THE UNIVERSITY OF NEW MEXICO SCHOOL OF ENGINEERING

FALL 2006

UNM engineering

Beyond the Classroom

1906 - 2006
100
YEARS OF
EXCELLENCE

From the Dean

Innovation for Life

Educating engineering and computer science students to find and produce creative solutions to real-world problems demands a wide and ever-increasing spectrum of hands-on experiences. We do this by engaging our students in independent research and exposing them to practice through a variety of design projects. Good technology research must be informed by the best principles of practice. Likewise, practicing engineers must understand how to evaluate and apply research in their ever-advancing fields.

The extensive level of research in the School of Engineering ($29M annual expenditures for approximately 100 faculty) not only provides the basis for most of the nearly 200 M.S. and Ph.D. degrees we award annually, but enables us to offer independent research projects to our undergraduates as well. Students also have the opportunity to work on challenging design projects, often in collaboration with our industrial and national lab partners. In this issue of *UNM Engineering* we bring you a sampling of the many opportunities our students have for experiential learning.

Innovation requires research and practice to reinforce each other and lead to success in the marketplace. A good example is TruTouch Technologies (see article on page 13), led by one of our alumni, Dr. Jim McNally. Using proprietary optical technology, TruTouch has developed an affordable, non-invasive diagnostic that accurately measures blood alcohol levels and will serve as a major deterrent to drunk driving.

2006 is the Centennial Year for the UNM School of Engineering, a particularly appropriate occasion for us to be rededicating ourselves towards providing our next generation of graduates with the kind of quality education that has been the goal of the last one hundred years. A variety of Centennial Anniversary activities are planned throughout the year to engage our alumni, students, prospective students, and friends of engineering. Please go to our web site, **www.soe.unm.edu**, for a complete list of Centennial Celebration activities. We hope you will join us in celebrating how engineers and computer scientists combine research, practice, and innovation to solve the world's most pressing challenges. It is our goal that one hundred years from now, future UNM alums will look back on ten decades of engineering education and innovation with pride—just as we are doing now.

Joseph L. Cecchi
Dean of Engineering

Points of Pride

■ The University of New Mexico Center for Biomedical Engineering, in conjunction with the Department of Chemical and Nuclear Engineering, will receive $2,537,500 from the National Science Foundation over the next five years to fund a research and educational partnership with Harvard University, Albuquerque Public Schools (APS) and the Southwestern Indian Polytechnic Institute (SIPI).

The project, funded by NSF's program on Partnerships for Research and Education in Materials, will focus on natural and synthetic biomaterials—those materials used in contact with biological systems. Biomaterials are important for medical devices, and represent a huge and rapidly growing economic component of the health care system, estimated at over $100 billion per year worldwide. Professor Gabriel López, principal investigator and director of the Center for Biomedical Engineering at UNM, has designed the program to encourage students from underrepresented groups to pursue materials research careers.

■ A team of UNM researchers, including faculty and students from the Chemical and Nuclear Engineering Department, recently published findings in the prestigious journal *Science*. The project, directed by Professor Jeff Brinker and Helen Baca, Ph.D., determined that live cells are capable of organizing the structure of, and remaining alive in, inorganic silica. Their technique provides an entirely new framework for controlling and studying cells. Their results could have far-reaching applications in many fields. SOE grad students Carlee Ashley and Eric Carnes and undergrad Deanna Lopez were co-authors.

■ An SOE research team at the Center for High Technology Materials has applied for a technology patent to place gallium arsenide lasers on silicon chips. Diana Huffaker, associate professor of Electrical and Computer Engineering, says there is excitement for their work in the competitive world of semiconductors, as this allows truly effective integration of photonic components with microelectronic components without fracture.

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On the Cover
Tricia Padilla, B.S., Chemical Engineering, holds a novel thin chromatography plate that performs planar electrochromatographic separation of charged dyes.

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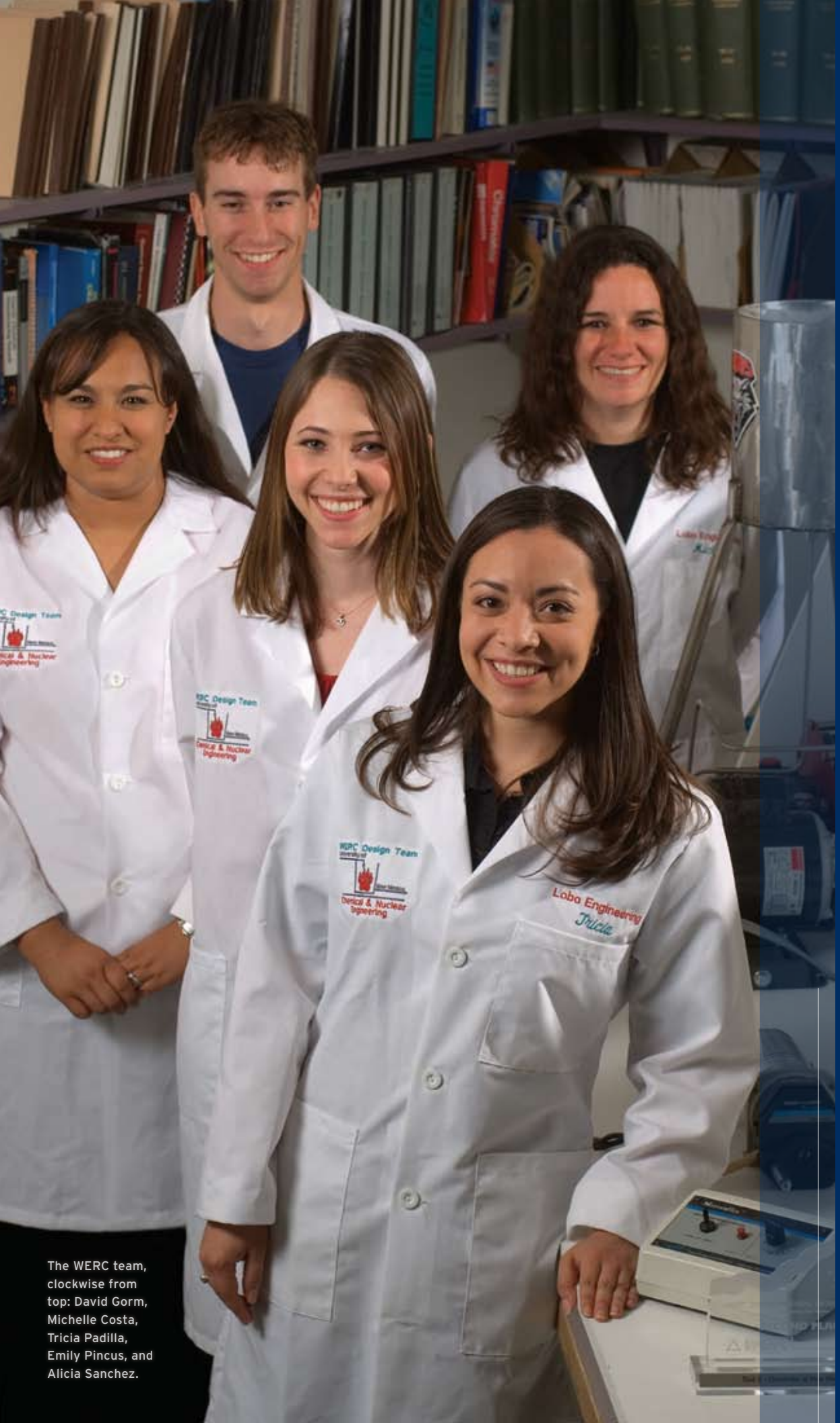
CAPPING IT OFF

Seniors apply four years of learning to capstone projects



The WERC team, clockwise from top: David Gorm, Michelle Costa, Tricia Padilla, Emily Pincus, and Alicia Sanchez.

Gannet Fleming West, Inc., civil engineer Matt Nighbert (standing) mentored civil engineering seniors (left to right) Isaiah Pedro, Brian Patterson, and Chris Grgich on their senior capstone project. The team designed a roundabout to replace a busy and confusing Albuquerque intersection.

Lectures and labs. Papers and presentations. Textbooks and tests. After years of hard work in the School of Engineering, undergraduates face one last challenge—the capstone project. The senior project challenges engineering students to apply everything they've learned as an undergraduate. The capstone tests students' knowledge and helps them hone their creativity and teamwork skills so that they're well prepared for the workplace.

Every department has a senior capstone requirement, but the projects vary from company-sponsored tasks to those designed and managed by the School of Engineering professors. In the past year, mechanical engineering students could choose from two industry-sponsored projects or join the FSAE team, a group that receives course credit for building a formula race car for a national competition.

Students in electrical and computer engineering work on their senior projects over two semesters and can pursue industry-sponsored projects or develop their own. This spring, a team of four electrical and computer engineers began developing a hydroelectric generator that could be hooked to a residential water line. The goal was to use residential water lines to generate power that can reduce a home's energy bill. This fall the team will build a prototype of their generator and finish a feasibility study on the design.

Computer science students work in teams on a two-semester capstone project where they research, develop, and test a computer program to solve a real world problem defined by the faculty. For a recent capstone called "Project Pay Me," competing groups developed the software to run a time card reporting system for student employees in the Computer Science Department.

Arup Maji, chair of the Civil Engineering Department, says the capstone projects have many benefits. "The ability to work on real-world problems while taking classes is a unique opportunity made possible by UNM's location in a major metropolitan area," says Maji. "In addition to providing valuable educational and team experience, capstone projects boost the confidence of the seniors before they enter the workforce."

Last spring, two student teams from chemical engineering and civil engineering pursued unique, challenging capstone projects to round out their experience at UNM.

Chemical Engineering

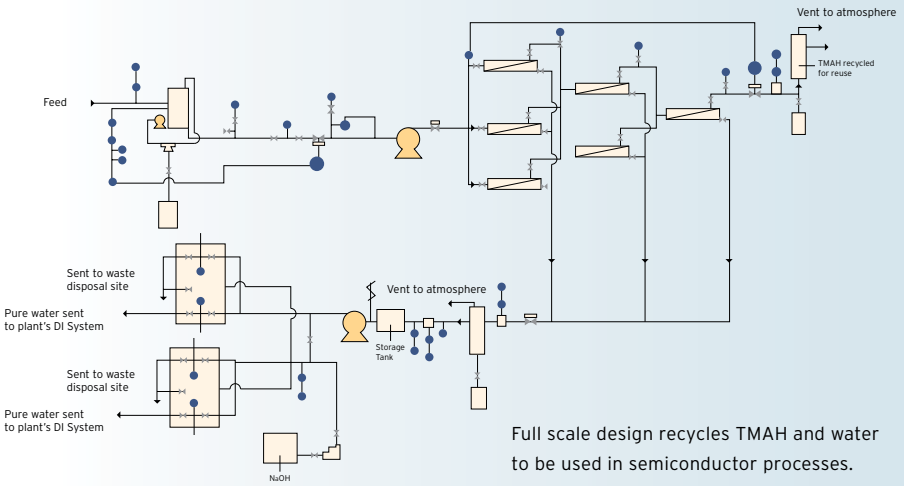
Excelling at WERC

The UNM chemical engineering seniors donned their monogrammed lab coats and double-checked their bench scale water treatment model. As judges looked on, a team member carefully poured a gallon of water into the model. Then they waited.

Michelle Costa, David Gorm, Tricia Padilla, Emily Pincus, and Alicia Sanchez were in Las Cruces participating in the WERC Annual Environmental Design Contest in April. WERC, a consortium for environmental education and technology development, hosts the annual competition for college students from around the world. Participants choose from eight real-world environmental problems and use their engineering skills to solve them. The UNM team had other choices for their capstone project, but

Brian Patterson

Chris Grgich



Full scale design recycles TMAH and water to be used in semiconductor processes.

> In this competition, students had to grapple with all the constraints that they will experience in their working careers. This gives them a sense of what engineering is like in the real world.
>
> Geoff Courtin, a chemical and nuclear engineering research engineer

liked the challenge presented by WERC. "The fact that this was a competition was a motivating factor," says Pincus.

From the eight tasks, the UNM team chose Task Five, which focused on removing tetramethylammonium hydroxide (TMAH) from a liquid waste collection system. TMAH is a chemical used in lithography, one of the first steps in the semiconductor manufacturing. Currently, semiconductor plants discharge the chemical into a sanitary sewer. The challenge for WERC competitors was to find a more effective, efficient way to remove TMAH.

The UNM team evaluated different water treatment techniques and ran numerous tests before designing a bench scale model that combined reverse osmosis with an ion exchange.

Many Right Answers

At the competition, the UNM team presented their work to a panel of judges, chosen for their expertise in water treatment technologies. The judges not only evaluated the team's technical accomplishments, but also their ability to work as a team, and their understanding of the legal, economic, and environmental issues related to the plant-scale implementation of their water treatment method. Their final challenge was to use their model to treat a gallon of TMAH-laced water. The team's system worked perfectly and they won second place, as well as compliments from competing teams and the judges. "We competed against schools with many team members and a history of winning, and we did really well," says Padilla.

During the semester, the students had a dedicated, interdisciplinary team of mentors to turn to for guidance. Bruce Thomson, University of New Mexico regent's professor of civil engineering and director of UNM's water resources department, and Kerry Howe, assistant professor of civil engineering and water treatment expert, served as academic advisors for the team.

Geoff Courtin, a chemical and nuclear engineering research engineer, also mentored the team and helped procure equipment for the bench scale model. Courtin, who is a past WERC participant himself, also attended the week long event with the team. He says the WERC competition gives students insight into real world engineering. "In engineering there are many solutions that will solve a particular problem, but very few that are suitable given specific design constraints," says Courtin. "In this competition, students had to grapple with all the constraints that they will experience in their working careers. This gives them a sense of what engineering is like in the real world."

Civil Engineering

Students Go Roundabout

The intersection of Eighth Street and Central Avenue on the west end of downtown Albuquerque is a tangle of roads intersecting at odd angles.

An array of signs and traffic lights only add to the confusion. Over the years, the area's odd geometry and confusing signage have caused numerous accidents and countless headaches for motorists, pedestrians, and bicyclists alike. As their senior capstone project, a team of three UNM civil engineering seniors, Brian Patterson, Chris Grgich, and Isaiah Pedro, decided to find a better way around the intersection—literally.

City planners had already decided to replace the current intersection with a roundabout. It would be the city's first. The novelty was one of the reasons the students chose the project. "This would be Albuquerque's first major roundabout. It would be really interesting to see it once it was completed," says Pedro. The circular intersections reduce accidents, improve safety, and enhance traffic flow. Because this type of intersection is new to the city, the project parameters required the students to create an informational brochure to educate the community about how to use a roundabout.

Engineers from Gannett Fleming West, Inc. (GFW), the Albuquerque branch of the international planning, design, and construction management firm that holds the city contract to design the roundabout, mentored the students. The company gave the students office space, a computer, and full access to company resources. More importantly, the firm assigned three of its engineers, Matt Grush, David Wilson, and Matt Nighbert, to mentor the team. The students worked at the GFW offices about three times a week where the consultants kept an open door policy. "It was great that Matt and the other consultants always made themselves available for questions," says Pedro.

In his role as a mentor, Nighbert came full circle with his capstone experience. Nighbert worked on his own civil engineering capstone project at UNM in 2004. He says being involved in capstone projects benefits the company as well. "This process helps Gannett Fleming network. By working with the students we also work with the UNM faculty," says Nighbert.

A Blank Slate

For the design of the project, students had a blank slate, but they had to address safety concerns and traffic flow challenges. One of the biggest challenges was creating a roundabout that could accommodate large emergency vehicles and the city's 60-foot long, articulated Rapid Ride buses.

The team mapped the original intersection, timed lights, and monitored traffic flow. After designing their roundabout, the students tested the design using a computer software program that simulated traffic flow through the intersection. They also used a computer program to confirm that the roundabout's turning radius would accommodate city buses, fire trucks, and tour buses.

The team's final design transformed the tangle of roads into an elegant, landscaped, five-spoke roundabout, which reduces conflict points in the intersection by fifty percent. "The UNM team's resolution to the Eighth Street Roundabout is a good one," says Nighbert. "Their design has many of the same features as the city-approved design." Construction of the roundabout was slated to begin this past summer.

While their specific design won't be implemented, the team came away with valuable experience. "The main benefit is that we got to apply what we learned in school to an office setting. You learn how the whole process works," says Patterson.

Nighbert says that beyond plan sets and learning about how to work with other professionals, the students learned one of the most important aspects of civil engineering. "You have to be able to present these projects in a way that people can understand them. They learned how important communication is for an engineer."

STC Pursues Patents

Cigar steamer/heater. Spartan automatic faucet and soap dispenser in one. Skateboard ground lighting.

Those are just a few of the inventions that began as undergraduate engineering projects and are now possible proprietary products, thanks to the Science and Technology Corporation (STC). The STC is a nonprofit company owned by UNM that helps students and faculty transfer their inventions to the marketplace by securing patents and exploring commercialization options. Student inventors are involved every step of the way. "I think the area of commercialization is a really important aspect and a valuable skill to have when students begin their careers," says Lisa Kuuttila, president and CEO of STC.

This past spring a team of mechanical engineering students took their senior design project to STC for consideration. Laura Reed, Travis Beaudin, and Eric Conklin combined functionality and aesthetics to create a skylight that incorporates a solar water heater. Fins on the solar panel absorb solar radiation and transfer the heat to water that moves through a pipe in the system. Three or four of these low cost, energy efficient units could heat 65 percent of an average home's water. STC has filed a patent application on the skylight and is now researching the product's marketplace potential. Several companies have expressed interest in learning more about the technology and the possibility of licensing it. Whether or not their product is produced commercially, Reed says the experience has been invaluable. "STC has the experience, knowledge, and time that we don't have. I'm learning a lot from STC as we move through this process."

FROM LECTURES TO

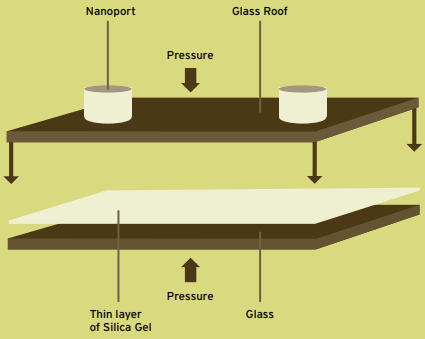
Integrating education and research to create well-rounded students

Tri Trinh, senior in nuclear engineering, researched the effects of an earthquake on the stability of radioactive waste containers in a storage facility.

LABS

It's crucial for students to get outside the classroom, to work in teams with engineers and other professionals, and to create new engineering knowledge.

Associate Dean of Research Kevin Malloy



Schematic of UNM's novel device for separating charged dyes developed in the NSF-REU program.

Marty Ridens enrolled in the UNM School of Engineering (SOE) to get "a piece of paper." What he got was a passion for research and a new career path. Five years ago, Ridens was on the East Coast pursuing a successful career in semiconductor engineering when he was downsized after 9/11. Though Ridens had years of experience, his employer had to let him go because he was a "non-degree engineer," meaning he didn't hold a college degree in his field. Ridens had tried. He'd enrolled in several universities, including UNM, but never finished his degree. After returning to Albuquerque in 2004, Ridens reenrolled in the School of Engineering with a plan to finally earn his "piece of paper" and then return to the corporate world. The school's emphasis on integrating education and research changed his plans.

Enter Terran Lane, assistant professor of computer science. Lane is an investigator on a National Science Foundation Research Experiences for Undergraduates (NSF-REU) to study embedded machine learning. UNM is collaborating with a team at the University of Oklahoma on the project. Lane's portion of the study focuses on teaching autonomous agents—like robots—to interact with their environments. While the REU has specific research goals, the key objective is to expose more undergraduates to research in hopes they'll want to pursue research as a career. "Making an opportunity like this available to undergraduates is important," says Lane. "Too often there's a wall between graduate and undergraduate education. Programs like this REU bridge that wall. And I'm happy to have good, smart people doing high quality research whether they're graduate or undergraduate students."

To that end, Lane visited undergraduate classes last fall to recruit research assistants. The opportunity piqued Ridens' interest so he applied and got the job. "I thought I might be able to do research in the future but having this opportunity as an undergraduate lays the groundwork for my future," says Ridens. "I'm learning things that I wouldn't learn in the classroom so it's been the best of both worlds." Ridens works about 10 hours a week on the REU, creating simulations and running experiments to determine if certain algorithms work. Like many students, Marty Ridens found that his research

Working in the lab has been a great experience. have a clearer understanding of laboratory tools

Tricia Padilla, B.S., Chemical Engineering

experience shaped his plans for the future. Now a junior working on a double degree in computer science and mathematics, Ridens plans to attend graduate school to study computer science with a focus on reinforcement learning. He's leaning towards a research career when he graduates.

Real World Experience

The NSF-REU is just one of the many ways that the UNM School of Engineering integrates education and research for undergraduates. Since becoming a research university almost 20 years ago, research has become an integral part of the undergraduate program through coursework and lab experiences. "It's crucial for students to get outside the classroom, to work in teams with engineers and other professionals, and to create new engineering knowledge," says Associate Dean of Research Kevin Malloy.

With $25 million in sponsored research, the SOE has plenty of opportunities for undergraduates to participate outside the classroom. Students can choose from honors programs, research assistantships with faculty, and research collaborations with industry and the government.

Tricia Padilla, who graduated in May with a degree in chemical engineering, received plenty of real world experience as she pursued her honors thesis. Padilla spent about ten hours a week on research with Gabriel López, professor of chemical engineering and chemistry. Their research, which is part of the Los Alamos Joint Science Technology Laboratory Project between UNM and Los Alamos National Laboratory (LANL), focused on separating proteins from mixtures using electrochromatography. The process would allow researchers to extract and analyze proteins from a mixture such as blood or from cells like cancer or bacteria cells. Working in a lab in the Electrical and Computer Engineering building, Padilla placed dye molecules on a specially treated chip where the proteins moved at different speeds to create distinct bands. Padilla then sent the chips on to LANL where scientists continue to analyze and identify the different proteins. The research could lead to a more effective protein separation process that would be useful in basic biological research, medicine, and the pharmaceutical industry.

"Tricia is very smart and very motivated. I felt that tangible experience in our research group could really help her," says Lopez. "It's clear that she has had the opportunity to hone her written and communication skills as well as working effectively in a goal-oriented team environment."

Because of her consistent work and contribution to the research, Padilla's name will be included on a published paper. "Working in the lab has been a great experience. Not only have I learned different lab protocols, I now have a clearer understanding of laboratory tools and construction of prototype devices," explains Padilla. "I obtained hands-on experience to prepare for future research and industrial work." She adds that she learned management skills as well. "Working with Dr. Lopez and his group allowed me to gain different leadership skills by his example of supervision of people. It was insightful to see how he worked with and managed people."

PREP Program

Lopez and Lane also work with students participating in the Post-baccalaureate Research and Education Program (PREP). The bridging program, funded by the National Institutes of Health, offers recent UNM graduates with bachelor's degrees in science, math, and engineering the opportunity to spend a year conducting research and honing their skills before entering graduate school. Students work full time in a research lab and take courses at UNM and short courses offered by PREP. At the end of the year, PREP students are better prepared for graduate school and research careers. "PREP has been particularly successful

Not only have I learned different lab protocols, I now and construction of prototype devices.

in allowing students that wouldn't have gone on to graduate school to consider grad school and research as options," says Lopez.

Participating in PROFOUND

April 13, 2006 was a bright spring morning and the Student Union Building ballroom was crowded with people admiring research poster displays designed by undergraduate students from across campus. Tri Trinh, a senior in nuclear engineering, stood confidently by his poster entitled "Seismic Vibration Effects on Criticality in a Radioactive Waste Facility." A group of professors walked up and began to question Trinh about his work.

The students, professors, and industry professionals were participating in the annual UNM Celebration of Undergraduate Research Symposium sponsored by the Program of Research Opportunities For Undergraduates (PROFOUND). The university-wide service connects students with research opportunities on campus throughout the year. During PROFOUND's spring symposium, students present their research for judging and some receive monetary awards for their work.

Trinh's research was a statistical analysis of the effects of an earthquake on the stability of radioactive waste containers in a storage facility. He ran hundreds of scenarios through a computer program to evaluate how the containers would move. Trinh conducted his research as an independent study course with Professor Anil Prinja, who encouraged Trinh to participate in the symposium to gain presentation experience.

Trinh knows his research inside and out but participating in PROFOUND offered new challenges. "I think it went well but they asked some tough questions," says Trinh. "Participating in PROFOUND was really worthwhile because it helped me develop presentation skills for the future." Trinh received a research stipend from the symposium. He'll have even more practice presenting and sharing his research soon, as he plans to submit his research at an upcoming American Nuclear Society conference.

Taking Flight

Design failures and triumphs, successful flights and crashes, financial and administrative challenges—the Lobo Unmanned Aerial Vehicle (UAV) Team experienced it all while preparing for the Association for Unmanned Vehicle International's (AUVSI) Aerial Robotic Competition. Starting last fall, a team of engineering students designed and built the Lobo UAV, a helicopter outfitted with electronics so that it can fly autonomously. The UNM team attended the competition in Ft. Benning, Georgia in late July along with teams from around the nation and other countries. At the competition, the UAVs had to fly through a three-kilometer course using only onboard sensors and electronics for control and navigation.

Some UNM UAV students worked on the project for course credit, others for independent study. A few students participated simply to gain additional experience applying what they've learned in class. That experience extended well beyond researching parts, building sensors, and making test flights. The students dealt with financial setbacks, red tape, and the challenges of teamwork. "This project has helped a lot of students get extra experience on the technical side of things," says team leader Michael Anderson, who graduated in May with a degree in electrical engineering. "For project coordinators like me, it gave us an idea of what to expect when we get into the workforce and start working in teams."

And that's exactly the type of experience that the SOE hopes to provide, says Malloy. "Real world situations involve people, uncertainty, and many more factors than simply plugging the right numbers into an equation."

INTERDISCIPLINARY

INVENTORS

Imagine the amazing results if scientists from diverse backgrounds—biology, chemistry, electrical engineering, and physics—crossed their scientific boundaries and collaborated on developing better cancer treatments, more efficient water purification processes, and new energy sources.

With the implementation of a new program and funding from a special grant, that interdisciplinary approach to problem solving is already underway at UNM—and scientific breakthroughs could be just around the corner.

UNM joins Rutgers University, University of Washington, and Northeastern in sharing a $12.8 million grant from the National Cancer Institute (NCI), which is part of the National Institutes of Health and the National Science Foundation. The grant will fund the Integrated Graduate Education and Research Traineeship (IGERT), a program that will help UNM expand its commitment to combining education and research by establishing an integrated training program for doctoral students researching how nanoscience and technology can be used to discover better ways to diagnose, treat, and ultimately, prevent cancer. The UNM IGERT is part of a nationwide program that provides interdisciplinary training for Ph.D. engineers and scientists who then use their technical and professional skills to solve the world's most pressing challenges.

UNM's IGERT, entitled "Nanoscience and Microsystems," gives doctoral students cross training in technology, science, engineering, and mathematics that they can then apply to cancer nanotechnology research. The four-year program leverages the university's cancer research treatment center as well as its strengths in materials synthesis, self-assembly, and nanolithography. "The reason UNM is so uniquely

New fellowship program trains uniquely qualified scientists

qualified for this IGERT is, among other things, its strong cancer research treatment center and our significant collaborations with the national labs in New Mexico," says Diana Huffaker, associate professor of Electrical and Computer Engineering at the Center for High Technology Materials and principal investigator on the IGERT. "The development of our new Nanoscience and Microsystems Ph.D. degree program and our extremely diverse student body and faculty are also important strengths."

The first group of eight IGERT fellows starts their training this fall. They will rotate through three different labs in their first year. Then the IGERT fellows select an advisor and focus on their specific research interest for the remaining three years of their program. Besides pursuing research, fellows take a series of five core courses in nanomaterials, microsystems, and nanotechnology. Participants can choose electives to complement their coursework, including courses from UNM's new Nanoscience and Microsystems Degree Program. The program is one of only a few of its kind in the country. A joint effort with the College of Arts and Sciences and the School of Engineering, the Nanoscience and Microsystems Degree program highlights UNM's nanotechnology research, including informational nanotechnology, nano-bio interfaces, and complex functional systems.

One of the IGERT's strengths is its truly interdisciplinary nature. More than 30 faculty members from the School of Engineering, the University of New Mexico's Center for High Technology Materials (CHTM), the College of Arts and Sciences, and the UNM Cancer Research and Treatment Center are collaborating to advise, teach, and train the IGERT fellows. "This IGERT is a platform for breaking down some of the barriers, cultural as well as technical, between the engineering and medical graduate degree programs," explains Huffaker.

Not only do IGERT fellows gain training and a diverse knowledge base, they also earn $30,000 a year, and the program pays for their tuition and fees and some research materials. When they graduate from the program, fellows can put their sought-after skills and experience to work at corporations with nanotech divisions or at the Center for Integrated Nanotechnology (CINT), a partnership between Sandia National Laboratories and Los Alamos National Laboratory.

By participating in the IGERT, the university, and the School of Engineering in particular, benefit from new graduate fellowships, innovative education and research programs, and cross campus collaborations. "Developing the new courses in response to the IGERT ensures that the ideas originating in cutting-edge research are immediately reflected in the graduate curriculum," says Kevin Malloy, associate dean of research. ✦

Diana Huffaker, associate professor of Electrical and Computer Engineering at the Center for High Technology Materials and principal investigator on the IGERT.

Improving Systems, Encouraging Dreams

Forum on Opportunities and Challenges for Women in Science and Engineering

Keynote speaker
Dr. Jane Zimmer-Daniels

- What major challenges have you confronted in your professional life?
- Has being a woman been an advantage or created opportunities?
- Has the situation in your profession changed for women?
- What changes are needed?
- What should secondary schools and colleges or universities be doing to increase the number of women in science and technology and to better prepare them?

These questions and more were asked of the prominent New Mexico women in academia, national security, and private industry who participated in "A Forum on Opportunities and Challenges for Women in Science and Engineering," sponsored by UNM's Feminist Research Institute and the Office for Policy, Security and Technology, held at UNM on March 29, 2006.

Guest speakers and moderators from UNM, New Mexico Tech, Eclipse Aviation, Intel, Air Force Research Laboratory, Los Alamos National Laboratory, and Sandia National Laboratories were on three panels that addressed issues for women in academia, national security, and private industry. There were common themes that emerged from the panels, said Dr. Anita Obermeier, director of the Feminist Research Institute. "These included the challenges of balancing family and children with a career, trying to assert oneself in a predominantly male world, and gender stereotypes."

Throughout the event, women were encouraged to pursue their dreams in science and engineering. At the same time, emphasis was placed on the need for systemic change. "Several women told of persevering through years of negative comments, isolation, and feeling invisible—and then rising to prominence and prestige in their careers," said Obermeier.

The keynote address was given by Dr. Jane Zimmer-Daniels, director of the Clare Boothe Luce Program for Women in the Sciences, Mathematics, and Engineering at the Henry Luce Foundation. She shared personal stories, discussed issues raised by women in science and engineering, and highlighted strategies and policies for recruitment and retention.

"Diversity in engineering, particularly gender diversity, is vital to achieving the best technological solutions that truly improve people's lives," said Joseph Cecchi, Dean of the School of Engineering. "This forum provided an important opportunity to explore ways to progress on this critical front."

Fifty to seventy-five people attended each of the events throughout the day. Approximately one-third were men. Cecchi encouraged male faculty, especially department chairs, to attend the forum to raise their sensitivity to the issues faced by women in engineering.

"It was a privilege to be in a room with that many high-powered women scientists and engineers from diverse backgrounds," commented Obermeier. "They were all testimony to their own outstanding intellect and perseverance. I was also incredibly heartened at the support Dean Cecchi gave this forum." ✦

Alumni Profile: Jim McNally

The Right Touch

Working hard to reduce one of the nation's most devastating and most preventable crimes: drunk driving.

Jim McNally (1986, Ph.D. Optical Sciences) is working hard to reduce one of the nation's most devastating and most preventable crimes: drunk driving. He's using technology to do it. McNally is CEO and president of Albuquerque-based TruTouch Technologies, Inc., which has used proprietary optical technology to create an accurate, non-invasive alcohol testing unit for use by police officers, medical professionals, and even employers. McNally's ultimate vision is to put the technology into ignition interlock systems.

"Every hour in the U.S. two people are murdered by a very preventable crime—drunken driving," says McNally. "It's been demonstrated and published in behavioral science literature that effective testing serves as a deterrent to substance abuse." With its ease-of-use and accuracy, TruTouch just might be that deterrent. An individual simply places his or her arm into the TruTouch cradle and the unit's near infrared reflectance spectroscopy penetrates tissue to measure alcohol molecules. No needles and no waiting. Testing with TruTouch takes just 60 seconds compared to current testing procedures, like breathalyzers, that can take 20 minutes or longer. McNally plans to launch TruTouch's first product in 2007.

TruTouch is the newest application of the optical technology that McNally helped develop at his previous company, InLight Solutions, which had its origins with the UNM School of Medicine and Sandia National Laboratories. The collaboration focused on the development of a non-invasive glucose monitor for diabetics. That success led company management to create start-up companies that would use the technology in different applications.

TruTouch is just the latest entry in McNally's distinguished resume that ranges from service in the military and work with the Department of Defense to creating small tech start-ups. Optics and imaging technology have been the common thread. McNally earned his Ph.D. in optical sciences from UNM. During his studies, he learned about the potential for public/private partnerships. "I was fortunate that a number of faculty involved in my program had ties to industry and the federal government," says McNally. "It was a combination that gave me very practical experience and understanding of research with an intended practical outcome." McNally says that since he returned to Albuquerque in 1990, he's seen a significant commitment by the university and the local business community to collaborate on commercializing technology developed at UNM.

Now McNally is involved with a variety of organizations fostering technology transfer. Among other roles, he is Chairman of the Board for the New Mexico Optics Industry Association and is a member of the UNM Business and Industry Advisory Cabinet. Through his leadership and entrepreneurship, it's clear that Jim McNally has the right touch. ✦

This diploma was awarded to the first civil engineering graduate in 1909 by the College of Arts and Sciences; the first School of Engineering diploma was awarded in 1912.

Looking back,

Ned Ross slowly withdrew the aged document from its protective plastic cover. It was water-stained, stiff, and cracked. Some layers of the paper were peeling back. "There it is," said Ned. "The first diploma awarded by UNM to an engineering student." The diploma was dated 1909 and the graduate was Ned's father, Edmund Ross, who majored in Civil Engineering. The alums and several of the School's emeriti faculty were participating in a "Last Tour of Wagner Hall" on June 9, just days before the building was scheduled to be demolished to make way for the new Centennial Engineering Center. Soon the dark hallways of Wagner Hall would be replaced with a gleaming new building and a bold new future for the School of Engineering.

Centennial Anniversary

Engineering instruction at the University of New Mexico began in 1906, with two faculty members and one engineering student society. Four-year programs were offered in Civil, Electrical, Mechanical, and Mining Engineering. Over the years, the curriculum changed to reflect the needs of the times. Today the UNM School of Engineering has over 100 full-time faculty, nine accredited undergraduate programs, graduate degrees in ten disciplines, and several student organizations promoting diversity.

The School's Centennial Anniversary parallels the remarkable achievements of engineering in the 20th century. At the top of the National Academy of Engineering's list of the twenty greatest engineering achievements of the 20th century is electrification. Engineers have transformed our lives with innovative, widespread uses of electricity to make our lives safer, healthier, and more convenient. They gave us mobility with cars and planes, and opened new worlds with cell phones, computers, and the Internet. Engineers also made dramatic changes to society's infrastructure and how we use energy.

Looking ahead

The Campaign Kick-Off

Accelerating Innovation

Increasingly over the past few years, the rapid growth in information technology is driving a transformation in engineering education. As a result, the School of Engineering is engaged in more cutting-edge research, collaborating with other disciplines, and integrating research with classroom education at all levels.

Construction began in August for the 140,000 square foot Centennial Engineering Center, which will house classrooms, laboratories, student services, innovative new programs, and meeting rooms for students, faculty, staff, and the community. The new building will open its doors for the Fall 2008 semester.

The new Center will be the springboard for the School's expansion in teaching and research. It will also increase the School's capacity for innovation, multidisciplinary research, developing patents, creating new businesses, and economic growth.

Students will learn in technology-equipped classrooms, study in a variety of spaces designed for both solitude and collaboration, and work in labs with state-of-the-art equipment. In addition, they will have better access to pre-major advisement, multicultural programs, and scholarship information at new centralized offices for Engineering Student Services. With space for new programs and systems-based research, the School is planning to increase its current $27 million annual research to $40 million in five years.

Going Forward

The new building is being funded by a variety of sources, including state appropriations, student fees, and private donors. This year the School initiated a Centennial Engineering Campaign to raise the remaining construction and equipment funds, as well as funds for student and faculty support, research, and programmatic needs.

The Centennial Engineering Campaign kick-off was held on April 5, under a huge tent on the patio of the Mechanical Engineering building, adjacent to Wagner Hall. UNM alumni, faculty, staff, and friends of the School gathered to hear keynote speaker Sid Gutierrez, formerly a Columbia Space Shuttle astronaut and currently manager of the Physical Sciences Department at Sandia National Laboratories. He emphasized the importance of innovation and referred to collaborations within the University, with other schools, industry, and government agencies. "Innovation is usually the intersection of many disciplines," Gutierrez said. "This facility will enable us to do that." For the grand finale, the crowd gathered at the far end of the patio and watched as a Komatsu trackhoe tore down a corner of Wagner Hall, amidst applause and cheers. The vision for the future is so strong that there didn't seem to be regrets about tearing down the past.

Since that first diploma was awarded to Edmund Ross back in 1909, the School of Engineering has awarded degrees to over ten thousand students. These graduates have made improvements to society's infrastructure and developed products that improve the way we live, work, and communicate. With this legacy and the vision of School of Engineering leaders, future UNM graduates will surely make even more significant contributions and innovations. ✦

The last Tour of Wagner Hall

Chemical and Nuclear Engineering

Professors David Whitten and Gabriel López organized a Biotechnology Workshop at the Defense Threat Reduction Agency (DTRA), in Ft. Belvoir, VA on June 14–15. The workshop was hosted with Penn State as part of the DTRA University Partnership. The purpose was to share information and identify cutting-edge technologies and research to identify and defeat future bio-threats faced by the war fighter.

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Civil Engineering

A dozen School of Engineering students were literally out on the road this summer working for the New Mexico Department of Transportation. The 14-week, 16,000-mile project was designed to help state engineers determine where repairs are needed and provide "real-world" education for students.

Civil Engineering faculty Mahmoud Reda Taha and Arup Maji, in collaboration with Electrical and Computer Engineering Professor Thomas Caudell, have prepared a set of eight one-hour interactive educational and training modules and a simulation tool for the Defense Threat Reduction Agency (DTRA). The course and the simulation tool will be used for Distance Learning and training of DTRA personnel to improve safety of military installations worldwide against explosives.

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Computer Science

CS alumnus Derek Smith's (Ph.D., 1997) article "Predictability and Preparedness in Influenza Control" was published in the April 2006 issue of the prestigious journal *Science*. The paper argues that mathematical models can help determine and quantify critical parameters in predicting the risks of influenza and planning its control. Smith received the NIH Director's Pioneer award in 2005, one of five given out annually. This 5-year $2.5 million award allows Smith to continue his research on influenza modeling, work he began while a Ph.D. student at UNM.

Chair: Stephanie Forrest
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Electrical and Computer Engineering

Professor Marios Pattichis will lead a $1.2 million project for the Air Force to develop reconfigurable parallel architectures for space applications. The system will use the Virtex-4, a new, field-programmable gate array (FPGA) from Xilinx, Inc. The research team will deliver architectures for applications ranging from digital signal and image processing to reconfigurable sensor array processing. The resulting architectures and techniques will allow the Air Force to build new space vehicle devices that they can not only reconfigure, but that they can reconfigure wirelessly during flight.

Chair: Chaouki Abdallah
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Mechanical Engineering

The popular and recently updated LEGO robotics course, taught by Professor Greg Starr, offers students the opportunity to investigate the basic principles of robotics and automation in an entertaining real-world environment. Teams of students design, construct, and evaluate computer-controlled mobile robots. The robots are "hands-off" and fully autonomous, using sensors to navigate their environment. At the end of the course, the students put their robots to the test in a friendly competition. The competitions have involved maze-following, firefighting, simulated rescue, balloon-breaking, and much more.

Chair: Juan C. Heinrich
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Computer Science

Stephanie Forrest has been appointed the new chair for Computer Science. She has taught in the department for the past 16 years.

Forrest plans to expand the department's outstanding research and teaching record in core computer science and build on its special strength in interdisciplinary science, reaching out to other disciplines and underrepresented groups.

While at UNM, Forrest has attracted over $9 million for research projects. Her research focuses on information processing in biological systems, importing strategies used in biology to build better electronic computers and furthering scientific understanding of natural processes by using information-processing principles to explain their behavior. This research agenda has led to projects in computer security, memory management algorithms, computer networking, operating systems, and many others.

Melanie Moses received her Ph.D. in Metabolic Scaling in Individuals and Societies from the Department of Biology at UNM in 2005 and will join the Computer Science Department in January. Her areas of interest include study of complex biological systems, the scaling properties of networks, and the general rules governing the acquisition of energy and information by social organisms.

Chemical and Nuclear Engineering

Elizabeth Dirk graduated from Rice University in 2004 with a Ph.D. in Bioengineering and has joined the Chemical and Nuclear Engineering Department. Dirk's research involves the development of rationally designed three-dimensional degradable polymeric scaffolds for the delivery of cells and/or signaling molecules for the regeneration of natural tissues including heart valves, bone, and cartilage. She graduated with a B.S. in Chemical Engineering from the University of California, Santa Barbara.

Electrical and Computer Engineering

ECE is proud to announce the arrival of four new assistant professors:

Yasamin Mostofi's interests include sensor and actuator networks, collaborative information processing in intelligent mobile networks, sensing and control over wireless networks, and signal processing. She received her Ph.D. from Stanford and was a postdoc at CalTech for the last two years.

Pradeep Sen's interests include computer graphics, real-time rendering, computational photography, and computer vision algorithms. He received his Ph.D. from Stanford in June.

Payman Zarkesh-Ha's interests include statistical modeling of VLSI systems, design for manufacturability, and low-power, high-performance VLSI design. He received his Ph.D. from Georgia Tech and most recently worked at LSI Logic.

Sudharman Jayaweera's interests include wireless communications, signal processing, information theory, wireless sensor networks, image processing, and quantum information processing. He received his Ph.D. from Princeton and was a professor at Wichita State.

Mechanical Engineering

Professor Zayd Leseman has joined the department's nanomechanics program. Leseman is a recent graduate of the University of Illinois Urbana-Champaign. His research focuses on the development of Micro-Electro-Mechanical Systems (MEMS) for studying the properties of nanofilms, adhesion between micro/nanodevices, and laser material interaction. At UNM, he will also begin research in BioMEMS by measuring cell-cell adhesion and the mechano-transduction in cells.

The University of New Mexico

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