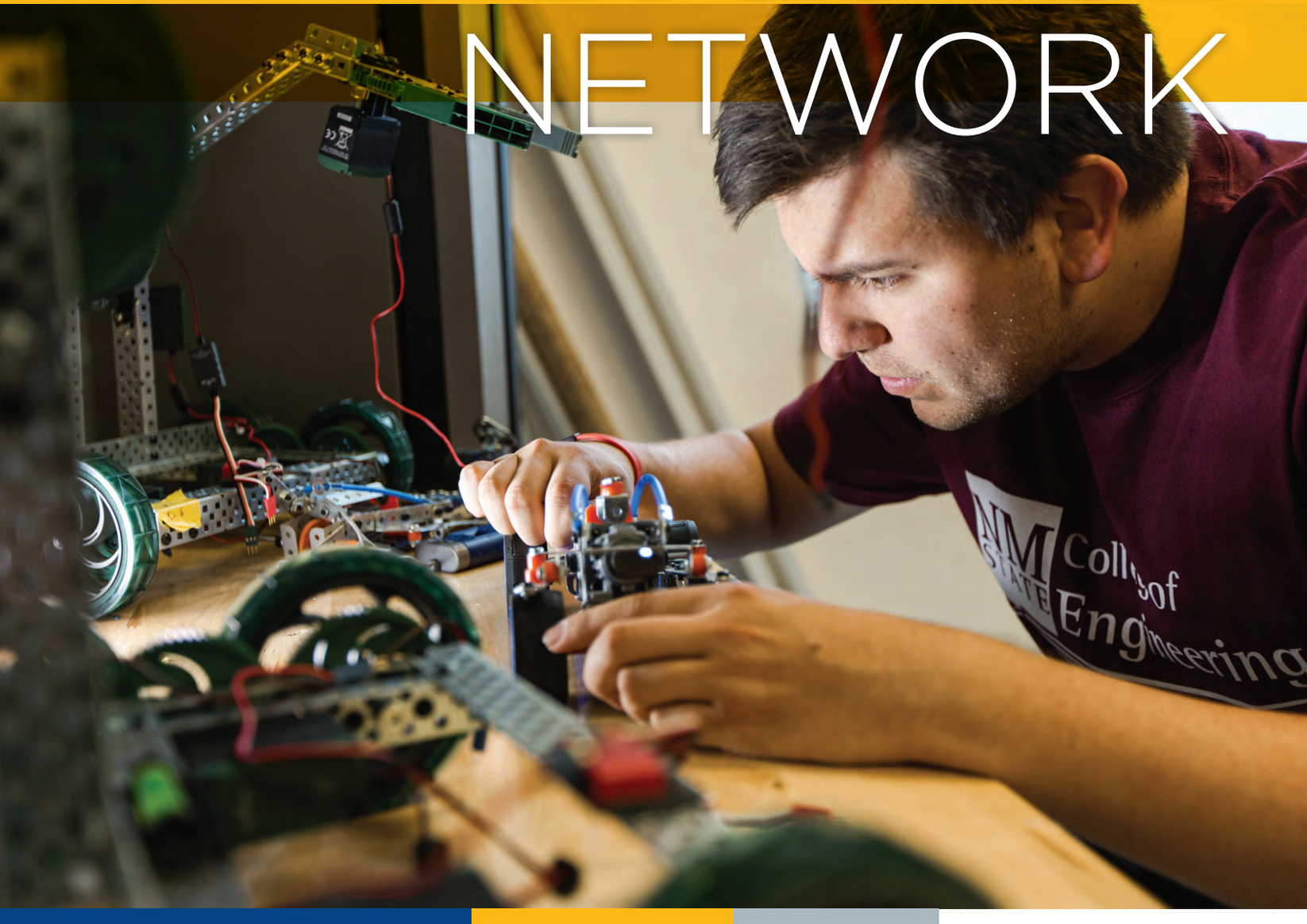
Intellectual Property Activity

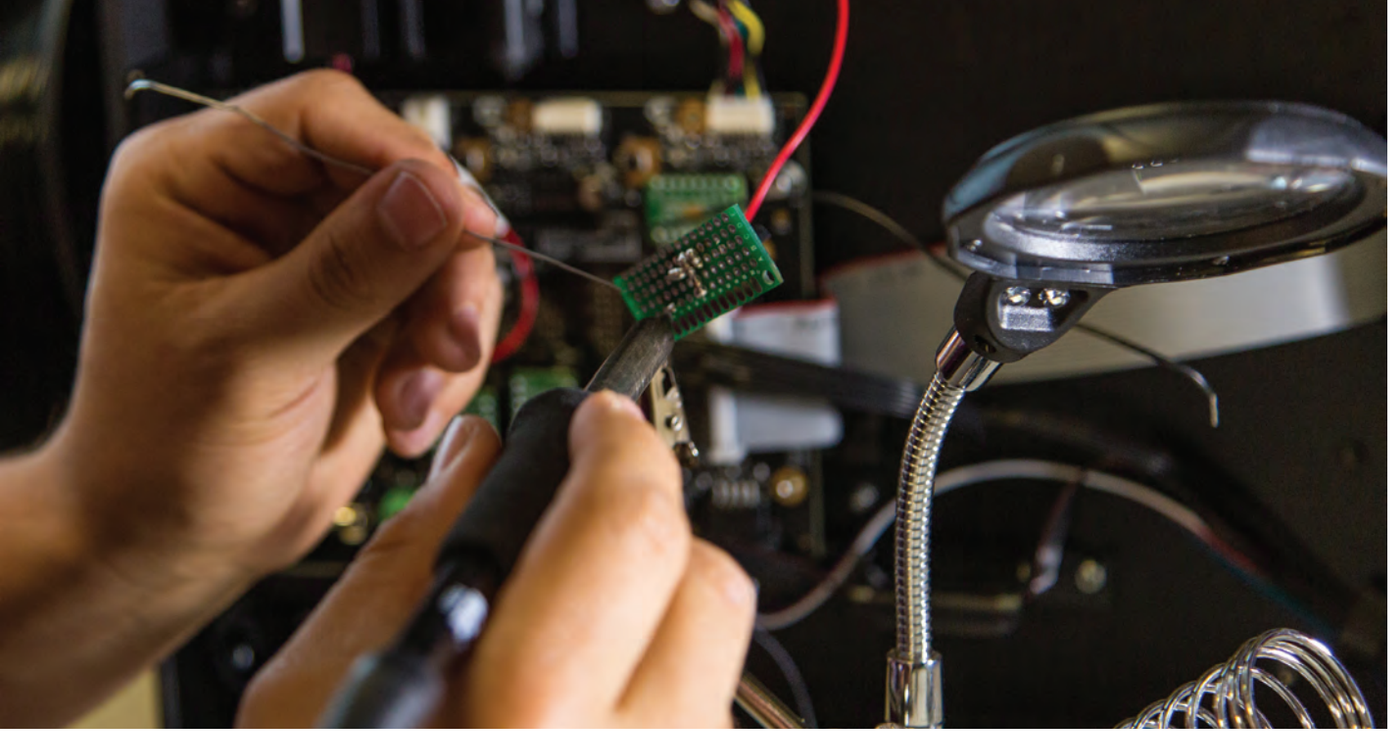
U.S. Patents Awarded: 2 new (18 currently in force)

Label-Free DNA Sensor Based on a Surface Charge Modulated Ion Conductance
Inventors: Sergi Smirnov and Huiqiang Wang
Direct Conversion of Algal Biomass to Biofuel
Inventors: Shuguang Deng, Aditya Anil Patil and Veera Gnaneswar Gude

U.S. Patents Pending: 4 new (10 total pending)
U.S. Provisional Patents Filed: 7
Invention Disclosures Filed: 7

ENGINEERING NEW MEXICO RESOURCE NETWORK





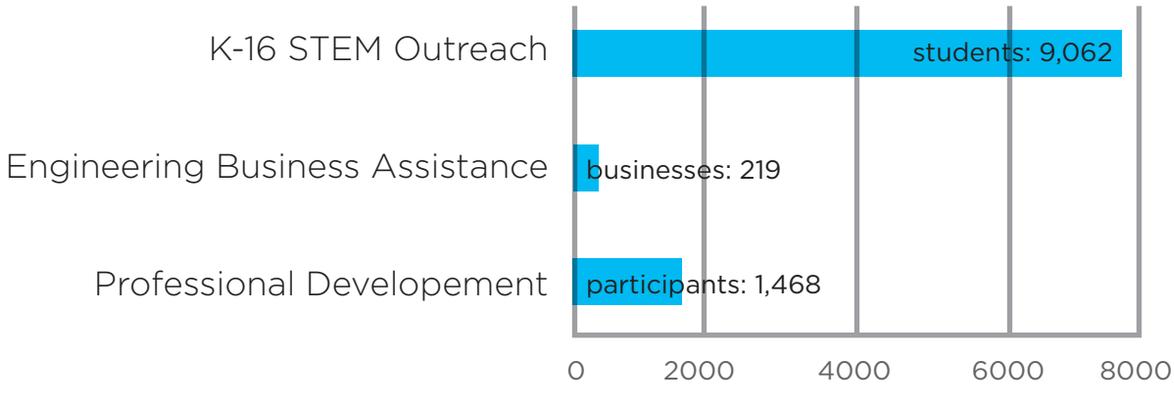
The Engineering New Mexico Resource Network is the formal outreach and public service division within the College of Engineering. The program delivers a range of engineering-based outreach programs to businesses, government agencies, teachers and K-16 students from across the state. Engineering New Mexico is focused on leveraging 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 technical assistance and engaged and aligned STEM workforce development programs.

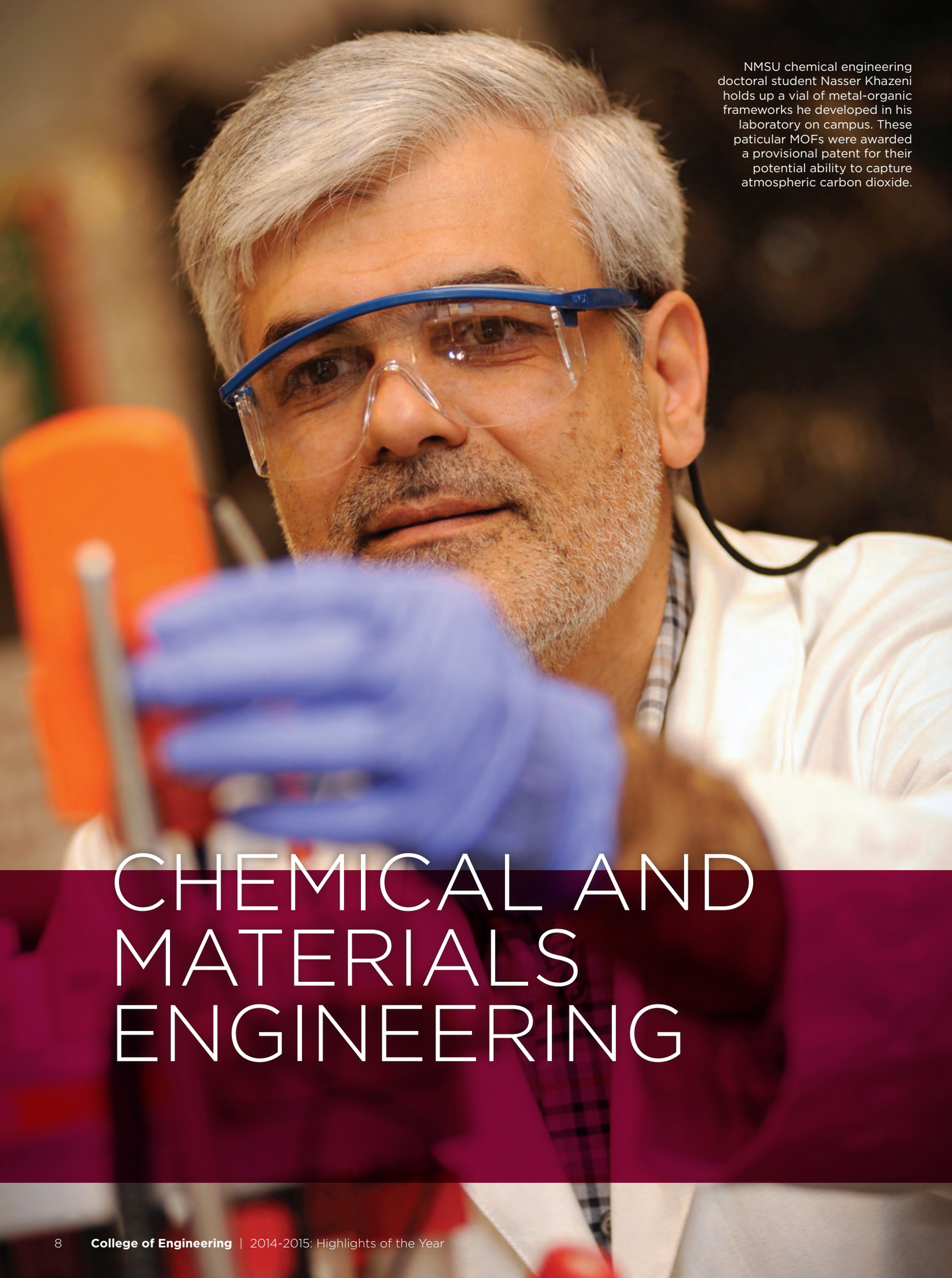
During the past year, more than 9,062 students participated in a variety of K-12 STEM programs that fostered critical thinking, communication skills, team-centered engagement, innovation and entrepreneurship. More than 1,468 individuals were trained through professional development, certificate programs and short courses. Some 219 businesses received technical assistance to enhance their economic and technical competitiveness through targeted solutions to engineering and design problems, facility design and layout, ergonomics, 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 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. The programs are one-day design challenges offered by industry and government agency partners; non-credit pop-up workshops to jump-start multi-disciplinary 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. Engineering New Mexico engages corporate partners 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, led by Stanford University and VentureWell, to integrate innovation and entrepreneurship into the engineering curriculum.

For more information about the Engineering New Mexico Resource Network, visit engr.nmsu.edu/enmrn/.

2014/2015 Engineering Outreach





NMSU chemical engineering doctoral student Nasser Khazeni holds up a vial of metal-organic frameworks he developed in his laboratory on campus. These paticular MOFs were awarded a provisional patent for their potential ability to capture atmospheric carbon dioxide.

CHEMICAL AND MATERIALS ENGINEERING

NMSU researcher's discovery could cut CO_2 emissions

A new technology developed by chemical and materials engineering doctoral candidate Nasser Khazeni could revolutionize carbon dioxide capture and significantly impact worldwide pollution reduction.

Khazeni has developed a special material that can capture carbon dioxide with greater capacity than any technology currently in widespread use for that purpose.

Khazeni's focus is on the post-combustion separation of carbon dioxide – how can it be more efficiently separated out, transported and stored or reused.

He described a chain of cause and effect in which human activity – primarily fossil fuel consumption – leads to increased concentration of greenhouse gases in the atmosphere, leading to global warming and climate change.

"To resolve this issue we need to take one of the links of this chain and mitigate it before it reaches the global warming stage," Khazeni said. "We're addressing the middle link – capturing carbon dioxide in the atmosphere."

Khazeni's research focuses on solid adsorbents, which capture carbon dioxide and store it for transport or storage. A hybrid metal and organic structure called a zeolitic imidazolate framework adsorbs carbon dioxide molecules to its structure of metal ions and organic linkers.

In a simulation study, Khazeni's new structure adsorbed more than 100 times more carbon dioxide than other similar structures.

Seeing that vastly increased selectivity and capture capacity – and its potential applications – led Khazeni to seek to protect the idea with a provisional patent, which he obtained with the help of NMSU's Arrowhead Center Intellectual Property and Technology Transfer Office. The next step is licensing the technology, and conversations are beginning with major energy industry contacts to do that.

> "This technology is going to radically impact the world with regard to carbon dioxide released into the atmosphere. It's exciting."
>
> *–Theresa Lombard, Technology licensing associate*

Read full story: engr.nmsu.edu/chme

NMSU alumnus Andrew Giesler worked on a research project that could triple the design life of bridges in New Mexico.

CIVIL ENGINEERING

Concrete testing aims to improve state infrastructure

Civil engineering graduate students, under the direction of Assistant Professor Brad Weldon, are testing ultra-high performance concrete bridge girders on a large scale to aid the development of bridge design procedures for the state of New Mexico that could lead to a variety of improvements to the state's infrastructure.

The concrete possesses dramatically increased compressive strengths, improved durability properties and steel fibers that greatly improve post-cracking strength. These properties allow for the design of bridges that can have much longer design lives compared to those constructed with normal-strength concrete. Mixture properties using primarily local materials helps to reduce the cost of UHPC.

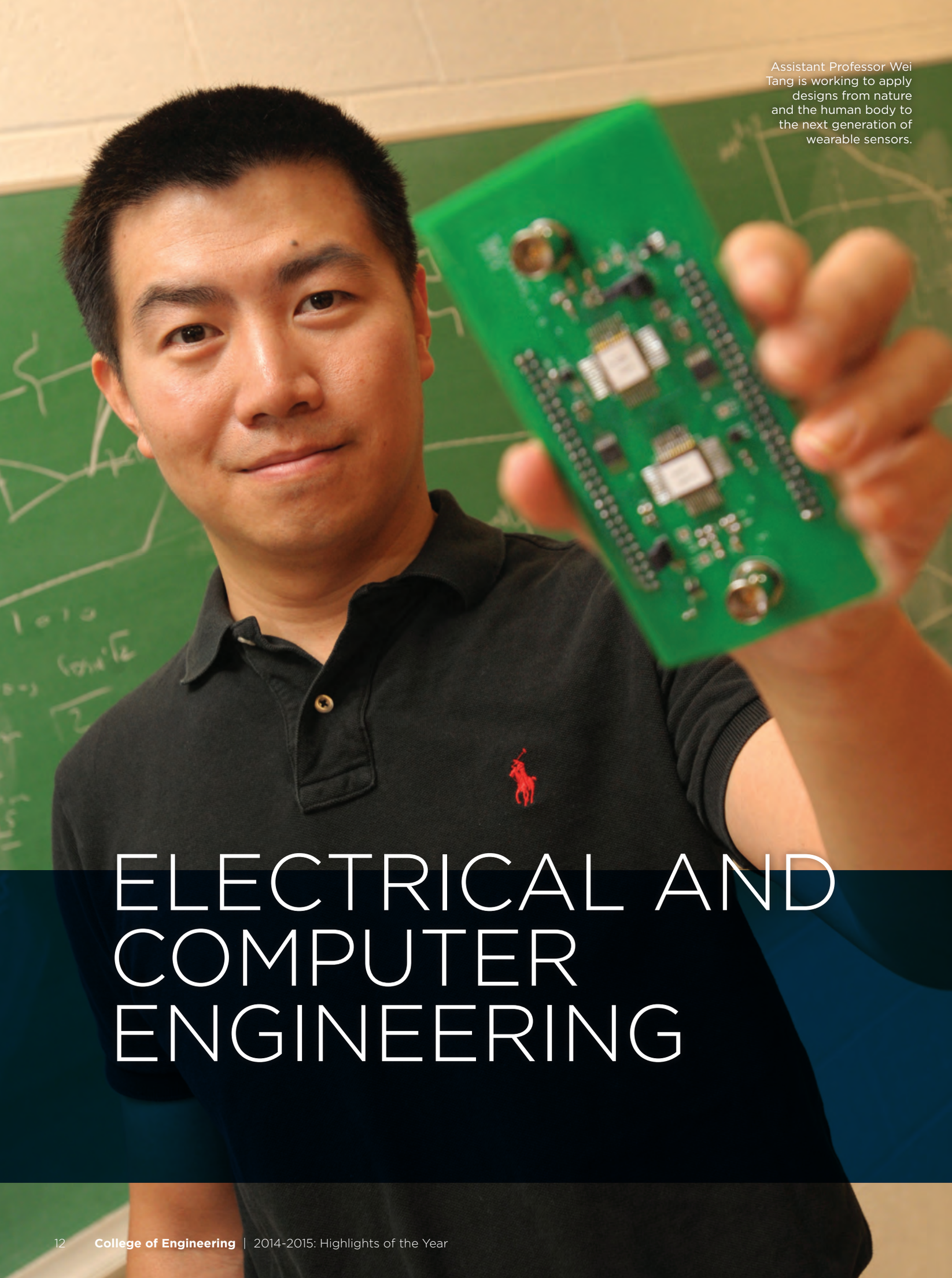
Students first designed and erected a structural testing frame. Three large-scale flexural tests were conducted on 16-foot, scaled prestressed UHPC bridge girders, followed by similar tests on a full-scale UHPC girder. This large-scale evaluation will aid in the development of standardized design codes. Previously, tests had been done on only small-scale rectangular beams. Large-scale tests provide a more realistic representation of how full-scale UHPC beams will behave in a structure such as a bridge.

Typical-strength concrete bridges are designed to last approximately 50 years. UHPC bridges are estimated to have design lives of up to 150 years. Additionally, UHPC is significantly stronger, exceeding 22,000 pounds per square inch, as compared to the strength of average concrete, which is between 4,000 - 6,000 pounds per square inch.

Currently, no bridge design specifications for concrete of this strength exist in the United States. The unique material properties are not accounted for in the common design standards. The next phase of Weldon's research includes the instrumentation of a new bridge being constructed in New Mexico using UHPC. This will be the first bridge in the U.S. constructed with non-proprietary UHPC.

Read full story: engr.nmsu.edu/civil

> "The uniqueness of this UHPC is that it is local to New Mexico. If it does make it to a bridge, it will be the first bridge in New Mexico constructed with UHPC."
>
> *–Andrew Giesler, Alumnus*



Assistant Professor Wei Tang is working to apply designs from nature and the human body to the next generation of wearable sensors.

ELECTRICAL AND COMPUTER ENGINEERING

Wearable micro-sensors inspired by human brain

The human brain inspired Wei Tang, assistant professor of electrical and computer engineering, to devise the next generation of integrated low-power, wearable micro-devices using miniaturized sensors that can detect, transmit and process data.

Wireless sensors are used in health care, surveillance, smart buildings, disaster mitigation and environmental monitoring. But next-generation devices will be miniaturized – small enough to wear on clothing, a hat or eyeglasses.

Tang plans to use current sensor technology, implementing a new design strategy to extend our ability to sense the world, respond to the environment and develop medical devices that can be used for rehabilitation or to prevent and detect disease.

"The challenge of designing wearable devices is to make sensors that require very, very low power consumption and have a very, very small circuit area," Tang said. "My idea is to learn from nature how our brains and bodies work. Our brain is a kind of a circuit that has some big advantages: it runs at very low power and is quite compact."

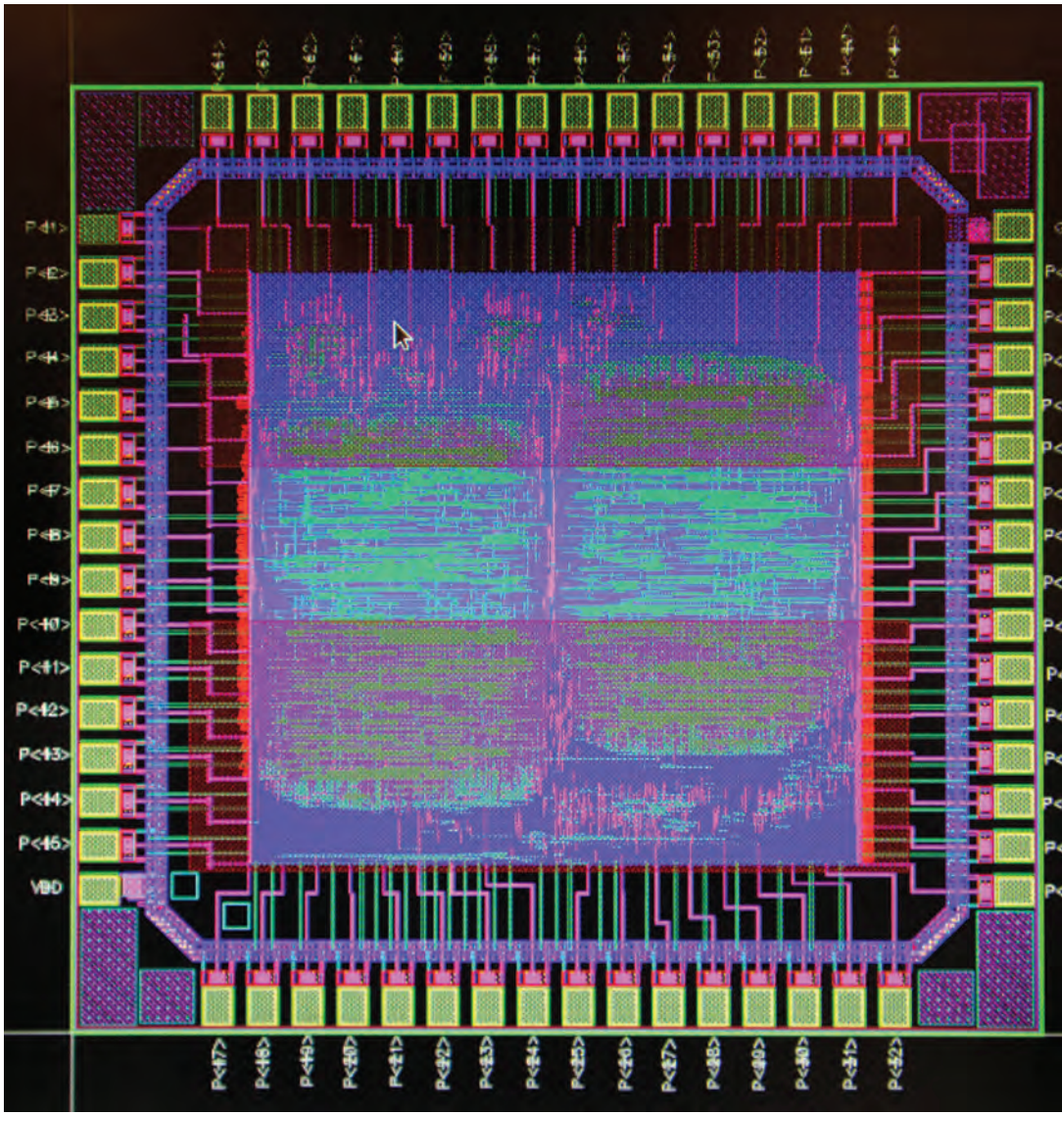
Computers are large and constantly running code and communicating. Tang proposes to use devices that work more efficiently, like the human brain.

"We developed a radio device with small circuits," Tang said. "We want to demonstrate that this radio can communicate to another radio using very low power consumption.

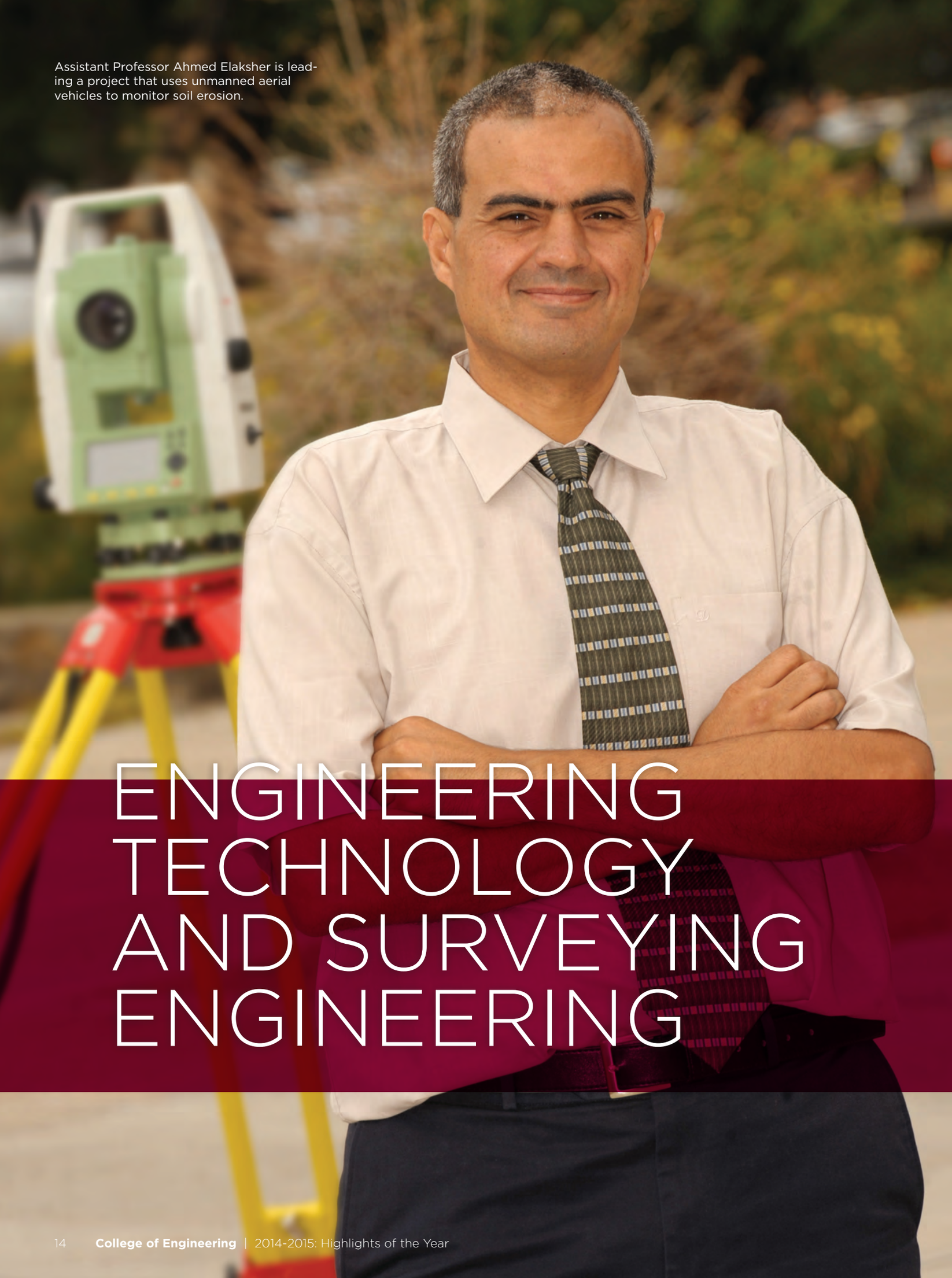
"The next part is to process the information. We created a very small integrated circuit, three millimeters by three millimeters. Eventually, we want to put it on a hat with a small battery to extract EEG brain wave information. A patient could wear it for a period of time to provide doctors with information to analyze."

This study is important to the future of using sensors that can reliably transmit information through liquids, leading the way for devices that can be implanted in the human body or submersed in water, or built into concrete structures for measuring mechanical stress, for instance.

Read full story: engr.nmsu.edu/ece



> "Our brain is a kind of a circuit that has some big advantages: it runs at very low power and is quite compact."
>
> *–Wei Tang,*
> *Electrical and Computer Engineering Assistant Professor*



Assistant Professor Ahmed Elaksher is leading a project that uses unmanned aerial vehicles to monitor soil erosion.

ENGINEERING TECHNOLOGY AND SURVEYING ENGINEERING

Professor uses UAVs to monitor ecosystems

Unmanned aerial vehicles are monitoring dryland ecosystems and soil erosion in a collaboration between New Mexico State University and the U.S. Department of Agriculture's Agricultural Research Service at the Jornada Experimental Range, north of Las Cruces.

Leading the project for NMSU is Ahmed Elaksher, assistant professor of engineering technology and surveying engineering.

Remote sensing technology, such as aerial photography and satellite imagery, enables broad-scale observation and analysis of drylands. By comparison, field methods usually cover smaller areas.

Researchers at the Jornada Experimental Range are interested in measuring soil erosion over time.

Aerial photography is used via UAVs to monitor soil erosion on larger landscapes. From overlapping aerial photos, researchers create a time-series of digital elevation models. Differencing the elevation models helps researchers visualize and quantify soil movement.

UAVs capture overlapping images of the ground. Using mathematical equations and software, Elaksher compiles the photographs to create a three-dimensional elevation/topographic map of the area.

"These UAVs operate the same way as our eyes," Elaksher said. "One eye allows us to see one particular area and the other eye allows us to see another particular area. When the two areas overlap, we are able to see depth."

Jeffrey Gillan, assistant professor at NMSU and remote sensing specialist at the Jornada Experimental Range, has worked extensively with Elaksher to measure vegetation height and soil erosion over time. The Jornada Experimental Range is a research station dedicated to studying rangeland and dryland ecology, including animal behavior and soil science.

"We can measure the height of visible points on the ground," Elaksher said. "We can measure the heights of points over the years and compare them to a few control points, which we then compare to find out how much the soil has eroded."

> "Currently, these UAVs are mainly used for mapping more remote areas. In the future, they may be used for remote mapping, urban planning purposes or to map highways or interstates."
>
> *–Ahmed Elaksher,*
> *Engineering Technology and Surveying Engineering*
> *Assistant Professor*

Read full story: engr.nmsu.edu/etse

Delia J. Valles-Rosales, associate professor of industrial engineering, is researching sustainable energy as NMSU's primary investigator of the U.S. Department of Agriculture's Building a Regional Energy and Educational Network Consortium.

INDUSTRIAL ENGINEERING

Professors research renewable energy solutions

Four professors from NMSU are researching different approaches to sustainable energy, funded by the U.S. Department of Agriculture's BGreen (Building a Regional Energy and Educational Network Consortium).

NMSU joins the University of Texas at El Paso (lead), Texas A&M University-Kingsville and Texas State University-San Marcos with the goal to involve more Hispanic students in renewable energy studies and careers.

"NMSU is working on sustainable energy in two different phases," said Delia J. Valles-Rosales, associate professor of industrial engineering and primary investigator of BGreen at NMSU. "The first phase is extracting biodiesel or bioethanol from a biomass. The second phase is developing biomaterials from biomasses."

Nirmala Khandan, civil engineering professor, has been working on extracting biodiesel and bioethanol from algae. Ram Acharya, associate professor of agricultural economics and agricultural business, has been conducting an economic analysis of converting biomass into biofuels.

Hansuk Sohn, industrial engineering associate professor, has been working on optimizing routes and minimizing transportation time of biomass. Valles-Rosales is investigating the conversion of biomass into biomaterials.

"We've been exploring different bioresources, such as pecan or chile plants, and the possibility of combining them with plastics in order to make composites," Valles-Rosales said. She added that the automotive industry is looking for improving fuel efficiency by producing lighter components from these composites.

BGreen offers student fellowships. Approximately 50 students from the four institutions have been selected to participate in BGreen.

"One of the main contributions of this project is that students are learning non-traditional concepts, specifically from the engineering side," Valles-Rosales said, adding that students are working on projects directly related to the needs of USDA.

Acharya

Khandan

Sohn

> "We've been exploring different bioresources, such as pecan or chile plants, and the possibility of combining them with plastics in order to make composites."
>
> *–Delia J. Valles-Rosales, Industrial Engineering Associate Professor*

Read full story: engr.nmsu.edu/ie

Engineering doctoral student Sasi Prabhakaran discusses a poster detailing variable speed control moment gyroscope technology during a special event honoring six finalists in the Launch proof of concept program competiton sponsered by the NMSU Arrowhead Center. Developed by NMSU engineering professor Amit Sanyal, the proposed technology went on to win the competition.

MECHANICAL AND AEROSPACE ENGINEERING

Project aids orientation control of small spacecraft

Technology that could improve orientation control for spacecraft is the latest commercialization project to receive seed funding through the Launch program at NMSU's Arrowhead Center.

The adaptive, singularity-free, control moment gyroscope technology was developed by Amit Sanyal, assistant professor of mechanical and aerospace engineering, along with doctoral candidate Sasi Prabhakaran. Master's student Taylor Burgett, a client of Arrowhead's student incubator Studio G, is working to commercialize the technology for use in cube satellites.


Burgett

Control moment gyroscopes are internal momentum-exchange devices that control the orientation of a rigid body in space. Comprised of novel hardware and software architectures, the gyroscope technology provides precise attitude control and stabilization and is scalable for vehicles ranging from nano-spacecraft to crafts as large as the International Space Station.

The technology has additional applications beyond spacecraft, including in rockets, cars, robots, ships and even health care, Burgett said.

"The main selling point of this technology is that it provides affordable, low-power and high-control-authority orientation control for spacecraft, particularly nano- and micro-satellites that have mass, size and power constraints," Sanyal said. "Currently, we are prototyping a three-unit ASCMG cluster where each unit will be the world's smallest control moment gyroscope."

The Launch program helps transition early-stage research projects into marketable products by exploring a technology's commercial potential very early in development and providing funding and resources for that work.

"The next steps are testing the prototype and quantifying how much smaller, lower-power and reliable the device can be compared to existing technologies," Burgett said. For more about the gyroscope, go to http://revolvtech.space.

Read full story: engr.nmsu.edu/mae

> "The main selling point of this technology is that it provides affordable, low-power and high-control-authority orientation control for spacecraft, particularly nano- and micro-satellites that have mass, size and power constraints."
>
> *–Amit Sanyal,*
> *Mechanical and Aerospace Engineering Assistant Professor*

Paola Bandini is NMSU's principal investigator of the Infrastructure Construction thrust of the Center for Bio-mediated and Bio-inspired Geotechnics, a consortium of four universities funded by the National Science Foundation.

FACULTY PROFILE

Bandini leads research center's technical thrust

"I was attracted to NMSU by the quality and diversity of our engineering programs, the opportunities to make a difference in the lives of many students, and the natural beauty of the Las Cruces area," said Paola Bandini, associate professor of civil engineering. "What I appreciate the most about my job in academia is enjoying the freedom to pursue my research ideas, and the opportunity to collaborate with diverse teams of colleagues and students (here) as well as at other universities."

This past summer, Bandini and her and her collaborators were awarded a grant to create the Center for Bio-mediated and Bio-inspired Geotechnics, a consortium of four universities funded by the National Science Foundation to pioneer advances in geotechnical engineering that "aims to produce and implement technology that mimics or employs methods developed and perfected by nature over thousands of years to solve complex engineering problems." The consortium of university, industry and government partners, led by Arizona State University, has been awarded $18.5 million. Bandini is a co-principal investigator of the grant and leader for infrastructure construction, one of four research thrusts of the center.

"The level of complexity of the research problems to be addressed by CBBG requires the collaboration of large expert teams and access to state-of-the-art labs and other resources across campuses of the partner universities and industries affiliated with the center," said Bandini.

Since joining NMSU's faculty 13 years ago, Bandini's research has focused on the application of experimental and numerical methods in geomechanics. Her current research interests include engineering properties of desert and diatomaceous soils, foundation engineering, erosion control measures for transportation infrastructure and sustainable use of materials in civil engineering. As a PI, she has managed more than $5.4 million in grants and contracts. She leads the Geotechnical Instrumentation and Modeling Committee of the Transportation Research Board.

Bandini received both her master's and Ph.D. from Purdue University in civil engineering with an emphasis in geotechnical engineering.

Read full story: engr.nmsu.edu/ce

> "The level of complexity of the research problems to be addressed by CBBG requires the collaboration of large expert teams and access to state-of-the-art labs and other resources across campuses of the partner universities and industry affiliated to the center."
>
> *–Paola Bandini, Civil Engineering Associate Professor*

STUDENT SPOTLIGHT

Graduates Ember Krech (left), College of Engineering Highest Honors Student, and Brendan Sullivan, the NMSU Outstanding Graduate Student, were the first NMSU Innovation Fellows and will carry on their entrepreneurial spirit in future endeavors.

Grads take entrepreneurship to the next level

Spring engineering graduates Brendan Sullivan and Ember Krech were named University Innovation Fellows by the National Center for Engineering Pathways to Innovation (Epicenter) funded by the National Science Foundation in 2014.

The fellows are a national community of students in engineering and related fields who work to advocate for lasting institutional change and create opportunities for students to engage with entrepreneurship, innovation, creativity, design thinking and venture creation at their schools.

Krech, College of Engineering Highest Honors Student, maintained a 4.0 throughout her undergraduate career and received a bachelor's degree in mechanical engineering. She is a graduate student at Kansas University now researching joint biomechanics and prosthetic development.

"I'm really interested in the complexity of joints and I would like to use engineering to solve some of the problems that people have with their joints. I have the ability to travel, go to school, hike and do things I love because I have four working limbs. If I could help someone who does not have that, it would be amazing," she said.

Krech says that a huge benefit of the Innovation Fellows program is the network. "I have mentors and know people all over the U.S. who are all passionate about the same things I am passionate about. I hope to pass that along to others who are willing to work hard."

Sullivan, the NMSU Outstanding Graduate Student, received a master's degree in industrial engineering and certificate in systems engineering; he also has a master's degree in political science. Sullivan is pursuing a Ph.D. in industrial engineering at NMSU working in the area of reclaimed materials functionalization.

"Through the separation of cellulose from cotton grown in New Mexico we are working to develop smart polymers that can be used around the world," he said.

"Innovation is one of the fastest growing facets in economic development here in the United States. As Innovation Fellows, we hope to encourage students to think proactively about both entrepreneurship and innovation."

> "I'm really interested in the complexity of joints and I would like to use engineering to solve some of the problems that people have with their joints. … If I could help someone who does not have (all their limbs), it would be amazing."
>
> *–Ember Krech, Alumna*

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Number of **NMSU students** that have been named **University Innovation Fellows** by the **National Center for Engineering Pathways to Innovation** (Epicenter) since 2013.

SOURCE: Epicenter website

> "Through the separation of cellulose from cotton grown in New Mexico we are working to develop smart polymers that can be used around the world."
>
> *–Brendan Sullivan, Ph.D. candidate*

Colin P. Cahoon, an attorney in Texas, attributes his career success to his chemical engineering degree. He encourages engineering students to pursue careers beyond traditional engineering fields, such as patent law.

DONOR SPOTLIGHT

Alum helps launch pre-law program for engineers

Colin P. Cahoon has realized many successes, but still gives back to one of the places where it all began – NMSU's Chemical Engineering Department where he earned a bachelor's degree in 1983. The Colin and Susan Cahoon Chemical Engineering Endowment was established in 2005 to support the department.

Alongside monetary support, Cahoon has made several Verge Fund Entrepreneurship Lectures where he encourages students to look beyond traditional engineering fields upon graduation.

"A degree in engineering is a great platform from which to launch into a number of interesting careers, such as patent law, a field that is closed to lawyers without technical degrees," he said.

Cahoon helped David Rockstraw, Chemical and Materials Engineering Department head, develop a pre-law academic track for engineering students and helped launch the program through financial support this fall.

"The pre-law program at NMSU is the first undergraduate program of its kind for engineers that I've ever heard of. … I think there will be great opportunities for engineers who want to matriculate into this field in the future," Cahoon said.

Cahoon utilizes a unique blend of expertise: law, chemical engineering and military service. One of the founding partners of Dallas-based Carstens & Cahoon, LLP, he practices as a patent lawyer in the chemical arts with a focus on international patent portfolio management. He is an inventor himself with four U.S. patents.

Crediting much of his success to NMSU, Cahoon said, "My entire career is founded on the education I received through the NMSU College of Engineering and Chemical Engineering Department. I'm delighted to give back to the program that has given so much to me."

A graduate of NMSU's Army ROTC program, Cahoon served as a helicopter pilot and was a captain in the U.S. Army, receiving the Meritorious Service Medal. Following that, he graduated cum laude from Southern Methodist University School of Law in 1991. He was recognized as a Texas Super Lawyer® from 2012-15.

$29.55 million
2014/2015 College Endowment

$1.04 million
2014/2015 Total Gifts Received

$873,028
2014/2015 Total Value of Scholarships Awarded

677
Number of Scholarships Awarded

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

> "My entire career is founded on the education I received through the NMSU College of Engineering and Chemical Engineering Department. I'm delighted to give back to the program that has given so much to me."
>
> *–Colin P. Cahoon,*
> *Patent attorney and '83 chemical engineering graduate*

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