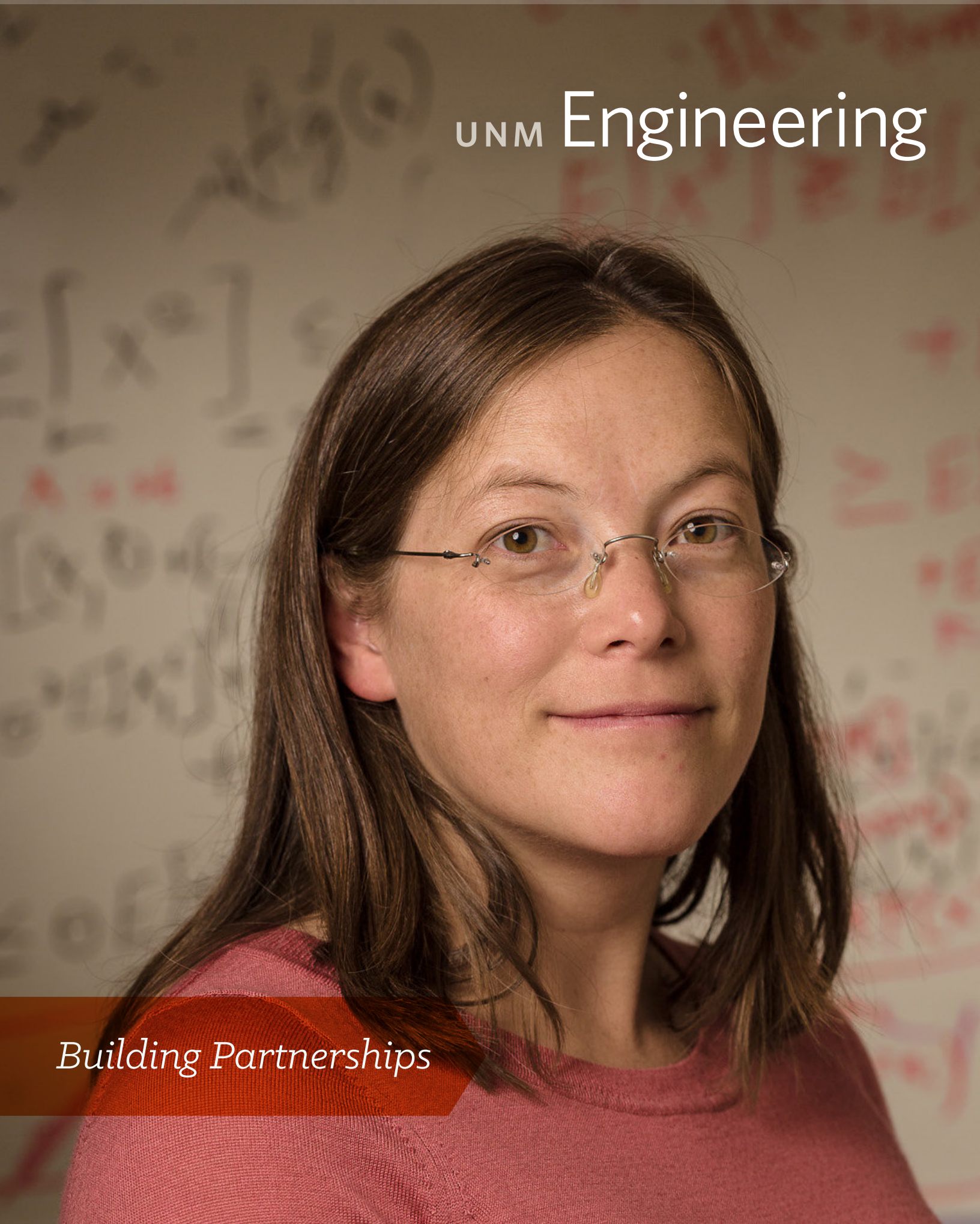
UNM Engineering



Building Partnerships

Message from the Dean

Welcome to the 2015

issue of *UNM Engineering.* This issue focuses on a subject I am particularly excited about — collaboration, particularly with our colleagues in the School of Medicine.

Health care, including diagnosis, treatment, and management of conditions and diseases, is of utmost importance to each of us.

Health care, including diagnosis, treatment, and management of conditions and diseases, is of utmost importance to each of us. We all have either personally dealt with or have had a close family member who has suffered a serious illness, so everyone can relate to the need for better tools for the diagnosis of conditions, as well as improved ways to treat diseases. Basic science and medical expertise are certainly integral parts of this, but when combined with engineering, new and exciting technologies and possibilities open up. Starting on Page 2, read more about how UNM engineers are making impacts in the fight against cancer, Parkinson's disease, heart disease, and improving our ability to get a good night's sleep.

In addition to highlighting some of our collaborative work with the School of Medicine, we are also proud of our faculty and their continued accomplishments. Daniel Feezell, one of our rising stars in the Department of Electrical and Computer Engineering, received an NSF CAREER Award for his work with technology that can improve things like high-density optical data storage and high-resolution printing. And Ronald Lumia, a professor in the Department of Mechanical Engineering, is the recipient of a Fulbright Scholar award (his second!) for research and teaching in Thailand, where he is exploring ways to improve manufacturing using Delta robots. Indeed, the School of Engineering is making an impact all around the globe! Read about them on Page 9.

I'm also very proud to have been a part of the signing of a new UNM-Sandia National Laboratories memorandum of understanding that will benefit the School in a variety ways, including more robust research collaborations and the ability to jointly recruit and hire nationally-prominent researchers. Read more about the agreement on Page 15.

A program that is near and dear to my heart is the Formula Society of Automotive Engineers (FSAE) LOBOMotorsports team. The program has grown and had some spectacular successes, but perhaps the biggest successes have been the students who have completed the program. On Page 10, read about how some of our FSAE alumni are using what they learned in the program to make the world a better place.

And speaking of our alumni, we have more than 15,000 alumni in the School of Engineering who are scattered around the world. Thanks to a mixture of data collection and creativity, we are able to produce a map of the United States that shows where our alumni live. It is exciting to know that you can travel to any of the 50 states and possibly bump into a School of Engineering alumnus. If you're in Texas, one such School of Engineering alumnus is Randy Velarde, who has made a great success in forming his own petrochemical business. Read about him on Page 16.

Please enjoy this issue of *UNM Engineering,* and thanks for all you do to support the School of Engineering.

Joe

Joseph L. Cecchi
Dean of Engineering

contents

On the cover
Meeko Oishi, associate professor of electrical and computer engineering, is one faculty member crossing the boundaries of engineering and medicine.

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Can we beat cancer?
Or stop Parkinson's disease?
How can we make hearts healthier?
And can technology help us finally get a good night's sleep?

AT THE INTERSECTION OF ENGINEERING *AND* MEDICINE

By Megan Fleming

Answers to those important questions could change the world, making it healthier and saving millions of lives. But those answers don't come easy. They require medical knowledge and engineering know-how, not to mention vision, financing, and dedicated, talented people to propel the research forward.

It's all happening at UNM. Here engineers, scientists, clinicians, and students from the School of Engineering, School of Medicine, and several other technical and clinical departments are working together to produce breakthrough medical technologies.

"Today's complex biomedical challenges require answers from multiple disciplines, which is why the School of Engineering's collaboration with the School of Medicine is so important," says Joseph Cecchi, dean of the School of Engineering. "When engineers, scientists, clinicians, medical researchers, and biologists bring their perspectives and knowledge together, exciting things start to happen. It is precisely those differences that lead to new creativity, insights, and innovation."

On the following pages, read about the exciting research happening at the intersection of engineering and medicine at UNM.

A High-Tech Window into Wound Healing

A multidisciplinary team of researchers at UNM is using a high-tech device to research the building blocks of the wound-healing process. Their findings could help diabetics—and other patients—who suffer from insufficient wound healing.

Thomas Howdieshell, a surgeon at University of New Mexico Hospital, and Paul McGuire, a cell biologist at the UNM School of Medicine, are using diabetic mice to study the role of matrix metalloproteinases (MMPs),

"This collaboration has been extremely valuable," says Howdieshell. "It's unique because we're bringing together sophisticated engineering, surgery, wound healing, and cell biology skills."

enzymes that play a critical role in wound healing. To get a better look at the process, they teamed up with Andrew Shreve, professor of chemical and biological engineering and director of the Center for Biomedical Engineering, and Steven Graves, associate professor of chemical and biological engineering. The engineers are developing biological sensing strategies to look at MMPs and the biochemical profile of wound tissue at the molecular level as it regenerates.

The team is developing a multiplex flow cytometer to analyze wound tissue samples from the mice. The sensor contains thousands of tiny beads coated with substrates that attract the MMPS from the tissue samples processed by the device. The results indicate if MMPs are present and how tightly they bind to the substrate, which reflects their activity level.

While the device development is still in its early stages, it shows great promise. Howdieshell looks forward to the time when he can use the flow cytometer to make more strategic treatment decisions.

Based on the results, Howdieshell could choose a different surgical approach or prescribe a certain medicine.

"This collaboration has been extremely valuable," says Howdieshell. "It's unique because we're bringing together sophisticated engineering, surgery, wound healing, and cell biology skills."

Lighting the Way to Better Sleep

Lack of sleep is a pervasive problem in the U.S. One National Sleep Foundation study found that almost 33 percent of employees said daytime sleepiness interfered with their productivity at least several times a month. **Meeko Oishi,** associate professor in the department of electrical and computer engineering, is using her expertise in control theory to develop a technology to combat that problem using light.

Oishi is collaborating with UNM professors **Lee Brown,** professor of pediatrics in the School of Medicine; **Steve Brueck,** distinguished professor emeritus of electrical and computer engineering; **Payman Zarkesh-Ha,** associate professor of electrical and computer engineering, and with researchers at Rensselaer Polytechnic Institute, as

"Ultimately, we want to help people control their circadian phase through lighting," explains Oishi

part of the NSF Engineering Research Center in Smart Lighting. The UNM team is creating a testbed to study the impacts of variable spectrum LED lighting on people with delayed sleep phase onset syndrome, a disorder that causes a chronic lack of sleep and interferes with a person's lifestyle, schedule, and productivity. Scientists have proven that people are sensitive to different colors of light at different times of the day and that sleep phase can be adjusted through exposure to—or limiting exposure to—certain colors and intensities of light.

"Ultimately, we want to help people control their circadian phase through lighting," explains Oishi.

The testbed, expected to be in use by late 2015, will be outfitted with actuators and sensors that can shift the quality, intensity, and color of light based on the needs of the patient who will wear a device that measures circadian rhythm indirectly.

Oishi and her students are developing theoretical and computational techniques that incorporate data gathered from the patients using the testbed to verify that the system is safe and produces desired behaviors.

"We want to be sure that despite the uncertainty associated with the measurement of circadian phase, and with circadian-affecting phenomena we can't directly measure, like eating a big meal, or going for an intense run, we can assure that the lighting strategies we're prescribing will have the desired effect," she says.

+ Peering into Parkinson's Disease

Up to 10 million people worldwide live with Parkinson's disease, a movement disorder that inhibits dopamine production in the brain and is characterized by involuntary movements. The disease progresses quickly in some people, and slowly in others; symptoms become more difficult to treat as the disease progresses.

Meeko Oishi is collaborating with neurologists at the University of British Columbia to characterize observed motor data from Parkinson's patients and use it to infer underlying mechanisms in the brain that may be responsible for the heterogeneity in disease symptoms and progression.

As part of the research, the team is trying to mitigate Parkinson's symptoms in a non-invasive manner using galvanic vestibular stimulation (GVS). Using a low-level current applied externally at the base of the skull, GVS appears to help mitigate symptoms of the disease.

"We find that GVS seems to affect corrective submovements in Parkinson's disease, making tracking motions smoother and less erratic" explains Oishi.

Now she's trying to tie the motor information with brain data (via EEG and fMRI) to understand those movements and what they may mean for potential treatment strategies.

The research is still under way but the goal is clear, says Oishi.

"Ultimately, we want to design optimal patterns of stimulation that could mitigate an individual's symptoms and improve their quality of life."

SOE Launches New Biodesign Course

To leverage the collaborative potential between engineering and medicine, the School of Engineering has launched a new graduate-level biodesign class open to students in the School of Engineering and the School of Medicine. The course brings together engineering and clinical faculty who lead student teams through the biodesign process. The goal is to transition student design projects into useful technologies.

The three-way connection between the School of Engineering, the national labs, and the Health Sciences Center is really ripe for interesting development and exciting opportunities. This connection makes New Mexico a very special place for unique collaboration."

Andrew Shreve
Professor of Chemical and Biological Engineering
Director of the Center for Biomedical Engineering

+ Generating Breakthroughs in Cancer Research

More efficient delivery of cancer medications via the nasal passages. Non-invasive skin cancer diagnosis using infrared imaging. Protocells that deliver cancer drugs to targeted cancer cells. These are examples of the powerful results that occur when nanoscience, microsystems, and health science experts collaborate to fight cancer, and they're all associated with an innovative center at UNM. **The New Mexico Cancer Nanoscience and Microsystems Training Center** (CNTC) was established in 2010 with a $3.5 million, five-year National Science Foundation grant and the goal of expanding partnerships between local cancer and nanoscience communities in order to reduce cancer deaths.

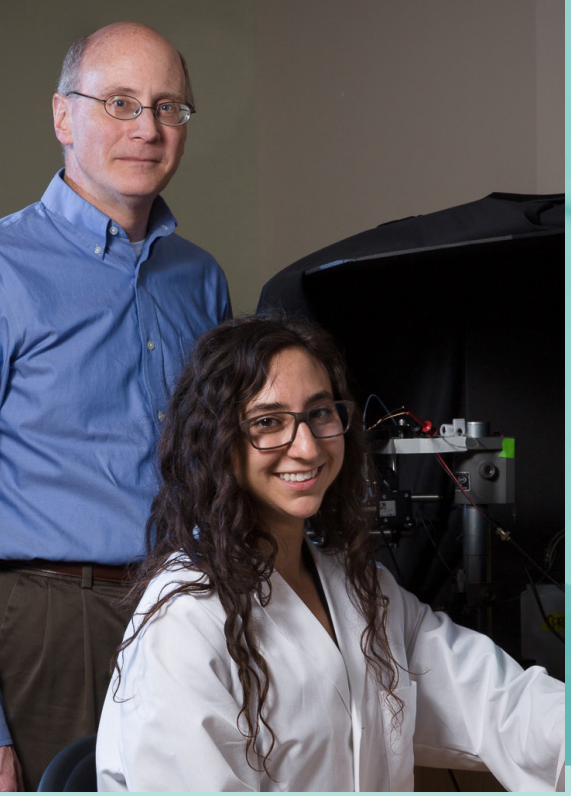
The CNTC gives graduate and postdoctoral students the knowledge and training in biomedical and nanoscale science to become next-generation leaders in cancer research.

"We help students think about solving problems in different ways. Making students in biomedical sciences take courses in nanoscale materials teaches them the importance of materials and how they would be useful for treatments. And, vice versa, we teach nanoscience students what they can do with these structures," explains **Abhaya Datye,** Distinguished Regents Professor and chair of the Department of Chemical and Biological Engineering.

He says the CNTC is an outstanding success that has led to research breakthroughs, spinoff companies and a more innovative graduate education experience with wide-ranging impact.

"Our underlying theme is to do great science, but think about the end users and how society will benefit from it," Datye says.

Datye and his team are working on gaining continued funding for the center.



Andrew Shreve (left) and Jacqueline De Lora

"In the future, my instrumentation will provide researchers with an in-vitro testing platform to validate hypotheses, perhaps even by testing chemotherapeutics in more realistic conditions before moving into animal and clinical trials,"

+ Future Dreams

Even as cancer patients receive chemotherapy, changes in the oxygen levels and pH balance within the tumor's microenvironment cause cells to diversify and develop resistance to treatment. A better understanding of tumor cell biology would help researchers understand changes in the microenvironment and could lead to better treatments, but they need special tools for those studies.

That's where **Jacqueline De Lora** comes in. De Lora ('10 Biology and Chemistry), a Ph.D. candidate in the biomedical sciences graduate program in the UNM School of Medicine, is working at UNM's Center for Biomedical Engineering to build instrumentation that integrates fluidics, optics, and electronics to create 3-D environments where researchers can culture and study cancer cells. The tools will be the first of their kind.

"In the future, my instrumentation will provide researchers with an in-vitro testing platform to validate hypotheses, perhaps even by testing chemotherapeutics in more realistic conditions before moving into animal and clinical trials," she says.

Andrew Shreve, professor of chemical and biological engineering and director of the Center for Biomedical Engineering, is a member De Lora's multidisciplinary mentor team. He says her research is a perfect example of why the School of Engineering works so hard to collaborate with other areas in the university, particularly the School of Medicine.

"Students are an important connection point because they can go back and forth between engineering and health sciences," says Shreve. "They make their own connections and that often leads to fruitful outcomes."

De Lora's mentor team includes another engineering faculty member and two faculty members from the School of Medicine. In turn, De Lora is sharing her knowledge with other students. During her studies she has mentored eight undergraduates and been a teaching assistant for several classes.

Her diverse background, the support of the multidisciplinary team, and the programs and courses offered by UNM make De Lora's work possible.

"I was really lucky to find that the research environment at UNM is built to support students like myself," she says. "Without the engineering, I wouldn't have the tools to ask the questions I'm interested in. And without my background in biomedical sciences, I wouldn't have a compelling reason for building such instrumentation in the first place."

"For this type of biotech product development and business development to happen, you have to have a strong engineering program co-located with a world-class medical school."

Michael Cumbo, Eta Diagnostics

+ Speeding the Search for Cancer Tumors

New technology developed by two UNM researchers could be a game changer when it comes to detecting cancer tumors. **Steven Graves** and **Andrew Shreve** have developed a new form of flow cytometry, a process of analyzing individual cells. This advance builds upon the research work of Graves and his co-workers over the last several years.

Through a grant funded by the National Institutes of Health, Graves and Shreve engineered highly-parallel flow cytometry, which accelerates the analysis process and lets clinicians look at cells at a much faster rate than previously possible. That additional speed makes it easier to find circulating tumor cells, strong indicators of the presence and growth rate of tumors associated with colorectal, pancreatic, breast, and prostate cancer. Like needles in a haystack, circulating tumor cells are present at extremely low concentration levels in the blood. Speeding the search for those cells in a blood sample could give doctors earlier warning about a tumor's presence and make it easier to track changes in the tumor over time in a non-invasive way.

Highly-parallel flow cytometry is also a game changer for **Eta Diagnostics,** an Albuquerque-based startup that is transferring the technology from UNM's labs to the marketplace. With the support of STC.UNM, the university's technology transfer organization, and its first round funding in place, Eta Diagnostics is developing the first generation of highly-parallel flow cytometers. The first instruments should be on the market later this year.

"This is not only a scientifically capable instrument, it's also economically viable in the clinical realm," says **Michael Cumbo,** president and CEO of Eta Diagnostics. "This technology will lead to multiple market opportunities and plenty of good jobs by the time we're done. Most importantly, it can change the lives of millions of cancer patients for the better."

He adds that UNM is the right setting for creating breakthrough technology.

"For this type of biotech product development and business development to happen, you have to have a strong engineering program co-located with a world-class medical school," Cumbo said.

Lennae Ismari (left) and Steven Graves in the cold room at the Centennial Engineering Center.

Melanie Moses with her iAnts

Elizabeth Dirk with members of her team

+ Studying the Science Behind Cooperation

How do ants collaborate to build and maintain their colonies? How do cells in our bodies work together to fight infection? Do those two systems have anything in common? **Melanie Moses,** associate professor of computer science, is aiming to find out in her research on how cooperative behavior emerges in complex systems.

"We'd like to be able to develop a theory of how cooperation emerges that's generalizable to a lot of different systems, including human systems, where almost everything we do is in some sense cooperative, from transportation infrastructure to food networks, " she says. "The hope is that this research contributes to an understanding of how cooperation is beneficial and what prevents it. In human societies, that's a very important question."

In 2014 Moses received a six-year, $450,000 grant from the James S. McDonnell Foundation 21st Century Science Initiative in Studying Complex Systems to study how cooperative behavior emerges in complex systems. Undergraduate and graduate students from the computer science and biology departments, as well as the School of Medicine, are helping with the research. Moses is also collaborating with **Judy Cannon,** an assistant professor in the Department of Molecular Microbiology at the School of Medicine.

The team uses computation to understand nonlinear interactions involved in effective cooperation. Through the research, she hopes to develop a mathematical formula that would predict the performance of cooperative search strategies

Research results could have a range of clinical applications particularly in vaccine design and immunotherapy.

+ Getting to the Heart of the Matter

The cell makeup of the aortic heart value is different than the test of the heart. Studies have found that in people prone to heart disease, healthy valvular cells become dysfunctional and start to produce bone models in the aortic heart valves. This hard tissue buildup stiffens the valve and restricts blood flow to the rest of the body, decreasing a person's quality of life and eventually leading to death.

Elizabeth Dirk is researching these cells in hopes that her work will help lead to better treatments for heart valve disease. Dirk, assistant professor of chemical and biological engineering and a faculty member in UNM's College of Pharmacy, is researching aortic heart valve tissue engineering with the aim of providing suitable living tissue equivalents for the treatment of the disease.

"If we can create these disease states, we can work to understand the initiation, onset, and progress of heart valve disease," says Dirk.

She and her team are investigating the physical and chemical factors that influence the behavior of the heart valve cells to learn more about how to promote healthy cell and tissue growth.

Dirk's research is funded by a $400,000 National Science Foundation Faculty Early Career Development Award. The grant also has an educational component that will encourage New Mexico students to pursue biomedical engineering.

Jeff Brinker and Cheryl Willman's STC.UNM Innovation Fellow Award

Two of the University of New Mexico's leading innovators were celebrated at the 2015 STC.UNM Innovation Fellow Awards event. Distinguished and Regents' Professor and Sandia Fellow **C. Jeffrey Brinker** and professor and Cancer Center CEO **Cheryl L. Willman** received the award at STC's 2015 Innovation Awards Dinner on April 20.

Brinker and Willman's collaboration is a prominent example of the work that is being jointly conducted by the School of Engineering and the School of Medicine.

This special award is presented each year by the STC.UNM board of directors to a university faculty inventor whose body of technologies has made a significant social and economic impact on society and the marketplace. The annual event also recognizes UNM faculty, staff, and students who have received issued patents and registered copyrights/trademarks within the past year.

Together Brinker and Willman developed the protocell, a nanoparticle designed to deliver cancer drugs to targeted cells. This next-generation technology will vastly improve cancer treatment for patients everywhere. Beyond their work on the protocell, they each are widely recognized for vision, innovation, and leadership in their fields.

C. Jeffrey Brinker

Cheryl L. Willman

Together Brinker and Willman developed the protocell

"Dr. Brinker's research and commercialization activities are shining examples of what the School of Engineering strives for — to engage in cutting-edge research that increases the visibility of the School in research and commercialization," says School of Engineering Dean Joseph Cecchi. "He is an outstanding role model to students as well, as an example of how to carry out academic research and drive it to high-impact commercialization."

"Dr. Willman is a remarkable cancer physician and inventor who is doing cutting-edge research to find new ways to treat cancer. She is an international expert in leukemia research, particularly acute lymphoblastic leukemia in children, and an innovator in discovering the underlying gene mutations in these cancer cells," says STC.UNM CEO Lisa Kuuttila. "Her individual achievements are not the only thing remarkable about her. Dr. Willman is also head of the UNM Cancer Center where her outstanding faculty are doing innovative research."

Feezell receives NSF CAREER award to study blue and green vertical-cavity lasers

Daniel Feezell, an assistant professor in the Department of Electrical and Computer Engineering at the University of New Mexico, has received a $500,000 National Science Foundation (NSF) Faculty Early Career Development (CAREER) award.

The award, which began March 1, 2015, and continues through February 2020, is for a project titled "Short-Wavelength Vertical-Cavity Surface-Emitting Laser Arrays Using Nonpolar and Semipolar GaN."

Feezell said the basic thrust of the project is to develop arrays of blue and green vertical-cavity surface-emitting lasers (VCSELs) with stable polarization of the light emission by using novel orientations of the semiconductor material gallium nitride (GaN).

Applications of this technology could include improved high-density optical data storage and high-resolution printing, improved mobile displays and projectors, and advancements in chemical/biological sensing and atomic clocks.

One example of a possible practical application would be the addition of projection capabilities on smartphones. Feezell said such a projector could be included on the back of the phone, right next to the camera.

"This would allow your phone to become a display projector, so you could view movies, pictures, or PowerPoint slides on the wall or on a screen instead of directly on your phone," Feezell said. "You could basically have a projector in your pocket."

Feezell will also be researching how to create a green VCSEL, which has not yet been developed. Red and blue VCSELs have been developed, and adding a green VCSEL would complete the RGB (red, green, blue) spectrum, allowing for the creation of white light, which makes possible technologies such as display screens or LED light bulbs for room lighting and other uses.

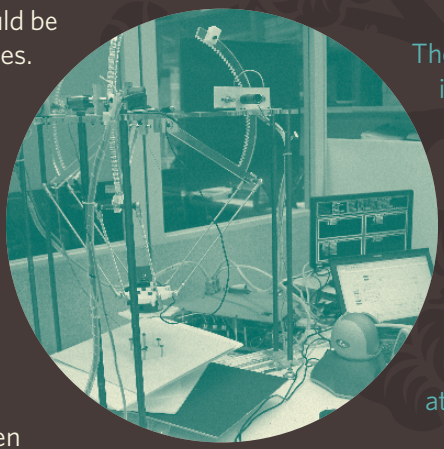
Much of the work on the project will be done at UNM's Center for High-Technology Materials, and some will be done in collaboration with the Center for Integrated Nanotechnologies at Sandia National Laboratories.

Lumia receives Fulbright for projects in Thailand

Ron Lumia, a professor in the Department of Mechanical Engineering at the University of New Mexico, has received a Fulbright Scholar award for research and teaching in Thailand. It is second time he has received a Fulbright.

He is spending the 2015-16 academic year in Bangkok, Thailand, and is working with Chulalongkorn University.

He will teach "Design for Manufacturability," a course that he currently teaches at UNM. The course focuses on optimizing mechanical designs to minimize assembly time. For instance, Lumia said, finding a way to eliminate just one part of a product can yield great rewards in terms of time, reliability, and cost savings in its manufacture. A faculty member from Chulalongkorn University will attend the course, with the expectation that the professor can then teach the course to his or her students in the future.



The research part of the effort will involve exploration into what are known as Delta robots, which are small robots that have motorized rack-and-pinion arms that perform much like a marionette and are used for the "pick and place" manufacturing, where a part is moved from one place to another at a rate of two units per second.

What Lumia would like to explore as part of the Fulbright award is the possibility of making the Delta robot assemble parts into a product. This could enable much more efficient manufacture of assembly-line type products, such as small electronics.

Lumia's previous Fulbright was in Bangalore at the Indian Institute of Science, where he worked on a project to develop new microelectromechanical systems (MEMS) packaging techniques and applied this technology to microgrippers.

By Kim Delker

FORMULA SAE RIDING ON YEARS OF SUCCESS

It started with just five students in 1997, and with little money or direction, the program didn't seem to have much of a future.

But luckily, in 1998, John Russell, who had spent a career in the Air Force and recently transitioned to the School of Engineering to direct the school's research efforts, was recruited to take the reigns, and the Formula Society of Automotive Engineers (FSAE) LOBOMotorSports program has been on the fast track ever since.

Students in the program take three courses worth 10 hours: Racecar Design and Dynamics, Racecar Build Lab, and Racecar Test Lab, culminating in the FSAE international competition each June in Nebraska.

One student in the program serves as the program manager who teaches the lab, and the program is structured so that the current year's team and the previous year's team overlap.

"That gives us more continuity, so we don't start a new car without using the knowledge of the old team," Russell said.

Successful formula

While the program has evolved and the team has experienced several years of success at competition, perhaps the best proof of the impact of the program comes in the success of its students.

One example is **Kirby Ann Witte,** who is now a Ph.D. student in mechanical engineering at Carnegie Mellon University. She was awarded a National Science Foundation fellowship to study the effects of lower-limb exoskeletons on stroke therapy. She said her time in the program helped her get her footing in graduate school.

John Russell

"My experience in FSAE allowed me to hit the ground running on my research," Witte said. "FSAE gave me an opportunity to manage a large project. I am not sure that I would have been as successful without having first experienced FSAE. Being a part of LOBOMotorsports gave me an opportunity to make lots of mistakes. I learned from these mistakes and was able to avoid similar problems when I started grad school. "

Austin Graham, a senior in mechanical engineering and a deputy project manager on the team, is planning to go into the automotive field after graduating. His dream is to build a concept car.

"My experience in FSAE will help a lot," he said. "I've gained so much management experience and how to use the right tools at the right time to do what is needed for the team."

Akamee Baca-Malta was marketing manager for the 2014 FSAE team. She earned her bachelor's degree in mechanical engineering in 2014 and is now the founder of a startup company called As Girls Grow LLC, a company she co-founded with her sister that designs toys that use engineering concepts to encourage girls to be creative thinkers and problem solvers.

Baca-Malta said her interest in entrepreneurship is directly linked to her experience in the FSAE program. As part of her role, she was encouraged to attend the UNM Business Plan Competition. That inspired her to bring to fruition an idea she and her sister had to encourage girls to get interested in STEM fields. Before long, she found herself working on a business plan, presenting at the competition, and winning $15,000 in the contest that allowed her to go to the next level.

After completing both the CNM and the ABQid accelerator programs, Baca-Malta is now in the process of creating a prototype for the toy, which she hopes to have ready by 2015.

She learned an invaluable life lesson from FSAE, something she said is helping get her through the ups and downs of being an entrepreneur.

"Things are not black and white. There's a lot of gray area," she said. "In order to succeed, you have to fail."

Future dreams

Russell said the program receives continued support from various donors and organizations at UNM, including the School of Engineering, but there are always needs, especially in an era where many such programs from bigger universities are extremely well-financed and equipped with spacious, high-tech shops in which to build their cars.

"We have old equipment and would love to have a new shop that is bigger," Russell said. "We rely upon longer-term donors and believers in the program, but are always looking for support."

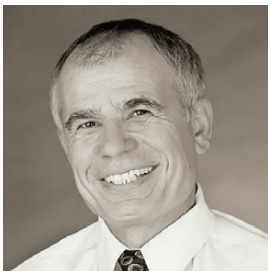
Despite the program's challenges, Russell says some of the challenges are actually a strength of the program, contributing to the learning process.

"You don't have time to develop all the knowledge that you need. You have to use what you've got. You mean I can't get the right answer? No, you can get as close as you can. That's uncomfortable for a lot of students. But that's real engineering."

To support the FSAE program and the LOBOMotorsports team, contact Betty Karlsson, senior director of development for the School of Engineering, at (505) 277-0230 or betty.karlsson@unmfund.org.

Transitions and Achievements


Anil Prinja


Christos Christodoulou


Darko Stefanovic


Abhaya Datye


Arup Maji

New Leadership

Anil Prinja, professor of nuclear engineering, has been selected as the chair of the Department of Nuclear Engineering. He has been serving as interim chair since 2014.

Christos Christodoulou, Distinguished Professor of Electrical and Computer Engineering, has been selected as the interim chair of the Department of Electrical and Computer Engineering. In addition, he serves as the associate dean for research in the school.

Darko Stefanovic, professor of computer science, has been selected as the interim chair of the Department of Computer Science.

Plamen Atanassov, Distinguished Professor of Chemical and Biological Engineering, was named director of the University of New Mexico's Center for Micro Engineered Materials.

New Faculty

Several new faculty have joined the School of Engineering for the 2015 – 16 year:

Fernando Moreu joined the Department of Civil Engineering as an assistant professor.

Edward J. Nava joined the Department of Electrical and Computer Engineering as a lecturer.

Tarief M. Fawzy Elshafiey joined the Department of Electrical and Computer Engineering as a lecturer.

Michael Gonzalez joined the Department of Civil Engineering as a lecturer.

Faculty Achievements

Abhaya Datye, department chair and Distinguished Regents Professor of Chemical and Biological Engineering at the University of New Mexico, has been elected as a fellow of the American Institute of Chemical Engineers. The rank of fellow is the highest grade of membership in the organization.

Arup Maji, professor of civil engineering, has been selected as associate fellow of the American Institute of Aeronautics and Astronautics. Associate fellow is a distinction conferred upon outstanding members of the institute who have made notable and valuable contributions to the arts, sciences, or technology of aeronautics and astronautics.

Jane Lehr, professor in the Department of Electrical and Computer Engineering, was awarded the IEEE Nuclear and Plasma Sciences Society's 2015 Richard F. Shea Distinguished Member Award for outstanding contributions to the leadership of the IEEE Nuclear and Plasma Sciences Society and the IEEE NPSS Pulsed Power Science and Technology Committee

Edl Schamiloglu, Distinguished Professor of Electrical and Computer Engineering, received the 2015 IEEE Nuclear and


Edl Schamiloglu


José M. Cerrato


Lyndsay Stapleton


David J. Buehler


Fernanda Yamasaki

Plasma Society's Pulsed Power Science and Technology Committee's Peter Haas Award in recognition of his contributions to the field of pulsed power.

Anil Prinja, professor and chair of the Department of Nuclear Engineering, received the 2015 Gerald C. Pomraning Award for his outstanding technical achievements in mathematics and computation.**José M. Cerrato,** an assistant professor in the Department of Civil Engineering, has received the Oak Ridge Associated Universities (ORAU) Ralph E. Powe Junior Faculty Enhancement Award. The Ralph E. Powe Junior Faculty Enhancement Awards provide seed money for research by junior faculty at ORAU member institutions.

Two professors in the School of Engineering have been made fellows in the IEEE. **Stephanie Forrest**, Distinguished Professor of Computer Science, was selected for her contributions to computer security systems based on biological principles. **Marek Osinski,** professor of Electrical and Computer Engineering, was selected for his contributions to analysis of optoelectronic materials and devices.

Construction management student **Albert Villascas** won the National Association of Home Builders Outstanding Student Award.

The American Concrete Institute named **Mahmoud Reda Taha,** professor and chair of Department of Civil Engineering as the new chair for ACI Committee 548: Polymers and Adhesives in Concrete.

Student Achievements

Lyndsay Stapleton, who received a bachelor's degree in the Department of Chemical and Biological Engineering at the University of New Mexico in May 2015, received a graduate fellowship from the National Science Foundation. She is attending graduate school at Stanford University.

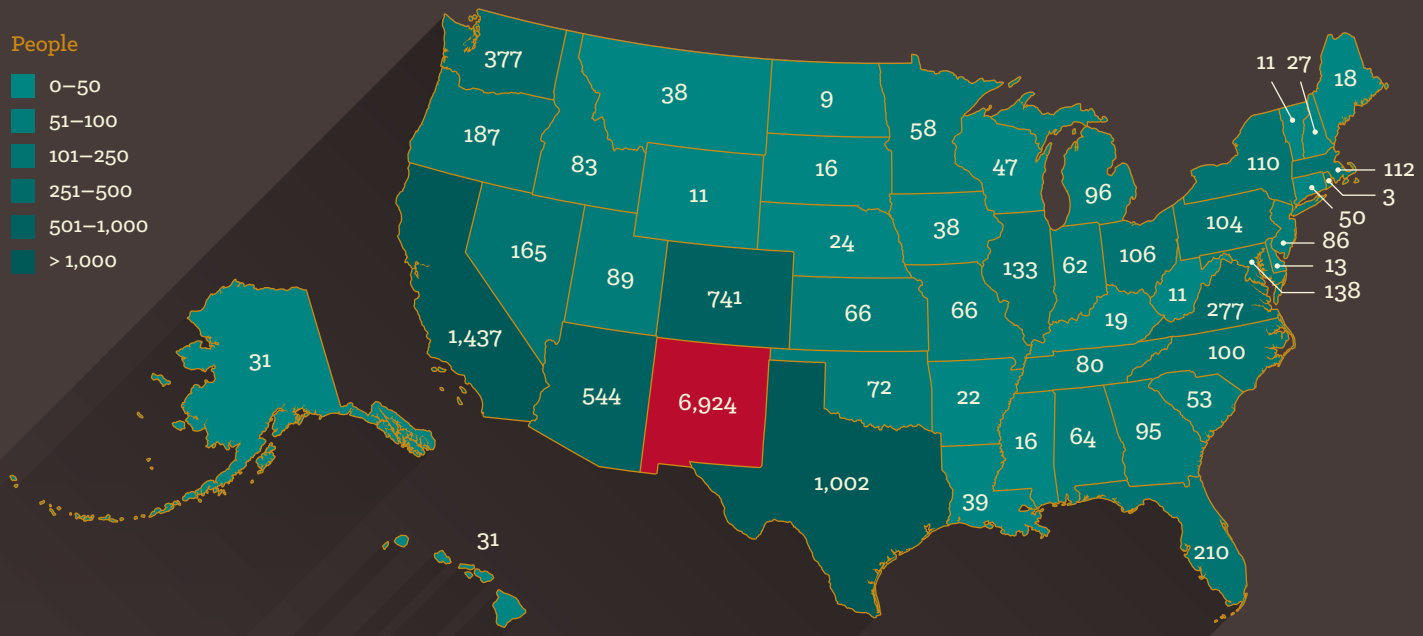
Civil engineering graduate student **Elisa Borowski** has been awarded a graduate research fellowship from the New Mexico Space Grant Consortium, a program administered by NASA.

Md. Mottaleb Hossain, a doctoral student in the Department of Electrical and Computer Engineering and the optical science and engineering program at the University of New Mexico, has won the 2015 IEEE Albuquerque Section Outstanding Graduate Engineering Student Award.

David J. Buehler, a senior in chemical engineering, received the Society of American Military Engineers ROTC Award of Merit. Buehler is a cadet colonel in the Air Force ROTC, where he is the cadet wing commander at Detachment 510. The award is given by the Society of American Military Engineers in conjunction with AFROTC.

Fernanda Yamasaki, a doctoral student at the National Institute for Space Research in Brazil who is currently working with Edl Schamiloglu, Distinguished Professor of Electrical and Computer Engineering, received the Best Student Paper Award at the IEEE International Pulsed Power Conference in Austin, Texas, in June 2015.

WHERE ARE OUR ALUMNI?



DRIVING SUCCESS

TWO ENGINEERING PROGRAMS TO BENEFIT FROM DONATION BY LOCAL COMPANY

Thanks to the generosity of a local donor, two programs in the University of New Mexico School of Engineering will be better equipped to meet the needs of their students.

Marc Powell, owner of Albuquerque-based transportation company ReCARnation, is donating the use of two vehicles that will benefit two initiatives in the school: the Lobo MotorSports Formula Society of Automotive Engineers (FSAE) team and outreach and research efforts led by the Center for Water and the Environment.

The gift agreement specifies that each entity will receive vehicle rentals at no charge on an as-needed basis for five years. The FSAE team will receive use of an extended-cab pickup truck to be used when they have competitions, practice drive days, and other uses. The Center for Water and the Environment will be able to use the pickup truck to conduct field research and tow a trailer that is being built to do K–12 education and outreach. The trailer-mounted demonstration unit will be called the Water Activity

Vehicle and Experience (WAVE) vehicle, which will allow students to understand and experience water-related research in a hands-on way.

Powell said his generosity was inspired by a deep commitment to improving the educational opportunities for students in New Mexico, which in turn serves to bolster the community. In 2013, Powell donated more than 50 percent of ReCARnation's profits to individuals and organizations in need.

The LOBOMotorSports Formula SAE program was started in 1998 by John Russell, Halliburton Professor of Mechanical Engineering.

The Center for Water and the Environment is led by Kerry Howe, associate professor of civil engineering. The center consolidates and maximizes the water- and environmental-related research at the university.

UNM and Sandia

New Agreement with Sandia Will Boost Research, Recruiting

The University of New Mexico and Sandia National Laboratories on July 13 expanded their commitment to work together to help redefine the future of science and engineering for national security, partner on research and jointly recruit top researchers.

Sandia National Laboratories President and Director Paul Hommert (now retired) and University of New Mexico Provost Chaouki Abdallah signed a memorandum of understanding (MOU) for a strategic alliance at the School of Engineering's Centennial Engineering Center.

"With this MOU, Sandia and UNM commit to a deeper relationship to strengthen both organizations by exchanging personnel, developing innovative joint research programs and educating the next generation of national security leaders," Hommert said.

The new agreement aims to:

- *Explore strategies enabling the future of engineering for national security;*
- *Seek innovative facility partnerships that enable collaborative research; and*
- *Jointly recruit and hire nationally prominent researchers for UNM faculty and Sandia technical staff.*

Collaborative research will focus initially on quantum computing and information science, nanoscience and microsystems engineering, nuclear engineering, high-energy density science, energy, water, cybersecurity and bioscience for national security.

The research involves several areas from around the university, but it will particularly benefit the School of Engineering, said Dean Joseph L. Cecchi.

"I believe the MOU reflects the special multidimensional and strategic collaboration that we have built with Sandia over the past 30 or more years," he said. "Going forward, it positions us very well to work with Sandia to define the future of engineering for national security."

Rob Leland (left), Paul Hommert (center) and Chaouki Abdallah sign the MOU for a strategic alliance.

The agreement also makes UNM part of a larger academic alliance that Sandia has formed over the past year to bring together the labs' technical status as a Federally Funded Research and Development Center and the know-how of major national research universities. The alliance has three principal goals: solve big problems, sustain and engage human capital, and accelerate technology commercialization.

The two institutions have had a series of research pacts dating back to 1982. The new agreement supersedes an MOU signed by Sandia and UNM in 2011 that was set to expire next year. Sandia and UNM will build on their historic interactions and create more strategic relationship between the institutions, said Rob Leland, Sandia's vice president for science and technology and chief technology officer.

"We wanted to establish a deeper and mutually beneficial relationship between Sandia and UNM as part of our new academic alliance with research universities that are performing mutually beneficial research with Sandia that's focused on national security," Leland said.

Sandia has also formed academic alliances in the past year with the University of Illinois at Urbana-Champaign, Purdue University and the Georgia Institute of Technology.

TAKING THE ROAD LESS TRAVELED

***Randy Velarde,** ChE '81, took his engineering skills from UNM and applied them in an innovative and entrepreneurial way to achieve major success in the petrochemical industry.*

By Kim Delker

Randy Velarde grew up in Albuquerque and followed in the footsteps of his older brother, choosing the University of New Mexico to study chemical engineering. But rather than begin his career as an engineer, Velarde chose a different — and less obvious — route.

"It was a high time for the petroleum industry when I graduated in the spring of 1981," Velarde said. "I had many job offers, most for an engineering position and one working on the commercial side; I chose the commercial job offer from Shell Chemical in Houston."

For the first few years, he worked for Shell in Cleveland, where he held a position in sales. After earning an MBA from Baldwin-Wallace College in Berea, Ohio, he was transferred to Houston by Shell and held various positions in marketing, business planning, and product management of what are known as the "downstream" products of oil — petrochemicals that are made from petroleum and natural gas. Such petrochemicals are used to make a wide variety of products used in the housing, automotive and construction industries.

In 1990, Velarde joined Texaco Chemical as a business manager. Four years later, he made the big decision to form The Plaza Group, a specialty marketing firm focused on marketing refinery and petrochemical products produced at Texaco refineries as Texaco Chemical's assets were being sold to Huntsman. Within a few years, The Plaza Group became the exclusive distributor of the chemical products produced at these facilities in a long-term contract. Today, the company now has sales agreements with many of the industry's leading petrochemical producers, including Dow Chemical, Shell, Goodyear Chemical, Total, Versalis, Husky, Mitsui, and Alon Refining, among others.

MY UNM ENGINEERING DEGREE PROVIDED ME WITH A SET OF SKILLS TO APPROACH CHALLENGES OF ALL KINDS, WHICH HAS HELPED ME TREMENDOUSLY IN BUSINESS AND IN LIFE.

Today, as has been the case for the past two decades, The Plaza Group remains in growth mode, as it continues to build its reputation as a multi-million dollar international chemical marketing firm. Last year alone, The Plaza Group was ranked among the top 15 North America Chemical Distribution Leaders, the Top 50 Chemical Distributors and one of the 50 largest private companies in Houston.

Velarde says The Plaza Group is a niche business that operates from a unique model.

"We serve a vital and valuable purpose for many refiners and chemical producers, who would rather invest their time marketing their core products than marketing their by-products," he said.

Among his many career achievements, Velarde was appointed by former Secretary of Energy Bill Richardson to serve on the National Petroleum Council, and has been named Entrepreneur of the Year by both *Hispanic Business* magazine and the Houston Hispanic Chamber of Commerce.

Velarde continues to visit the UNM campus several times a year, especially in connection with his role as a board member of the UNM Foundation.

"My UNM Engineering degree provided me with a set of skills to approach challenges of all kinds, which has helped me tremendously in business and in life," he said. "I enjoy the connection I have with UNM and what I have received, and I look forward to giving back."

FIVE FOR *Christina Salas*

Christina Salas is a perfect example of the intersection of engineering and medicine. She earned a bachelor's degree in mechanical engineering from California State University – Chico, and both her master's in mechanical engineering and Ph.D. in biomedical engineering from UNM. Her graduate advisor was in civil engineering, and Salas worked in orthopaedics throughout her graduate career. She is now an assistant professor in the Department of Orthopaedics and Rehabilitation at UNM, where she facilitates the research requirement of the graduate medical education program for the residents and fellows in the School of Medicine.

How did you get interested in engineering?

I had a teacher in elementary school who encouraged my interest in engineering. I always liked tinkering with things and taking things apart. I started out in computer engineering, but I decided I liked the hands-on aspect more than the theoretical, so I ended up with a mechanical engineering degree.

How did you make the transition from purely engineering to a more medical focus?

One of my last semesters at CSU, I was working at Best Buy and I met a guy who bought a TV from me. He happened to be a manager at a local dental manufacturing company and he asked me if I wanted to do an internship with him, based on my interaction with him and my technical knowledge. That was the start of the transition from purely engineering to a medical-related field.

What is the difference between working with engineers and working with physicians?

The engineers like to take time to investigate what they are testing, but the surgeons expect a quick response. Having them understand what is involved in the engineering decision-making process is the first step toward a successful research collaboration.

You are involved in a lot of outreach. Why do you feel this is important?

I'm involved in the Perry Initiative, an outreach program to encourage women to be leaders in orthopaedic surgery and engineering. Because the Perry Initiative fosters both engineering and orthopaedic careers, it attracted me as a hands-on program to help more females get into both fields.

What inspires you?

I was the first person in my family to go to college. I'm from a very large family and the youngest of my siblings. It's something that I think they've been very proud of, and that has encouraged me to keep going. I feel like I've accomplished so much in my life that I feel like sharing and helping those who came from where I did — low-income, Hispanic, with no direct role models. I want to reach out to those people and say, 'You can do it.'

NOTABLES

Co-editor of University of New Mexico *Orthopaedic Research Journal*

Featured in *Diversity Careers in Engineering & Information Technology's* Technical Women of Color edition, April/May 2012

Outstanding Graduate Student Award, UNM Department of Chemical and Nuclear Engineering, Spring 2014

THE UNIVERSITY of NEW MEXICO

School of Engineering
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MAKE A DIFFERENCE IN A STUDENT'S LIFE

SUPPORT THE VISIONARIES OF INFINITE POTENTIAL ENDOWMENT IN THE SCHOOL OF ENGINEERING

As we know, getting a good education is the key to a lifetime of success. But we also know that the cost of a quality education, like that provided by the University of New Mexico School of Engineering, is out of reach for many qualified students.

Scholarships provide deserving students much-needed support during their educational journey. In the School of Engineering, there are many ways to support student success. One of the newest ways is through the Visionaries of Infinite Potential (VIP) Endowment.

This endowment, once fully funded, will generate scholarships each year for engineering students. But in order to make that a reality, your help is needed. By making a gift to the Visionaries of Infinite Potential Endowment, you will be providing students with the support they need to earn a degree that will position them to contribute to our region's economic development and solve our world's greatest challenges.

To support the Visionaries of Infinite Potential Endowment, go to
https://www.unmfund.org/fund/visionaries-of-infinite-potential-vip-endowment/
or contact Betty Karlsson, (505) 277-0230 or betty.karlsson@unmfund.org.