

# UNM Engineering

*Big Ideas in Action*





# Message from the Dean

*Diversity is a major focus for all of us, so I am especially proud that our School of Engineering this year received a Bronze Award from the American Society of Engineering Education (ASEE)*

**WELCOME TO THE 2019** issue of *UNM Engineering*. As I begin my third year as dean, it is gratifying for me to see so much exciting progress in the School as we implement many of the goals we formulated a few years ago.

One of my top priorities as dean has been to attract more students through robust recruiting and marketing efforts. The well-publicized trend of declining college enrollments has given all of us in higher education a challenge that we must quickly address for our survival as well as to meet the needs of a workforce that calls for increasingly educated workers. This past year, I co-chaired a University-wide task force to examine the factors contributing to enrollment decline and what could be done to combat it. As of this printing, our fall 2019 School of Engineering enrollment is pointing to modest growth, and we will

strive to continue to grow through our staff and faculty's phenomenal efforts.

We are also immensely proud to be in a continuous cycle of innovation when it comes to our facilities. This spring, we dedicated the Dana C. Wood Materials and Structures Laboratory, which includes a state-of-the-art 3D concrete printer and 3D carbon fiber printer lab. These facilities set our School apart and will enable some exciting new research, in addition

to attracting students, faculty and industry partnerships. Read more about the lab on Pages 2-5.

Facilities of course help us with a couple of our other priorities: research and reputation. In the latest *U.S. News & World Report* Best Graduate Schools for engineering rankings, we placed No. 85 in the nation — the only engineering program to be ranked in the top 100 in New Mexico! Part of our success stems from our continued growth in research. Our research expenditures from external sources rose nearly \$2 million from last year. For fiscal year 2019, we stand at \$36.5 million School-wide, which reflects the tremendous efforts of our faculty.

Diversity is a major focus for all of us, so I am especially proud that our School of Engineering this year received a Bronze Award from the American Society of Engineering Education (ASEE) in the inaugural Diversity Recognition Program. UNM is one of 74 engineering programs around the country — and the only one in New Mexico — to receive the designation.

UNM also welcomed a new provost, James Paul Holloway, who just happens to also be one of our new Nuclear Engineering faculty members! We welcome Provost Holloway as a Lobo Engineer. You can read more about him on Pages 6-7. He is one of 13 new faculty to join the School this year (see full list on Page 10).

Thanks to everyone for their support of the School of Engineering, and I look forward to working with you as we march toward 2020 and beyond.

**Christos Christodoulou**  
*Jim and Ellen King Dean of Engineering and Computing*

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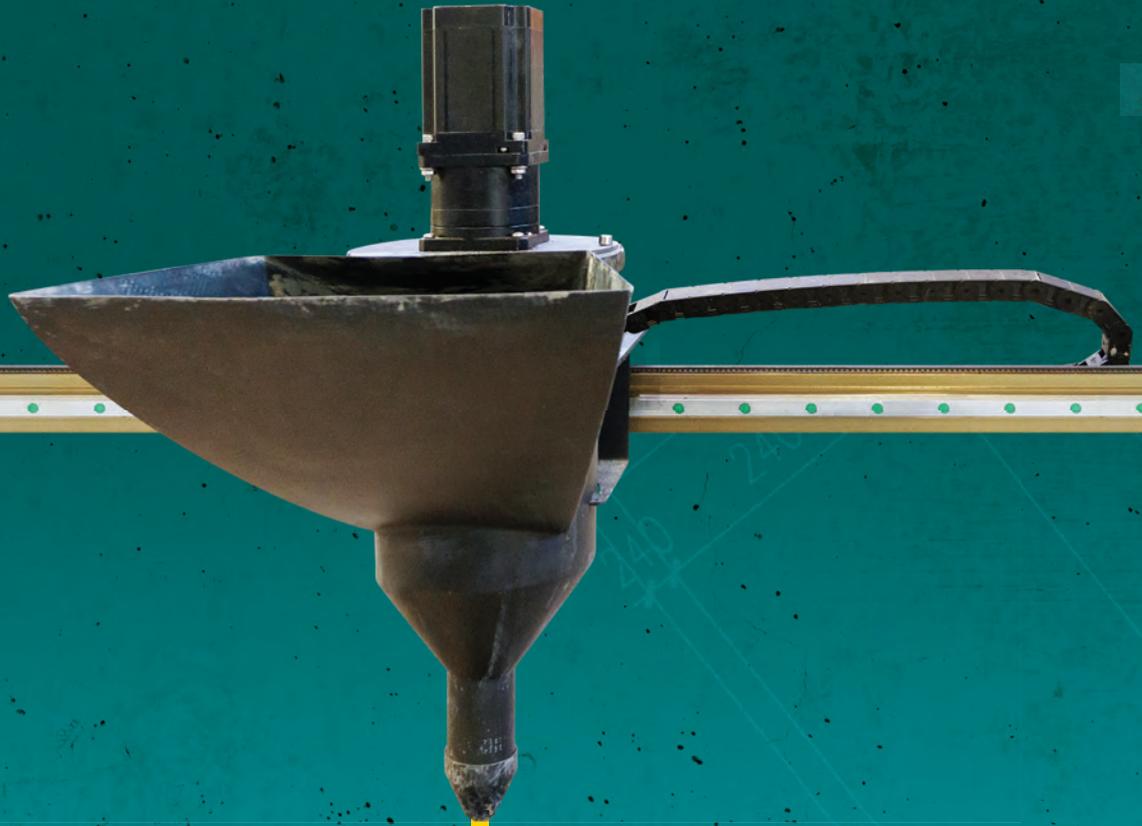
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**THINK**

**CONSTRUCTION INK**

**3D CONCRETE**

**PRINTING AND**

**CARBON FIBER TECHNOLOGY**

**LEADING A REVOLUTION AT UNM.**

**GREAT THINGS ARE HAPPENING IN THE**

**DANA C. WOOD MATERIALS & STRUCTURES LABORATORY**



Mahmoud Reda Taha, chair and Distinguished Professor in the Department of Civil, Construction and Environmental Engineering, stands with his team of students outside the Dana C. Wood Materials & Structures Laboratory.

**“WE NOW HAVE A ONE-OF-A-KIND 3D CONCRETE PRINTING LAB, WHICH BENEFITS US IN MANY WAYS, GIVING US A COMPETITIVE EDGE IN NEW RESEARCH TOPICS, AND IN RECRUITING TOP STUDENTS AND FACULTY” — Mahmoud Reda Taha**

With little fanfare in a quiet corner of the Centennial Engineering Center in early 2019, students and faculty were busy setting up what promises to be revolutionary pieces of equipment not just for the School of Engineering but for the concrete and civil engineering industry in general and advancement of research in the field.

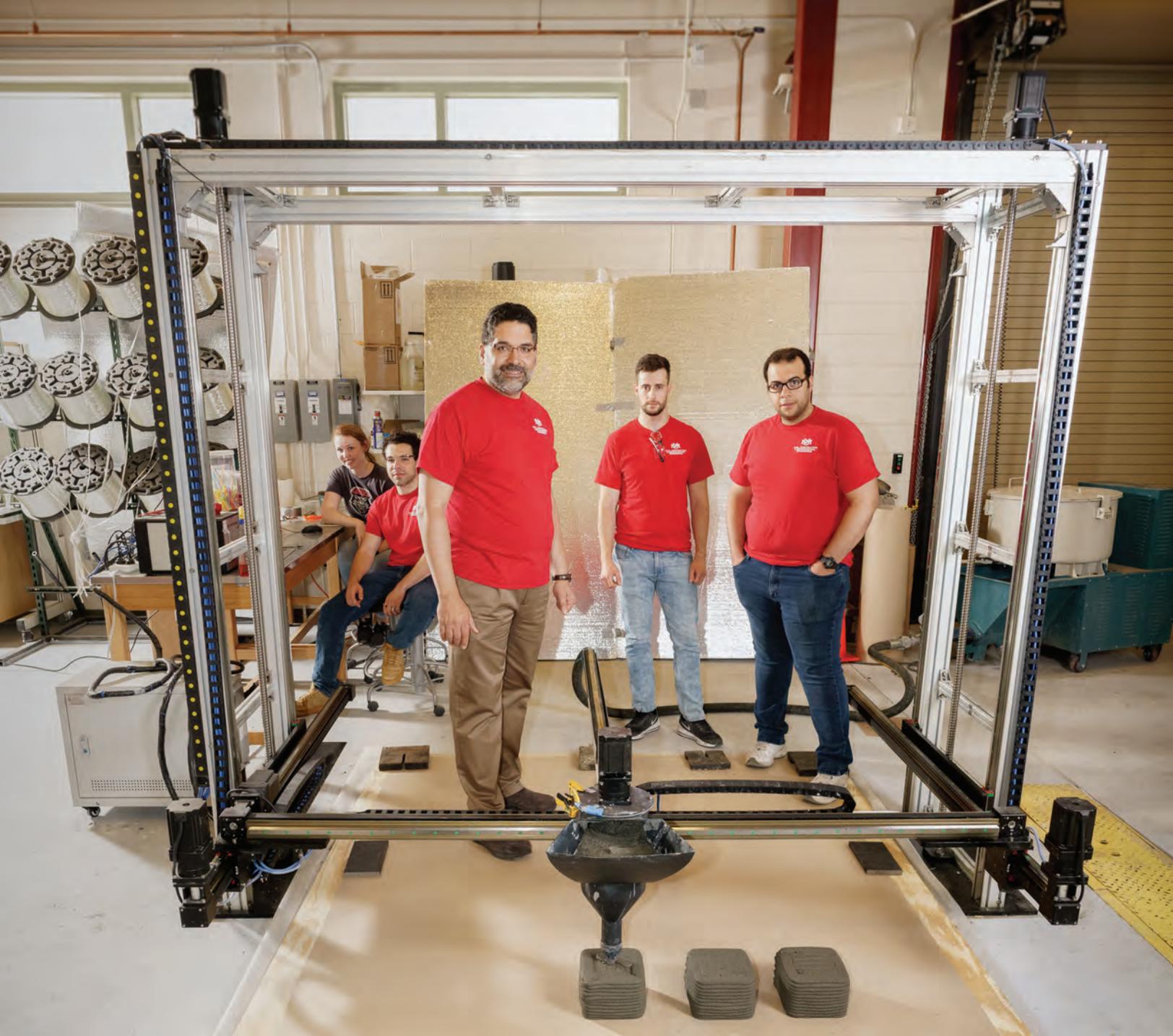
Thanks to a gift from the estate of alumnus Dana C. Wood, the Department of Civil, Construction and Environmental Engineering was able to purchase and install 3D concrete printing technology in the Dana C. Wood Materials and Structures Laboratory on the first floor of the Centennial Engineering Center.

The 3D concrete printer at UNM is one of only about a dozen such printers at universities around the country.

“We now have a one-of-a-kind 3D concrete printing lab, which benefits us in many ways, giving us a competitive edge in new research topics, and in recruiting top students and faculty,” said Mahmoud Reda Taha, Distinguished Professor and chair of the Department of Civil, Construction and Environmental Engineering.

So just what is 3D concrete printing and why is it so revolutionary?

Imagine printing a bridge, or sections of a bridge, in minutes or hours instead of days or weeks. With the new equipment, users are able to enter a design into a computer program, then the printer is able to take that design and mix the correct amount of concrete and dispense it, much like a cake icing decoration



tool, layer by layer, into the desired shape and consistency.

The resulting piece is dry and strong in a short period of time and able to be used almost immediately. Custom shapes and sizes of concrete can be made quickly, which saves time and money when it comes to new structures or structure repair, Taha said.

And the mixing technology allows new blends of materials—including carbon fibers and more environmentally-friendly combinations—to be added to concrete, depending on the application. Taha has compared the 3D equipment to “construction ink.”

This world of large-scale additive manufacturing puts UNM at the forefront of the 3D printing of structures and components that



**“IT’S A QUANTUM LEAP IN OUR CAPACITY AND CAPABILITIES IN THE CIVIL ENGINEERING SCHOOL,” — Mahmoud Reda Taha**

are later shipped to construction sites. It can also be used for on-site construction projects for structures like homes and office buildings, and even NASA is looking at the technology to build bases on Mars and the Moon.

It is Taha’s hope that this technology will make UNM a national leader in research, development and education for emerging 3D construction printing technologies.

The lab includes a large 3D concrete printer as well as a smaller version. In an adjacent lab space, the department recently acquired another high-tech piece of equipment, a 3D carbon fiber printer that can create components and materials for the construction of everything from buildings to bridges.

“It’s a quantum leap in our capacity and capabilities in the civil engineering school, both for research and in educating our students,” Taha said. “We are incorporating this technology into our curriculum so that all of our students can learn it.”

The 3D carbon printer lab includes a filament maker to add in fiber optics for sensing and monitoring capabilities into the concrete and composite components.

Apart from the 3D printing equipment, the lab includes an array of high-tech machinery for chemical, mechanical and thermal characterizations of materials, as well as machines for structural testing of components.

## New provost is a nuclear engineer who brings a global vision to the University

**James Paul Holloway** started as UNM's new provost on July 1, coming from a series of administrative and faculty roles at the University of Michigan, which he had called home since 1990. In addition to taking on the University-wide role of provost and executive vice president for academic affairs at UNM, Holloway is also a professor in the Department of Nuclear Engineering.

Holloway was born in Washington, D.C., but he spent much of his childhood in Thailand, where his father, a physician in the U.S. Army, was stationed for five years on a research project studying drug addiction among Vietnam War servicemen. He returned to the United States, where his family settled in the very different world of rural Oklahoma, followed by a move to the



# “I am tremendously optimistic

Washington, D.C., area. He chose to attend college at the University of Illinois at Urbana-Champaign, beginning in computer engineering, but changed about a week later to nuclear engineering, based on his fascination with a book describing a nuclear reactor. He earned his bachelor's and master's degrees at the University of Illinois, then did graduate work at Cambridge University, eventually earning a Ph.D. in engineering physics from the University of Virginia. His research focuses have been on computational and mathematical modeling of neutral particle transport, plasma kinetics and hydrodynamics, related problems in inverse problems plasma tomography and uncertainty quantification. He and his wife, Johnna, are celebrating their 40th anniversary this year, and they have a grown son, Patrick.

*Holloway discusses his view of New Mexico and the world, and his goals for UNM in the coming years.*

### **WHAT BROUGHT YOU TO UNM?**

First of all, The University of New Mexico is a flagship institution in a very special state. It's got some truly unique resources. We have faculty who are astonishing and very dedicated to the institution and to its students. It's got a student body who is truly grateful

for the educational opportunities afforded to them by UNM. And it's the most diverse research institution in the country, by far, bar none. It's a Hispanic-serving institution, with nearly 50 percent Hispanic and 10 percent Native American students. That's terrific. We are what higher education will look like in about 2045. So we sit in this state with amazing cultural resources: Native American, Spanish, Hispanic communities, three national labs (Sandia, Los Alamos, Air Force Research Laboratory), the world's only commercial spaceport, and Meow Wolf too. That's a huge, cool set of resources around a truly unique and special institution. That's part of what brought me here—an opportunity to work in a place that is so unique, so diverse, and is the future of higher education.

Within the institution, the presence of these cultural resources in the state offers us many opportunities, including tremendous opportunities in the arts. There are some fundamental things we can do to take advantage of the uniqueness of New Mexico, doubling down on the way that we serve the state.

### **WHAT WILL YOUR FOCUS AS PROVOST BE?**

Definitely supporting student success. We've had some good success in time to degree, but we can't



**“ALL WE HAVE TO DO IS WORK TOGETHER, AND IF WE DO THAT, WE TRULY ARE GOING TO CHANGE THE WORLD.”**

rest on our laurels. We need to make sure we don't have disparities in success between those who are more privileged and those who are less privileged, in all schools and colleges. We also need to make sure faculty at UNM have what they need to be successful and know they are valued. Part of what I'd like to do

## about UNM”

as provost is make sure we can move forward and provide a stronger sense of community and belonging. We have to address issues of climate for women in STEM and engineering, Hispanic faculty who may feel marginalized, and Native American faculty who are underrepresented. Our faculty do not look like the state of New Mexico, and we have to work on that. And the same thing for staff. Staff make the institution run. The staff allow the mission to be delivered, and we can't be successful if they are not engaged and supported. The final challenge for UNM to address is enrollment. We've seen declining enrollment, but we know we can turn that around. We know the students are there, so we just have to do the work necessary to bring more students from New Mexico to UNM, both to Albuquerque and to our branch campuses, and reach beyond the borders of the state too.

### **WHAT DO YOU SEE AS UNM'S GREATEST POTENTIAL?**

The most important potential is related to our diversity. That's a huge potential for us. The body of research that says that diverse groups of people come up with more ideas, better ideas, is completely compelling. We're sitting in exactly the right place to be hugely successful. I'm tremendously optimistic about UNM.

### **YOU HAVE LIVED IN VARIOUS PARTS OF THE U.S. AS WELL AS THE WORLD. HOW DID LIVING ABROAD AFFECT YOUR WORLDVIEW?**

I lived in D.C. until I was 4, then the family moved to Thailand and we were there until 1969, when I was 9 years old. Then Oklahoma, then the D.C. area, then college, then Cambridge University, then Germany, then teaching in Ghana and Thailand, then projects in India and Thailand, and in Ethiopia. Living in so many different places had a great deal to do with forming my interest in understanding other cultures and accepting differences, which is one of the great lessons of having students study abroad. Sometimes they say that when students study abroad, they find that we're all the same. I think that's wrong. I think they find out that we're different, and that's OK. Different cultures have different values and different ways to address the challenges of living, and that's OK.

### **WHAT HAS BEEN YOUR GREATEST PROFESSIONAL ACHIEVEMENT?**

The thing that has been most important to me professionally has been the ability to help young people achieve their own dreams. When a student who I helped as a first-year student comes up to me four years later at graduation and tells me she got there because of what I did when she was a freshman, that's awesome. That's a big piece of what makes me tick. One of the reasons I work in academic administration is that what our students do and what our faculty do is important, and it gives me a lot of satisfaction to help them do it. That's what a university is all about. It's helping students and faculty do this amazing work.

### **WHAT ARE YOUR HOBBIES?**

I learned to downhill ski at 50 and love it. I'm no expert, but I'm no beginner either. I also like kayaking. I hope to be able to do both of those in New Mexico.

## RESEARCH ROUNDUP

■ The University of New Mexico has received a 5-year, \$5 million grant from the National Science Foundation (NSF) to continue the groundbreaking research that the Center for Water and the Environment has been leading since 2014. This grant continues the work from Phase I, which was funded from a \$5 million, 5-year NSF grant awarded in 2014. CREST stands for Centers of Research Excellence in Science and Technology. **Kerry Howe**, professor in the Department of Civil, Construction and Environmental Engineering, is principal investigator of both CREST grants. Creating sustainable water resources is one of UNM's three Grand Challenges, as announced by President Garnett Stokes earlier this year.



The Center for Water and the Environment activity and outreach trailer helps UNM reach people remotely.





Arash Mafi, Ganesh Balakrishnan and Marek Osinski at a lab in the Center for High Technology Materials.

■ Sandia National Laboratories and UNM signed an agreement in May to bolster national security and advance science and engineering. The Cooperative Research and Development Agreement, or CRADA, will launch two projects focusing on radiation testing and developing particle detector designs for the European particle physics laboratory CERN. The umbrella agreement also allows the Labs and university to explore research collaborations among scientists, faculty and students in several areas. The UNM umbrella CRADA is a five-year project with the possibility of renewal. The agreement bolsters the collaboration the labs and UNM have had as part of the Sandia Academic Alliance Program, an initiative Sandia has formed with five universities to promote collaborative research and attract top talent to work on challenging problems.

■ UNM is part of a statewide consortium on a \$20 million, five-year grant that aims to modernize the electrical grid to make it more resilient, reliable and ready to handle renewable technologies of the future. The award from the National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR), for the New Mexico SMART Grid Center, supports an integrated research and education program for the development of a modern electric grid. The research program seeks to transform existing electricity distribution feeders into interconnected microgrids and will utilize multiple testbeds across New Mexico, including facilities at Mesa Del Sol in Albuquerque.

■ The National Science Foundation awarded \$6 million to UNM for quantum research as part of its RAISE-EQUIP: Frontiers of Quantum Engineering effort, an initiative designed to push the frontiers of engineering in quantum information science and technology. The funding includes a nearly \$750,000 award to UNM over three years as part of the overall award. Principal investigator **Marek Osinski**, Distinguished Professor in the Department of Electrical and Computer Engineering and the Center for High Technology Materials (CHTM), will lead UNM's project, one of eight in the program. UNM's team also includes **Arash Mafi**, director of CHTM and professor in the Department of Physics and Astronomy, and **Ganesh Balakrishnan**, associate professor in electrical and computer engineering and associate director of CHTM. The project also includes a subcontract to the University of Rochester.

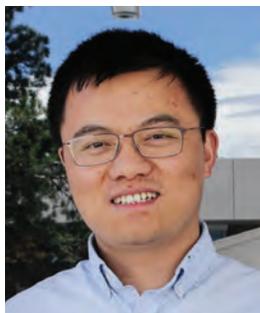
■ UNM has been awarded funding from the National Science Foundation for the purchase of a high-resolution scanning transmission electron microscope, which will be the first in the state with its particular capabilities. It will allow users to see objects that are invisible to the human eye and 100,000 times smaller than a human hair. Seeing matter at the atomic level has broad applications for research, ranging from drug delivery to improving the quality of water in rivers to increasing the efficiency of solar cells. Leading the project is **Abhaya Datye**, Distinguished and Regents' Professor of chemical and biological engineering, and also the chair of the department.

■ **Yin Yang**, an assistant professor in the Department of Electrical and Computer Engineering, has received a National Science Foundation CAREER Award to study a phenomenon called "deformation," which is the change in the shape of any object, and more specifically, how to better predict how an object will deform. His award is for a project called "Deep Learning Empowered Nonlinear Deformable Model." The five-year project began on March 15 and will conclude at the end of February 2024.

# Transitions and Achievements



Maryam Hojati



Minghui Chen



Leah Buechley



Shuya Wei



Mala Htun

## New Faculty

The following faculty have joined the School of Engineering in 2018-19:

**Tameem Albash**, assistant professor of electrical and computer engineering. Research interests are in developing theoretical methods and numerical tools to error-correct quantum annealing.

**Viktorii Babicheva**, assistant professor of electrical and computer engineering. Research interests are in nano-optics, nanophotonics, numerical modeling, nanofabrication, and optical characterization.

**Daniel T. Banuti**, assistant professor of mechanical engineering. Research interests are in multi-physics thermo-fluids and innovative modeling in high-performance computational fluid dynamics for aerospace and sustainable energy.

**William Bricker**, assistant professor of chemical and biological engineering. Research interests are in photosynthesis, light harvesting, quantum biology, and computational chemistry.

**Leah Buechley**, associate professor of computer science. Research interests are in the integration of electronics, computing, arts, crafts, and design.

**Tito Busani**, assistant professor of electrical and computer engineering. Research interests are in materials science and photonics.

**Minghui Chen**, assistant professor nuclear engineering. Research interests include nuclear reactor thermal hydraulics and safety and high-temperature thermal-fluid systems.

**Eric Hamke**, lecturer II, electrical and computer engineering. Research interests are in engineering education; signal processing; guidance and control of aerial robots; and speech processing.

**Maryam Hojati**, assistant professor of civil, construction and environmental engineering. Research interests are in green materials, additive manufacturing, special concretes, and functionally-graded materials.

**James Paul Holloway**, professor of nuclear engineering. Research interests are in nuclear reactor theory, fusion plasma physics, and radiation hydrodynamics.

**Gowtham Mohan**, assistant professor of mechanical engineering. Research interests include carbon emission mitigation, solar thermal energy, and energy storage.

**Shuya Wei**, assistant professor of chemical and biological engineering. Research interests include energy storage, electrochemical fundamentals, carbon capture, and nanomaterials.

**Carl Willis**, lecturer II, nuclear engineering. Research interests are in particle accelerator applications, radiation detection and measurements, and radiation transport modeling and protection.



Vanessa Svihla



Meeko Oishi



Edl Schamiloglu



Mahmoud Reda Taha



Abhaya Datye

## Leadership

**Mala Htun**, a professor of political science, was selected as special advisor to the dean for inclusion and climate.

**Vanessa Svihla**, a learning scientist with appointments in the School of Engineering and the Organization, Information & Learning Sciences (OILS) program, was named special assistant to the dean for learning sciences.

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## Faculty Achievements

**Meeko Oishi**, an associate professor in the Department of Electrical and Computer Engineering, has been chosen to participate in the 2020-2021 Defense Science Study Group.

**Edl Schamiloglu**, Distinguished Professor of Electrical and Computer Engineering, associate dean for research and innovation at the School of Engineering, and special assistant to the provost for laboratory relations at UNM, received the first-ever IEEE Magne “Kris” Kristiansen Award for outstanding contributions in experimental nuclear and plasma science.

**Hongyou Fan**, National Laboratory Professor in the Department of Chemical and Biological Engineering, has been selected for the 2019 Mid-Career Researcher Award by the Materials Research Society.

**C. Randall Truman**, a professor of mechanical engineering, was one of four recipients of the 2019

American Institute of Aeronautics and Astronautics (AIAA) Sustained Service Award.

**Mahmoud Reda Taha**, Distinguished Professor and chair of Civil, Construction and Environmental Engineering, has been awarded the American Concrete Institute’s Delmar L. Bloem Distinguished Service Award.

**Abhaya Datye**, chair and Distinguished Professor in the Department of Chemical and Biological Engineering and Regents’ Lecturer, received the 2019 Robert Burwell Lectureship in Catalysis, sponsored by Johnson Matthey and administered by the North American Catalysis Society.

**Robert Busch**, a principal lecturer emeritus of nuclear engineering, was awarded with the 2018 Standards Service Award from the American Nuclear Society.

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## Student Achievements

UNM’s **student section of the American Nuclear Society** received the 2019 Samuel Glasstone Award for best section in the country. This year is the first time that UNM’s chapter has received first place.

The University of New Mexico’s **student chapter of the Institute of Electrical and Electronics Engineers-Eta Kappa Nu (IEEE-HKN)** was selected to receive the Outstanding Chapter Award in recognition of excellence in their chapter administration and programs.

## DEAN DEBUTS INDUSTRY AND INNOVATION BOARD

In an effort to obtain new ideas and perspectives, School of Engineering Dean Christos Christodoulou started the Dean's Industry and Innovation Board in 2019.

The mission of the board is to assist the dean's leadership team on all matters pertinent to the School's vision. The board consists of leaders in industry, government, and academia, from both inside and outside New Mexico.

The first meeting occurred at UNM in April. Topics of discussion included how to raise the rankings and reputation of the School, how to attract more students, and how to raise additional funds from private and corporate sources. The board will meet at UNM twice a year.

### THE MEMBERS

**Chaouki Abdallah**  
Executive Vice  
President for  
Research, Georgia  
Institute of  
Technology

**M. Katherine Banks**  
Vice Chancellor  
of Engineering  
and National  
Laboratories,  
and Dean of  
Engineering, and  
Harold J. Haynes  
Dean's Chair in  
Engineering,  
Texas A&M  
University

**Wayne Brasure**  
Director of  
Defense  
Programs in the  
National Security  
Directorate at  
Pacific Northwest  
National  
Laboratory  
(PNNL)

**Brian Burnett**  
CEO Burnett  
Global Business  
Consulting, LLC,  
and chair of the  
UNM School  
of Engineering  
Alumni Board

**Todd Fridley**  
Vice President,  
PNM Operations

**Gregory Heileman**  
Associate Vice  
Provost, Academic  
Administration,  
The University  
of Arizona

**Lisa Kuuttilla**  
President and  
CEO, STC.UNM

**Oscar Martinez**  
Branch Chief and  
Program Manager,  
Tech Engagement  
Office, Air  
Force Research  
Laboratory

**Diane Peebles**  
Academic  
Alliance Manager,  
New Mexico  
Partnerships,  
Sandia National  
Laboratories

**Robert Peterkin**  
Director of  
Albuquerque  
Operations,  
General Atomics

**John Sarrao**  
Principal  
Associate Director  
for Science,  
Technology and  
Engineering,  
Los Alamos  
National  
Laboratory

**Samantha Sengel**  
Vice President,  
Advancement  
and Enrollment  
Strategy  
at Central  
New Mexico  
Community  
College

**Jerry Sarfati**  
Strategic Academic  
Programs  
Siemens Industry  
Sector, Siemens  
Product Lifecycle  
Management  
Software Inc.



## SCHOOL OF ENGINEERING TRANSPORTATION EXPERTS HELPING TO IMPROVE BALLOON FIESTA ACCESS

Researchers from The University of New Mexico's Department of Civil, Construction and Environmental Engineering offered their expertise to the Albuquerque International Balloon Fiesta to help ease traffic congestion associated with the city's world-famous event, held each October.

The need for improved access to the Balloon Fiesta became especially apparent on the morning of the first Saturday of the 2018 event, when motorists complained of being stuck in traffic for hours and park-and-ride users experienced excessively long waits for buses (which were also stuck in traffic).

Claude Morelli, a research scholar in transportation planning and policy, and assistant professor Gregory Rowangould studied ways to improve visitor access to the event, which annually attracts around 900,000 people. Their work was supported by Kasey Gooden, a master's student.

*Our intent is to apply research-driven awareness to what is possible.*

Morelli initiated the Balloon Fiesta project after seeing media reports about the Fiesta's traffic issues last fall, thinking that he and his UNM colleagues might be able to lend their expertise to develop solutions.

"The overarching goal is to help the Balloon Fiesta to develop an integrated, multi-modal transportation strategy to address issues related to traffic, parking, park-and-ride, pedestrians, and other travel modes such as taxis, tour buses, transportation network

companies [i.e., Uber, Lyft, etc.], and bicycles in a way that maximizes the quality of the guest experience while also minimizing community impacts," Morelli said.

**The group made their general recommendations public in summer 2019, which are:**

- 1 *Improving the design of the queuing and boarding process for buses to improve the way in which up to 6,000 visitors can be boarded efficiently*
- 2 *Improve on-the-ground traffic management and bus movement priority through increased police assistance*
- 3 *Real-time surveillance and operations control of buses and traffic.*

The group will continue to work with officials to implement more specific and scientific findings from the research.

"There is a limit to what we can accomplish with this study, but our intent is to apply research-driven awareness to what is possible," Morelli said.

Morelli said that the recommendations will not only benefit the Balloon Fiesta, but also other events held at Balloon Fiesta Park such as the Fourth of July celebration. In 2021, the International Balloon Fiesta will be celebrating its 50th anniversary, so findings could help manage the traffic flow for what is expected to be an extra popular event.

10,600'

## BLUE-SKY DREAMS

### Lobo Launch team makes successful debut at Spaceport America Cup

For the first time ever, a group from The University of New Mexico competed in the Spaceport America Cup, which was held in June between Las Cruces and Truth or Consequences, N.M.

UNM's Lobo Launch team, which included 21 mechanical engineering students, built a rocket that competed for a target altitude of 10,000 feet. More than 120 teams were in the international competition. UNM's team made a successful launch (UNM was the first team to launch), reaching 10,600 feet, slightly above the target of 10,000 feet. UNM's rocket team placed No. 5 overall and No. 3 in its height class.

Victoria Ramirez, Lobo Launch team lead, said the team made a lot of changes from the first launch in 2017 to streamline the process. Its predecessor was 47 feet tall. In contrast, this year's rocket was 79 inches tall.

Fernando "Doc" Aguilar, a longtime Air Force engineer who worked as a launch controller on rocket launches at Cape Canaveral, has been directing the rocket program the last few years. He said making the rocket smaller and more standardized helped the team greatly. He said that even though the rocket went 600 feet higher than the 10,000-foot target, it performed well and landed with barely a scratch the first time in competition.

Ramirez, who graduated from UNM with a bachelor's degree in mechanical engineering in May, said the experience of working on the Lobo Launch project gave her a lot of real-world experience that will help her transition from the academic world to the corporate one.

Lobo Launch is a senior design program that allows students to design, build, and launch an amateur rocket. Students in the project are enrolled in a 400-level, two-semester mechanical engineering course called Rocket Engineering, where they learn about rockets, structures, and propulsion systems. The program gives students a way to get hands-on experience in an aerospace project before earning their degrees.

Roger Koerner, a 1968 graduate of mechanical engineering, funded the majority of Lobo Launch this year. Other sponsors were Exxon, Albuquerque Rocket Society, Solid Works, Siemens, and Commercial Real Estate Management.

To donate, go to [unmfund.org/fund/unm-lobo-launch/](http://unmfund.org/fund/unm-lobo-launch/)



## ECE ALUMNUS CREATES ENDOWMENT TO UNM TO SUPPORT STUDENT DESIGN PROJECTS

**Ted Woodard**, an alumnus of The University of New Mexico Department of Electrical and Computer Engineering, has donated \$300,000 to support students in the department with senior design projects.

In fall 2018, he made a monetary donation that was used to create an endowment called the Ted Woodard Student Project Fund, which will distribute about \$12,000 a year for students. In addition, he donated a variety of electrical equipment he had collected throughout his career.

Woodard now lives in Colorado and has been retired from government service since 2003.

He received a bachelor of science degree in electrical engineering from UNM in 1983, then went on to earn a master's degree in telecommunications from the University of Colorado in Boulder.

**I'VE BEEN GIVEN A CHANCE TO GIVE BACK, AND IT'S IMPORTANT TO TAKE ADVANTAGE OF THAT WHEN GIVEN THE OPPORTUNITY.**

As a student, Woodard said he remembers working in a co-op program, which allowed him to work one semester on, one semester off, and earn money for school while gaining valuable experience. And that experience made it possible for him to transition into top-secret government work.

Woodard had a long career with the government that involved many top-secret and highly-classified projects and missions. His roles included working as an aerospace engineer for the Defense Contract Management Agency of Lockheed Martin in Denver; the U.S. Army Space Command in Colorado Springs, Colo.; and the office of the deputy undersecretary of defense in Arlington, Va.

He was forced to retire from classified government work in 2003, when the toll of various health issues made keeping up with the demands of such sensitive work impossible.



Christos Christodoulou  
with Ted Woodard

Woodard said that although his health issues have prevented him from being able to continue as an engineer, he is grateful to UNM and all that it provided him. He remembers especially doing a senior design project and having great difficulty buying the supplies he needed. He hopes this fund will help future students create and engineer their projects without a worry of cost.

One of his favorite memories at UNM was working with his advisor Dr. Martin Bradshaw on his senior design project—a variable-diameter Savonius wind vane. And he said the greatest compliment he ever received was when Dr. Bradshaw purchased his creation.

Woodard said that he first began thinking about giving back to UNM after reading an article about Dana C. Wood, an alumnus from the Department of Civil, Construction and Environmental Engineering, who donated \$3 million to programs in that department and for the Formula Society of Automotive Engineers program.

He remembers his time at UNM fondly and has the desire to make a lasting impact for students.

“Everyone takes for granted that they are going to live forever,” he said. “I’ve been given a chance to give back, and it’s important to take advantage of that when given the opportunity. I was here [at UNM] so long that there is a soft spot in my heart for the University.”

## BRIDGING THE TECHNOLOGICAL DIVIDE IS THE GOAL OF SILICON VALLEY ALUMNUS

Author Thomas Friedman famously declared in 2005 that “the world is flat.” School of Engineering alumnus **Atul Bhatnagar** is well aware of this fact, and to maximize our interconnectedness, it is his mission to make sure the world is technologically interconnected as well.

Bhatnagar, who received his master’s degree in electrical and computer engineering from The University of New Mexico in 1982, is president and CEO of Cambium Networks, a company whose goal is to create wireless communication products to bridge the global technological digital divide.

Although it may seem hard to fathom, considering the numbers of smartphones and other devices in our daily lives, Bhatnagar said that of the Earth’s approximately 7 billion people, around 3 billion are still not connected via the Internet, or are underconnected with unreliable and intermittent service.

Bhatnagar is a long-time Silicon Valley resident, and since he moved there in 1985, has “been a witness on the ground floor of a complete transformation,” of the many ways that life has changed since the boom of the Internet.

He says that the next transformation will allow even more sweeping societal changes to occur. “The next transformation is one in which every aspect of life is measured. It will focus on collecting data, analyzing data, and predicting and suggesting changes.”

Bhatnagar said one huge application of this technology would be in health care, where digital sensors can measure physical changes, monitor progress, and then suggest changes in behavior based on the data collected.

Although the realms of artificial intelligence and machine learning may seem like a brave new world to many, Bhatnagar and Cambium Networks firmly believe that data is the future and the key to advancing life for all.

“What you can measure, you can improve,” he said. “The key benefit is that we become more productive because we have the ability to predict and correct behavior.”

To make this goal a reality, Cambium is focused on creating affordable, high-quality wireless broadband through their technology. Bhatnagar said even in the U.S., many rural areas don’t have reliable Internet access, and that is certainly true for many parts of the developing world.

He says that service providers can purchase Cambium equipment, which can connect buildings wirelessly even 100 miles away and is resistant to various weather conditions, severe temperatures and varied terrain. He is very optimistic about what the future can hold for millions of people around the world once this technology is implemented widely.

**The next transformation will allow even more sweeping societal changes to occur.**

Bhatnagar said that his time at UNM prepared him to be the executive and visionary he is today and felt that the preparation he received in electrical and computer engineering provided him with a strong foundation. “I give UNM credit for the development of who I am.”

Bhatnagar said in the next stage of his career, he would like to become more involved in the mentoring of entrepreneurs, sharing what he has learned along the way. He also is passionate about using technology to improve children’s education in developing countries.

Looking back on his career, he said he has made continuous learning the main focus of his journey.

“It has been a tremendous journey from engineer to CEO,” he said. “I never think about goals, but about skills, and every three years, I keep adding a new skill. “The world is changing so fast, you have to keep educating and developing yourself.”



FIVE  
FOR

# Sakineh Chabi

*Sakineh Chabi, assistant professor of mechanical engineering, was born in Iran to parents who always encouraged her to think big and “don’t sweat the small stuff.” She enjoyed*

*math as a teenager and was encouraged to go into either medicine or engineering, but didn’t feel passionate about a career until college when she took a class in quantum chemistry. It was then that she discovered fascinating connections between materials and all that is possible when materials transform. In 2019, she won a UNM Women in STEM award for “Design and Synthesis of Artificial Leaf for Solar Fuel Generation,” which seeks to synthesize a fully-integrated, artificial photosynthesis system. The process uses sunlight to convert water and carbon dioxide into renewable fuels, such as hydrogen, methanol and hydrocarbons, which can be used directly as transportation fuels, raw materials for industry or for electricity generation in fuel cells.*

## What is the main focus of your research?

My focus is on creating advanced multifunctional materials, especially designing new structures and devices that can improve energy storage and conversion. Materials science is at the heart of every modern technology, and I think that materials advancement is the most important research area of the next decade.

## What inspires you?

I enjoy research. To me, doing research or publishing a paper isn’t like a job — I enjoy doing it. Nature is the big teacher. There is so much we can learn from natural processes, like photosynthesis in a leaf. We can never re-create it in a lab because the natural leaf is highly ordered at the nano level — it is so detailed, so perfect — but we can take our inspiration from nature. Or for example, look at natural materials such as wood and bone — they are both very lightweight but very strong, so we can mimic their structure to make strong, lightweight materials. In fact, I see it as my responsibility as a researcher to look at nature and build upon that work.

## Have you experienced challenges as a woman in a technical field?

Yes, and it was a surprise to me that this still happens. But I have learned how to deal with outdated attitudes. Also, not every single action or situation needs a reaction. My advice to women is to stay focused on their research, and rely on themselves. Do your best work, and the work will speak for you.

## What do you see as the direction of your research in 5-10 years?

I would like to get a good understanding of materials behavior at the micro/nano level, then come up with an ideal architecture and eventually bring that research to the marketplace to develop solutions to challenges like creating greener sources of energy or making stronger lightweight materials.

## What do you do when you’re not working?

I like to read. Reading helps me think out of the box and realize there is no absolute truth. I also like to work out and listen to music. Music inspires me and helps me find peace with myself.



# TO US, DIVERSITY IS MORE THAN JUST A BUZZWORD



THE UNIVERSITY OF NEW MEXICO SCHOOL OF ENGINEERING WAS RECENTLY SELECTED AS ONE OF ONLY 74 ENGINEERING PROGRAMS NATIONWIDE FOR THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION'S BRONZE LEVEL DIVERSITY RECOGNITION AWARD. THE AWARD MEANS THAT OUR SCHOOL IS AMONG THE NATION'S LEADERS IN INCLUSIVE EXCELLENCE.