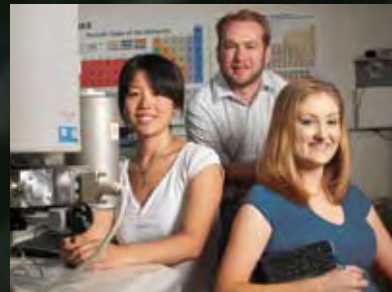
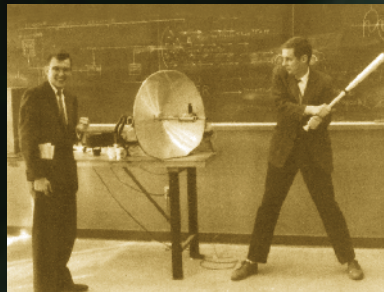


# UNM engineering

A Century of Excellence





George Santayana famously advised, “Those who cannot remember the past are condemned to repeat it.”

## From the Dean

Certainly part of Santayana’s point is to avoid repeating our mistakes. But a more forward-looking interpretation is that we should use “where we have been” and “who we have become” as a springboard to address new challenges. Nowhere is this more of an imperative than in engineering education. So, as we celebrate the Centennial of the UNM School of Engineering, we honor our past and draw on it to guide our future.

The focus on applying knowledge and solving problems in engineering education was developed in 1906, when the School of Engineering was founded. The UNM catalog that year states, “Owing to the rapid development in engineering methods and practices, it is necessary that the young engineer should be trained to solve new problems and learn the general principles of applied science, rather than collect a large store of data, no matter how valuable it may be at present.” While we continue to emphasize practice, we have developed—particularly over the past 25 years—an increasingly strong academic research component. We pride ourselves on how we integrate classroom learning and hands-on experience with cutting edge research to provide high-quality engineering education.

The School began with a few “classical” engineering departments, each focused on important problems of that time. Over the years, we have added a number of additional departments and programs. Increasingly, solutions to important problems span multiple engineering departments, as well as disciplines outside of engineering. In response to this, we work with other UNM colleges and schools. Our collaborations with other universities, industry, and national laboratories accelerate yearly, in many cases leading to discoveries that result in the commercialization of School of Engineering technology.

Throughout the past century, the most significant changes in the School of Engineering have been—and will continue to be—due to technological advances. Technology is a major driver in shaping the School; our curricula, projects, and research must reflect the continual advancement in our fields. New tools, especially in information technology, enable us to be more effective educators. A plethora of ever-more powerful computing platforms and high-speed networks has facilitated ready access to information. Incredible advances in instrumentation and synthesis in our laboratories have made our students and faculty increasingly more productive and innovative.

With this issue, we pay tribute to key individuals in our history, reflect on the important developments and events that have shaped the School, review programs that have encouraged and supported students from underrepresented groups to pursue careers in engineering, and look to a future of discovery and innovation.

Joseph L. Cecchi  
Dean of Engineering



## Points of Pride

- Professor of Chemical and Nuclear Engineering **C. Jeffrey Brinker** is among the top 1% of researchers publishing in materials science, according to ISI Essential Science Indicators. The November 2006 issue of In-Cites ranks "Continuous Formation of Supported Cubic and Hexagonal Mesoporous Films by Sol Gel Dip-Coating," which Brinker co-authored, in the top 20 papers with the highest total citations in the field of materials science.
- Civil Engineering Associate Professor **Julie Coonrod** is leading an effort to research issues associated with the Rio Grande as part of the Urban Flood Demonstration Program, a collaborative effort between the Corps of Engineers, the Desert Research Institute, Sandia National Laboratories, and UNM. For fiscal year 2006, UNM received \$358,000 for five projects related to issues that intersect ecosystem restoration and flood control. Coonrod's UNM collaborators include faculty from the CE, Earth and Planetary Science, and Biology departments.
- **Barney Maccabe**, professor of computer science and director of the High Performance Computing Center, has been appointed interim Chief Information Officer of UNM and will hold the position for one year. He heads the ITS organization of 220 IT staff and 60 student employees and is working to define and prioritize new projects and lead campus-wide IT initiatives.
- UNM has promoted ECE Professor **Steven Brueck**, director of the Center for High Technology Materials, to Distinguished Professor of Electrical and Computer Engineering. Brueck is the first distinguished professor in the School of Engineering and one of just 23 UNM faculty members with this title. The title of distinguished professor is the highest faculty title that UNM bestows.
- **Herbert Tanner**, assistant professor of mechanical engineering, was awarded the NSF Faculty Early Career Development (CAREER) Award in the field of robotics. The CAREER is NSF's most prestigious awards program for junior faculty members. Tanner's research aims at developing heterogeneous robots that could automatically plan their cooperative actions towards a common objective. He was awarded \$400,000 for a five year period.

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**Editing**  
Tamara Williams

**Writing**  
Megan Fleming Writing & Creative Services; Tamara Williams, UNM

**Design**  
Cisneros Design

**Photography**  
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School of Engineering, Farris Engineering Center, Room 107, MSC01-1140  
1 University of New Mexico, Albuquerque, NM 87131-0001  
505-277-5521

[www.soe.unm.edu](http://www.soe.unm.edu)



Downtown Albuquerque in the early 1900s was a bustling urban area, with banks, law offices, shops, hotels, and saloons. Streetcars extended to the university, connecting the outlying residential areas to the state's only institution of higher education.



The University of New Mexico Board of Regents, 1889. UNM was established 23 years before New Mexico was a state.



## FROM SLIDE RULES TO SUPERCOMPUTERS

Celebrating 100 years of education, research, and innovation

The University of New Mexico School of Engineering, originally known as the College of Engineering, opened in 1906 with a faculty of two and a single classroom. With time, advances in technology, social change, and the dedication and foresight of many talented people, the School has become a leader in engineering education and research.

Engineering at UNM has gone from slide rules to super computers and from lectures to sophisticated learning technologies. Highly interdisciplinary research is integrated with the classroom. Collaborations within UNM and with other universities, the national laboratories, and industry hold promise for innovative solutions to critical societal challenges.

Technology and social forces have shaped the School of Engineering, causing enrollment fluctuations and spurring the development of new programs. In recent decades, an emphasis on diversity and improving access to higher education for underrepresented groups has transformed a largely male Caucasian enrollment into a very diverse student body.



Hodgin Hall, the University's first building, was constructed in 1892 for the first class of 74 students. It was originally built in the Richardson Romanesque style and later rebuilt into a modified Pueblo style.

The 1907 Society of Engineers. The first Society of Engineers banquet received its own page in the 1908 student yearbook, *The Mirage*. "The entire membership was present...At midnight, the four hours of merriment came reluctantly to a halt and the crowd departed with a resounding yell: "Three Cheers, Three Beers, Varsity, Varsity Engineers!"

### The early years: SOCIAL SCHOLARS

Engineering instruction at UNM began in 1904, when two courses in electrical engineering were offered in the College of Letters and Science. In 1905, a one-year course in "dynamo-electrical machinery" was offered.

Increasing demand for engineering instruction led to the official opening of the College of Engineering (COE) in 1906, with courses leading to four-year degrees in civil, electrical, mechanical, and

mining engineering. Tuition was free for New Mexico residents; nonresidents paid \$10 a semester and \$20 per month for room and board. Until 1907, UNM students traveled up to the rocky hill to campus in "Jumbo," a wagon drawn by four horses.

UNM's first student engineering society was organized in 1906. The group's initial meeting included oral presentations on "The Automatic Switchboard" and "Progress in Invention." The intellectual development of members was balanced

with many social events and lavish banquets.

Early engineering students had a penchant for mischief. John D. Clark, Professor Emeritus, commented, "In the pre-statehood days, the students liked to play pranks on Halloween, such as putting a buggy on top of the Main Building of the University, or a horse in some class room..." Engineering students were also known to paint UNM President Tight's bay horse with stripes so it looked like a zebra.

- 1889 The Territorial Legislative Assembly of New Mexico establishes UNM.
- 1904 The College of Letters and Science offers electrical engineering classes.
- 1906 The College of Engineering (now the School of Engineering) opens with two faculty, nine students and courses leading to four-year degrees in civil, electrical, mechanical, and mining engineering.
- 1909 Edmund Ross obtains the first engineering degree from UNM, a BA in Civil Engineering.
- 1910 The engineering building, known as Hadley Hall, is completely destroyed by fire.
- 1911 A four-year program in chemical engineering is offered.
- 1912 Charles R. Lembke receives the School of Engineering's first BS degree.



Kissing the "Blarney Stone" and other St. Patrick's Day exploits were documented in a special edition of UNM's student newspaper, which was printed on green paper.



Engineers took charge of the annual whitewashing of "U Mountain," clearly visible from campus and an important landmark for decades.



On "Engineers Day," students in the School of Engineering challenged those from Arts and Sciences in an annual tug-of-war. The colleges competed in highly publicized basketball games, road races and swim meets throughout the 1920s and 1930s.



## The 1920s: GROWING ACADEMIC AND STUDENT PROGRAMS

By 1920, the School of Engineering had seven faculty members and an enrollment of 50 students. The original engineering building, Hadley Hall, was destroyed by fire in 1910 and then replaced in 1920 with Hadley Hall II, which housed civil engineering, mathematics, shops, and drafting rooms.

Even though the original UNM Society of Engineers had been disbanded by the late 1910s, demand remained strong for an engineering society. The American Association of Engineers, the leading engineering organization in the United States at the time, officially granted a branch chapter of the organization at UNM in 1920. The chapter, commonly known as the Engineers' Society, had a membership of 38 students and two faculty advisors. The

Society sponsored lectures, study sessions, a popular open house, and many highly-publicized social events.

In keeping with tradition, the Engineers' Society balanced its scholarly side with plenty of social pursuits. Engineers took charge of the annual white washing of "U Mountain," a large "U" made of white stones that decorated the Sandia Mountain foothills. The "U", which was clearly visible from campus, was an important landmark for decades. On at least one occasion, the engineers had extra maintenance work to do on the "U" because New Mexico Tech students had rearranged the stones to form an "M" (for Miners) on the eve of a football game between the rivals.

At the turn of the 20th century, engineering colleges across the country dubbed St. Patrick as

their patron saint. At UNM, St. Patrick's Day events included spirited competitions with the College of Arts and Sciences, placing homemade statues of St. Patrick around campus, having parades, and hosting elaborate dinners and dances.

Today's emphasis on combining technical and practical experience has its roots in 1929. That year, the School started a series of short trips for freshmen and sophomore classes. The freshmen visited organizations in and around Albuquerque, including the Santa Fe Railroad shops and The Albuquerque Gas and Electric plant. Sophomores took trips to the Madrid coal mines and to the American Metals Company mill in Pecos. Juniors and seniors took longer engineering trips.

- 1920 New Hadley Hall for Engineering (Hadley Hall II) is completed.
- 1930 Enrollment grows to 160 students; there are six faculty.
- 1938 The SOE is elected an institutional member of the Society for the Promotion of Engineering Education (now ASEE).
- 1941 Engineering courses become part of the War Training Program.
- 1942 1192 students are enrolled in War Training Courses in addition to engineering students.
- 1943 The Navy College Program is established.
- 1947 Influx of WWII veterans, attending college under the GI Bill of Rights.



During the WWII Wartime Training Programs, the School of Engineering conducted special classes at night. The pilot-training program taught 886 adults and students.

In 1941, the Navy established ROTC at UNM. Senior Navy students studied airplane construction in Aerodynamics class, using a Douglas Dive Bomber assigned to the Engineering School for this purpose.



The Engineers' Ball was a grandiose event, consisting of a reception, dinner, and dance, culminating with the naming of an Engineering Queen.

### The 1930s and 40s: WORLD CONFLICT SHAPES THE SOE

The Depression and World War II transformed the way the country lived and worked and spurred important new collaborations and programs at the college.

The SOE secured one of its first government collaborations when the State Highway Department moved their testing laboratory to Hadley Hall in 1938. The move benefited both the Department of Civil Engineering and the State. The following year, the University contracted with the Civil Aeronautics Authority (CAA) to offer ground school courses and flight training to university students. During the program's four years, approximately 600 students from around the country took the SOE flight training course.

The 1930s also saw research programs develop in the

electrical and civil engineering departments. Electrical engineering students studied power losses in transmission lines; civil engineering students began a study of the properties of New Mexico lumber.

In 1941, the Navy Department established a Reserve Officers' Training Corps (ROTC) at UNM. The SOE's curriculum changed to allow engineering students to elect the ROTC course and in just two years, over half of the students in the School were members of the reserve corps in the US Army or Navy. In July 1943, the SOE participated in the Navy College Program, which allowed members of the U.S. Navy to receive training in civil, mechanical, and electrical engineering.

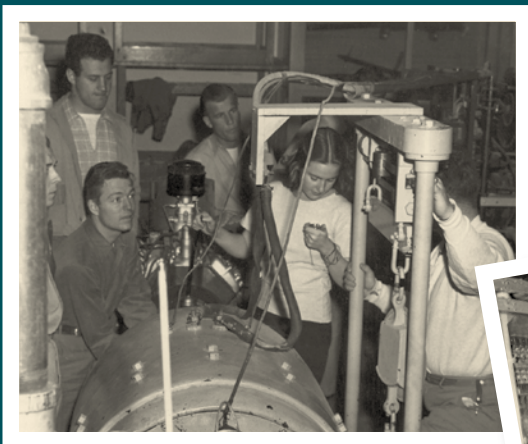
Demand for engineers from both the war industries and the armed forces far exceeded the supply,

so short courses were instituted. In addition to contributing to the war effort in World War II, these wartime training programs helped increase the national reputation of the School.

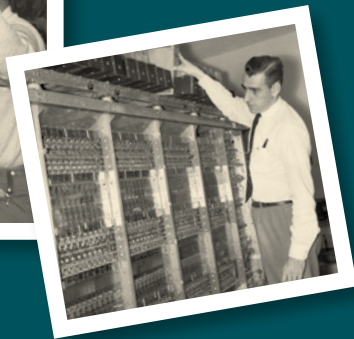
#### Deans of Engineering at UNM

1910-1913	Martin F. Angell
1914-1919	Charles E. Hodgkin
1920-1921	J.M. Cochran
1921-1925	Thomas Taylor Eyre
1926-1929	Philip S. Donnell
1930-1931	R.S. Rockwood
1931-1960	Marshall E. Farris
1960-1968	Richard H. Clough
1969-1974	Richard C. Dove
1974-1980	William A. Gross
1980-1986	Gerald W. May
1986-1987	Richard H. Williams
1987-1994	James E. Thompson
1994-1995	Nasir Ahmed
1995-2000	Paul A. Fleury
2000-	Joseph L. Cecchi

1951	The onset of the Korean War depletes student ranks; enrollment dips to 715 students.
1953	Civil, electrical, and mechanical engineering departments develop graduate programs.
1958	347 students are enrolled in graduate programs; funded research climbs to \$300,000.
1960	The nuclear engineering program begins.
1965	Due to a better job market for engineers, undergraduate enrollment is now 1049; graduate enrollment is 348; 228 degrees are awarded.
1968	Farris Engineering Center is completed.

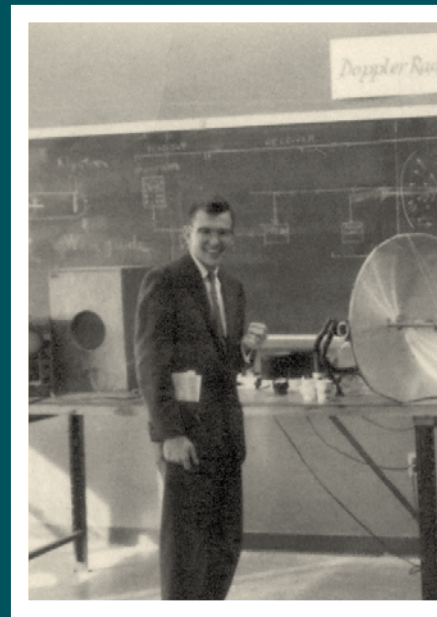


MANIAC I was an early computer built at the Los Alamos Scientific Laboratory in the early 1950s, then moved to UNM. Here Research Assistant Dale Sparks removes a memory unit.



The annual engineering open house, popular since the 1920s, was organized by students and attracted people from all over New Mexico. Events included laboratory tours, student projects, demonstrations, and contests.

Making engineering fun—a student helps a professor demonstrate how Doppler radar works.



### Post WWII and Vietnam: THE IMPACT OF THE GI BILL

The GI Bill, which paid for college tuition for all those who served in the armed forces, swelled enrollment and by 1947, staff and space were at a premium. Classes and laboratories ran from 8 a.m. - 10 p.m. daily to accommodate the large number of students.

Several military bases and research organizations were built in New Mexico in the late 1940s, attracting highly educated people to the area and spurring demand for better educational programs at all levels. Because of UNM's proximity to the labs, by the 1950s the SOE was increasingly committed to large graduate programs, especially in electrical and mechanical engineering. In 1959, the Technical Development Program (TDP) began, permitting employees of the Sandia Corporation to pursue graduate

studies at UNM on a part-time basis. During its ten years, the program helped 349 students earn their graduate degrees, including many Sandia engineers.

### The 1960s and 70s: SCIENTIFIC AND SOCIAL ADVANCEMENTS

The 1960s not only saw a dramatic increase in graduate programs, but also a surge in research and better educational methods. The explosion of the use of computers and the coming of the Space Age created extraordinary new demand for all levels of engineering education and for engineers in industry, government, and defense. According to the 1962-63 SOE Annual Report, "The engineering graduate program is now rivaling the undergraduate program in size and the quality of engineering students is becoming progressively better." The 1963-64 Annual Report notes, "Never before has there

been so much change, so much experimentation, and so much searching for better educational methods...This is brought on by the post-World War II explosion of scientific and technology breakthroughs."

By 1965, there were 1049 undergraduates and 348 graduate students. However, many of them experienced academic difficulties, and administrators speculated that the Vietnam War and the draft were contributing factors. In 1970, anti-war protestors disrupted normal operations at UNM following the U.S. move into Cambodia. Off and on over the next two years, events in Southeast Asia touched off sizeable campus demonstrations.

Meanwhile, research and technology continued to advance at the SOE. By the

- 1970 Three university buildings are named in honor of emeritus engineering faculty: Ford Utility Center, Wagner Hall and Farris Engineering Center.
- 1974 There are 1070 undergrads and 290 graduate students; 224 receive degrees.
- 1975 The Native American Program, School of Engineering (NAPCOE) is established.
- 1975 Research contract spending is \$826,000, compared to \$407,000 a year earlier.
- 1976 Computer science becomes a department in the School of Engineering.
- 1979 State legislature provides \$2,000,000 for UNM engineering and science equipment.





Here students view a Kleinschmidt evaporator, which uses the energy of surface waves in an ocean to manufacture fresh water in a submarine.



In the 1960s, undergraduate recruitment and enrollment accelerated. The 1962 SOE Annual Report states, "Several recruiters who visited our campus during the year stated that our freshman increase topped anything that they had encountered elsewhere, although some Rocky Mountain universities did experience engineering freshman increases."

late 60s, SOE students were experimenting with computers and taking computer courses offered by the Department of Electrical Engineering.

In 1968, the opening of the new \$2.6 million Farris Engineering Center provided much-needed space for faculty, research laboratories, and graduate student offices.

Diversity programs that fostered access to an engineering education for underrepresented groups, including American Indians, Hispanics, African Americans, and women, had their start in 1975. The Native American Program, College of Engineering (NAPCOE) was established that year with a \$330,700 grant from the Sloan Foundation to increase the number of American Indian students earning degrees in engineering. It was the only

program of its kind in the nation and response to the program was unprecedented. The Hispanic Engineering Program and Society for Women Engineers were started in the following years.

### **The 1980s and 90s: A FOCUS ON RESEARCH AND COLLABORATION**

By the 1980s, rapid advancements in technology and increasing globalization created a demand for engineers that far outstripped supply. Like many schools in the nation, the SOE worked to meet demand by adding faculty, new courses, and new programs.

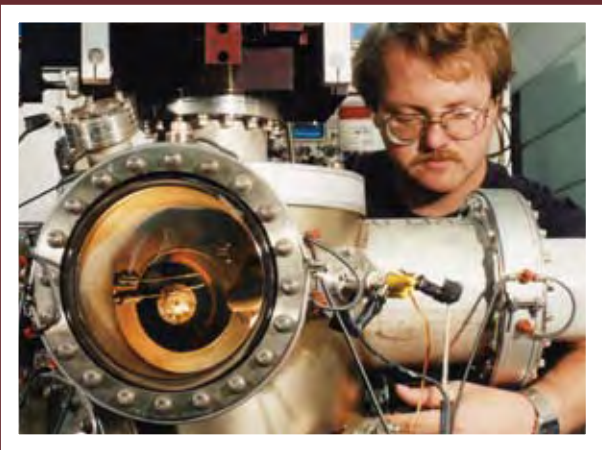
In the early 1980s, New Mexico began using oil and gas revenue to transform state universities from purely teaching institutions into research universities. When the Carnegie Foundation for the Advancement of Teaching

designated UNM a Category I Research Institution, the emphasis on research not only expanded opportunities for students and faculty, but also heightened the SOE's profile nationally and internationally.

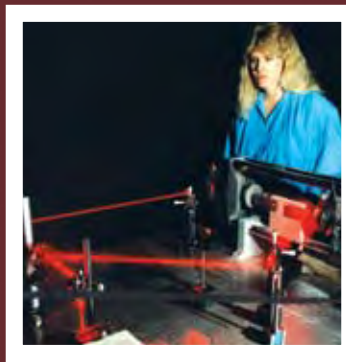
Gerald May, past UNM president and professor of civil engineering, reflected on his term as SOE Dean from 1980-1986 and the importance of technology. "It was a time of great growth in engineering. During that decade I think that society realized—maybe for the first time—how important technological innovation was to the economy," said May. "Much of the growth came from new technology. And much of the basis for that new technology came from the universities."

New research also fostered new collaborations. Partnerships with the national labs,

- 
- 1980 The ME Department moves into a new five million dollar building.
  - 1983 1076 undergrads, 548 graduate students, 396 degrees awarded, 82 faculty.
  - 1983 The State of New Mexico creates the Center for High Technology Materials (CHTM) as a Center for Technical Excellence.
  - 1984 With new lab equipment funded by 1979 legislation, the SOE is one of the best-equipped engineering colleges in the nation.
  - 1984 The Institute for Space and Nuclear Power Studies (ISNPS) is founded.
  - 1985 Degree programs in construction engineering and in construction management are initiated.
  - 1986 Construction is completed on the new ECE building.
  - 1988 Sematech Corp. selects UNM as one of the six University Centers of Excellence to receive a grant to conduct basic and applied research in the general area of semiconductor processing and metrology.
  - 1989 The Minority Engineering Program is organized.



A graduate student works with a high-vacuum chamber in one of several of the School's interdisciplinary research centers founded during the 1980s and 1990s.



More and more women were attracted to engineering in the 1980s. In 1989, the Minority Engineering Program was founded to encourage women and students from underrepresented groups to pursue an engineering education. Now 20% of SOE undergraduates are female, on par with the national average.



other universities, and private industry created unique research programs, budding interdisciplinary alliances, and new organizations. Specialized research centers, including the Center for High Performance Computing, the Center for High Technology Materials, the Manufacturing Training and Technology Center, and the Institute for Space and Nuclear Power Studies, were created and quickly gained national and international attention.

In the 1980s and 90s, the SOE also invested heavily in infrastructure to keep up with enrollment—which had climbed to over 1000 undergraduates in 1986—and provide world-class research facilities and modern teaching laboratory space. The School added six new buildings at the Research Park south of the

main campus, a new Electrical and Computer Engineering building, and a new Mechanical Engineering building.

Along with dramatic physical changes came a name change in 1995. In an effort to align the status of the school and the degree with other professional programs, such as law or medicine, the College of Engineering officially became the School of Engineering in 1995.

The SOE continued to receive national recognition for its ongoing efforts to foster enrollment of minority groups through outreach, support, and scholarship programs. By the early 90s, there were more than 300 women and close to 500 Asian, African American, Hispanic, or Native American students.

In 1996, two important changes helped boost SOE enrollment:

the New Mexico Lottery Scholarship, which provides a tuition scholarship to graduating New Mexico high school seniors, and the SOE Pre-Major Program, which admits qualified high school students directly into the school. By 1999, the Pre-major Program had increased the rate of matriculation to SOE academic departments by 70 percent relative to the baseline year of 1995.

### A New Millennium

Programs started more than 30 years ago to help minority students excel at the SOE had literally changed the face of engineering at the school and by 2006, 40 percent of the SOE student body was from a minority population.

To help the school achieve its fullest potential, the SOE invited 24 nationally recognized leaders from industry, government, and

- 
- 1993 Undergraduate enrollment is 1318; graduate enrollment is 614 and there are now 105 faculty; 330 degrees are granted; over \$34 million in funded research.
  - 1993 The Alliance for Transportation Research Institute (ATRI) is founded.
  - 1993 Phillips Laboratory awards UNM \$32.5 M to run the supercomputer center that will put UNM in league with the largest computer centers in the nation.
  - 1993 UNM is named a minority-serving institution.
  - 1994 UNM Center for High Performance Computing (HPC@UNM) is founded.
  - 1995 The College of Engineering becomes the School of Engineering.
  - 1995 The UNM Center for Micro-Engineered Materials (CMEM) is founded.



From developing alternative energy sources to advances in medicine and the next generation of microprocessors, UNM engineers and computer scientists have developed a broad spectrum of innovative solutions that improve our quality of life.



A web cam on the School of Engineering web site ([www.soe.unm.edu](http://www.soe.unm.edu)) gives visitors the opportunity to see progress on the construction of the Centennial Engineering Center.

academia to offer their guidance. That group, known as the Board of Visitors, first convened in 1999 and has been instrumental in planning the SOE's next decades of growth and success. At the same time, a tradition of recognizing the past began with the first Distinguished Engineering Alumni Banquet in 1999, now a popular annual event.

In the first years of the 21st century, the SOE has continued to push boundaries and expand opportunities for students and faculty. Students participate in NASA and National Science Foundation programs and engage in regional, national, and international engineering competitions. Faculty members receive many prestigious grants and conduct leading edge research in a broad spectrum of fields. This extensive research provides the basis for most of

the graduate degrees awarded, as well as enabling independent research projects for most undergraduates. Ground-breaking for the new Centennial Engineering Center in 2006 signaled an important expansion in teaching and research for the School.

The SOE embarks on economic development initiatives and technology transfer processes through STC.UNM, a separate non-profit corporation, wholly owned by the University of New Mexico, to move research and inventions generated at the School into the private and public sectors. School of Engineering researchers have developed innovations that improve people's lives and have commercial potential, says STC CEO and President Lisa Kuuttila. "UNM engineers are creating inventions that range

from developing innovative medical diagnostics to advances in silicon chip technology."

Reflecting on the School's first century and its future, Dean Joseph Cecchi comments, "We continue to build on the strong foundation of quality engineering education and interdisciplinary research created during the School of Engineering's first 100 years. With new programs and collaborations on the horizon, our new building, and our ongoing commitment to academic excellence and innovation, we're laying the groundwork for another successful century." ♦

- 
- 1996 New Mexico Lottery Scholarship begins; the SOE pre-major program increases enrollment.
  - 1997 Partnerships are begun or expanded with Intel, Lockheed Martin, HP, Anderson Consulting, Ford, GM and the federal labs.
  - 1998 The NASA PURSUE project begins its five-year, \$2.5 million initiative to encourage undergraduate student research.
  - 1998 The UNM Manufacturing Training and Technology Center is founded.
  - 2000 1518 undergraduate students, 519 graduate students, 291 degrees granted, \$41 million in funded research.
  - 2006 The Center for Biomedical Engineering (CBME) is founded.
  - 2006 Construction begins on the \$42 million Centennial Engineering Center.
  - 2007 SOE innovation has led to 148 patents and 13 start-up companies.

## School of Engineering Departments

# Through the Years

### Electrical and Computer Engineering Department

With courses first offered in 1904, electrical engineering is the engineering program with the longest history at UNM. By 1917, the department had its own research laboratory where faculty and students conducted experiments. By the late 1960s, computer courses had become an integral part of the department. Later a focus on microelectronics developed, which led to creation of UNM's Center for High Technology Materials, now a key interdisciplinary research organization for many engineering and science departments at UNM. Today, ECE students working on advanced degrees collaborate with other

engineers, scientists, medical researchers, and artists to develop advanced technologies ranging from digital media and nanoscale lasers to electromagnetics and virtual reality.

#### Student Project Goes from Concept to Reality

Balancing technical and practical experience is a hallmark of the department's education, as exemplified by Joe V. Quintana, EE 1956. Quintana remembers his senior project for Dr. Moore's class, where students were to design electronics for the International Geophysical Year satellite that would be launched in 1957. Teams of students were assigned specific technical areas, including telemetry, sensors,



Members of the 1956 senior project who designed electronics for the International Geophysical Year satellite: Joe Quintana, Ken Drake, Dr. Moore, Milan Stewart, and Vic Miano.

Officials used a laser during the ribbon-cutting ceremony for the new ECE building in 1986. There are more than 30 well-equipped research and teaching labs, including advanced graphics, robotics, plasma and fusion science, and visualization.



#### ECE timeline

**1904**

Electrical engineering courses are offered through the College of Letters and Science.

**1906**

The College of Engineering offers electrical engineering courses.

**1909**

Electrical engineering becomes a four-year undergraduate degree-granting program; the first four-year degree is granted to Clarence E. Rogers.

**1910**

Hadley Hall, which housed the EE program, is destroyed by fire May 23.

**1937**

EE program is accredited.

**1944**

Mrs. Pid Urquhart receives a BS degree in electrical engineering. She is the department's first female graduate.

power, and orientation. "Armed with slide rules and knowledge gained from our UNM academic experience, brainstorming and design work was launched for the unprecedented systems," remembers Quintana. Moore was so pleased with the results that he arranged for the teams to present their work to engineering faculty and students.

Years later, Quintana was involved in testing the missile-borne telemetry systems on the ATLAS weapon system. "It was really amazing to see that our senior project design was very comparable in approach to what was actually being done on the ATLAS," says Quintana.

### Making Waves in Pulsed Power Research

In the spring of 2004, ECE Professor Edl Schamiloglu and an interdisciplinary team of scientists gained worldwide recognition for their study of pulsed power technology, particularly in the generation of high-power microwaves. The versatile pulsed-power devices can be used in defense, materials science, and medical applications, even for oil exploration. The UNM team is one of the most respected university pulsed-power research programs worldwide.

Chair: Chaouki Abdallah  
505-277-2436 ■ info@ece.unm.edu



The Centennial Science and Engineering Library is located in part of the two-story underground portion of the ECE building.



ECE Professor Vince Calhoun and graduate student Rogers Silva discuss MRI data showing the volume of gray matter and amount of brain activity in response to a task, both for schizophrenia patients and for a control group. Calhoun's research team is comparing data from functional MRI, which measures brain activity, and structural MRI, which measures gray matter, to determine whether there is a relationship between functional activity and gray matter volume in schizophrenia.

**1954**

The department moves into the newly constructed Tapy Hall.

**1956**

Electrical engineering begins offering a Doctor of Science degree-granting program.

**1979**

The department changes its name to the Department of Electrical and Computer Engineering to reflect the new emphasis on computer engineering.

**1986**

The department moves into the new ECE building.

**2007**

ECE's rankings in *U.S. News & World Report* continue to climb. This year, the computer engineering graduate program is ranked #31 among public universities nationwide, and electrical engineering is #35.

## Civil Engineering Department

For thousands of years, civil engineers have shaped the way we live by designing the roads, bridges, and buildings that make our world work. As the oldest of the main engineering professions, it was only natural that courses leading to a civil engineering degree were some of the first offered when the School opened its doors in 1906.

From the very beginning, focusing on fundamentals and hands-on learning have been hallmarks of UNM's civil engineering education. In recent decades, Albuquerque's rapid growth and proximity to the national labs have given civil engineering students unparalleled opportunities for practical training and excellent jobs.

The department trains skilled professionals in three degree programs: civil engineering, construction engineering, and construction management. Bachelors, masters, and doctoral degrees are offered. Annual sponsored research expenditures exceed \$2 million.

### Putting Theory into Practice

In the summer of 1990, an inch of rain fell on the UNM campus over the course of two hours. Wagner Hall, home to civil engineering, began to flood. Two feet of water filled the courtyard, then seeped under the glass

doors and into the building. The doors acted as a dam keeping most of the water out, but also stopped the courtyard from draining.

Civil Engineering Professors Bruce Thomson and Koon Meng Chua and a graduate student were in the building and realized they needed to do something or the glass doors would collapse and the flooding would get much worse.

Thomson writes: "We had to do something immediately, but without access to large capacity pumps, we had few options. We eventually went back to our open channel hydraulics laboratory, and recognized that the main east-west hallway through Wagner Hall was both short and straight. We went around to the Engineering Annex, stole some of their sand bags and used them to dam the north-south hallway inside Wagner, then opened the glass double doors. The effect was spectacular, at least from the perspective of a civil engineer. A wave of water gushed straight through the hallway and out of the building onto Redondo Drive. The sandbags did their job and very little water entered the rest of the building. It was a classic hydraulics experiment; water entered the building in supercritical flow, then formed a hydraulic jump as it



In 1967, CE students and their mascot Baron Ludwig von Beethoven picket the Kappa Kappa Gamma sorority as it moves out of the house across the street from the civil engineering building. The Kappa's departure ends "the best girl watching on the campus," an engineering privilege for over 30 years.



The National Student Steel Bridge Competition, sponsored by ASCE and AISC, offers future structural engineers the opportunity to work as a team to design and fabricate steel in both a regional and a national competition.



The CE department has a ten-acre lab along the Rio Grande river in Albuquerque. Civil engineering students and faculty work to shape strategies that will restore and protect the river and surrounding area for generations to come.

### CE timeline

1906	1909	1929	1938	1949	1973	1985	1988	1989
The College of Engineering opens and offers courses leading to a CE degree program.	The State Highway Department moves their well-equipped testing lab to the new wing of Hadley Hall.	A research program to study the properties of New Mexico lumber begins.	Edmund Ross obtains the first engineering degree from UNM—a BA in civil engineering.	The department acquires pumps and turbines for the hydraulics labs—for free.	A long-term traffic accident study begins.	Funding increases five-fold in three years, the number of graduate students doubles, and three new labs keep the department ahead in technology.	The construction engineering and construction management degree programs begin.	The curriculum in construction engineering is accredited.

slowed to subcritical flow. It took about 30 minutes for the courtyard to drain below the level of the doorsills. All told, it was a great adventure and an unforgettable experience, never to be repeated.”

Chair: Arup Maji  
505-277-2722 ■ civil@unm.edu

## Mechanical Engineering Department

Mechanical engineering, one of the oldest engineering disciplines, has been a part of the School of Engineering’s curriculum from the outset. The department grew steadily to match enrollment and the world’s demand for less expensive and more effective systems and machines.

In 1980, the department moved into a new building with a state-of-the-art energy conservation system. As energy costs decreased toward the end of the decade, the thermal solar system was abandoned. Now, as energy costs soar, the 25-year-old solar system is being revitalized and the existing infrastructure is being restored and enhanced. It is estimated that the cost of heating and cooling the building will drop by 20 percent or more and that carbon dioxide emissions will be reduced by about 100 tons each year. The sustainable

energy systems are also providing a resource for teaching renewable energy, efficiency, and conservation concepts.

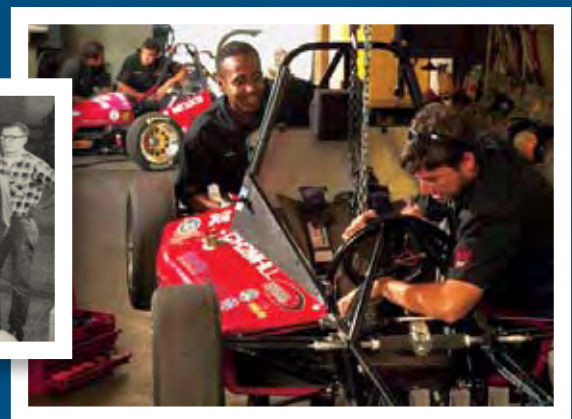
### Robotic Ribbon Cutting

Mechanical engineers planned a clever stunt for the new mechanical engineering building’s ribbon cutting in 1981. Department Chair Bill Baker suggested that a robot do the honors. But not just any robot; a robot specially programmed to have a sense of humor and flair for drama. Governor Bruce King, Senator Harrison Schmitt, Senator Pete Domenici, Congressman Manny Lujan, along with UNM administrators, faculty, students, and over three hundred guests, were on hand for the event. A dignitary pushed a red button to start the robot and, as the crowd looked on, the robot approached the ribbon and missed. It backed off, moved towards the ribbon again—and missed. As programmed, on the third try the robot deliberately approached the ribbon and clipped it in half. “By that time the audience was on their feet and cheering,” recalls Greg Starr, professor of mechanical engineering. The event made the national news.

Chair: Juan C. Heinrich  
505-277-2761 ■ mecheng@unm.edu



ME students have a seminar on a beverage shaker design.



In a three-semester ME class, students design, build, test, and drive a formula race car in the Formula Society of Automotive Engineers (FSAE) competition.

### ME timeline

1910-11	1931	1953-54	1980-81	1989	2005	2006
A full four-year program in mechanical engineering is offered.	The Mechanical Engineering Department is officially established.	A graduate program in mechanical engineering is started.	The ME Department moves into a new \$5,000,000 building in the summer of 1980.	The Master’s degree program in manufacturing engineering, one of the few in the country, produces its first graduates.	The department upgrades the mechanical testing equipment and acquires capabilities from nano-scale to large-scale measurements.	The ME building is chosen to be the pilot site for an energy demonstration project that uses information technology to plan and operate the power grid.

## Chemical and Nuclear Engineering Department

The School of Engineering added the relatively new discipline of chemical engineering in 1911 and had a full-fledged Chemical Engineering Department underway by the early 1920s. The Nuclear Engineering Department was created in 1972, the two departments were then combined, and programs were expanded to meet the growing societal and environmental demands of the future.

"In the late 70s, energy was a big issue and we were heavily involved in energy research," explains David Kauffman, past School of Engineering associate dean and professor of chemical and nuclear engineering. "Then in the early 80s we expanded research in environmental areas like water pollution and handling of waste materials," he continues. "After that we developed research in inorganic materials." Today the department conducts world-class research on nanomaterials, biomedical engineering, semiconductor processing, and the peaceful use of space and nuclear power technologies.

## Five Watts of Controversy

The department received a special delivery in 1966: its very own nuclear reactor. Purchased from University of California Berkeley for \$10,000 (the cost of shipping), the School received a valuable training tool for students and plenty of controversy to go with it. Students protested over concerns about the environment and the dangers of nuclear power and national media investigated the reactor. The reactor, which produces only heat, not electricity, has had an excellent safety record since it went into operation. "The reactor provides opportunities for our students to receive training not only in safe reactor operation, but also in the increasingly important security issues," says Julia Fulghum, chair of the Chemical and Nuclear Engineering Department. "It's an important component of our undergraduate nuclear engineering program, and we are very proud of both our utilization of the reactor and our outstanding safety record."

## Educational Outreach and Training

The department participates in community education and outreach programs to help K-12 teachers in New Mexico make science activities enjoyable, raise



Chemical engineers use a heat treating furnace to make a pizza for the 15th annual Christmas dinner.



The nuclear reactor was first located in a Quonset hut, then moved to a new building with more shielding outside the department's main building. On moving day, professors and students moved the reactor down a sidewalk along a series of pipes "the same way we think the Egyptians moved the pyramids," says former professor Robert Long.

ME and ChNE students fly experiments on board the "Weightless Wonder," a microgravity KC-135 airplane at Johnson Space Center in Houston as part of the NASA Reduced Gravity Student Flight Opportunities Program.



### ChNE timeline

1911	1946	1960	1962	1965	1972	1976
A four-year course in chemical engineering is offered.	Professor Thomas Castonguay joins the faculty, beginning an unlikely-to-be-repeated 25-year period as Department Chair.	The nuclear engineering program begins with the appointment of Professor Glenn Whan as head of the Nuclear Laboratory.	A PhD in nuclear engineering is formally established as a special graduate division of the Department of Chemical Engineering.	A doctoral program is added in chemical engineering and a separate Department of Nuclear Engineering is established with Professor Glenn Whan as Chair. The AGN-201 M reactor is acquired from the University of California.	The Departments of Chemical Engineering and Nuclear Engineering are combined to create the Department of Chemical and Nuclear Engineering.	The undergraduate BS in chemical engineering is first accredited by ABET.



the state's science standards, attract underrepresented students to pursue careers in engineering, and educate the workplace.

Nuclear engineering workshops are held in the summer to acquaint K-12 teachers with different types of radiation. "We have two trunks with Geiger counters, curricula materials and about 45 different activities that high school teachers can integrate into their classroom," says Chemical and Nuclear Engineering Professor Bob Busch. "We provide training for the teachers and they use the trunks to create interesting activities for their students."

Researchers at the UNM Center for Biomedical Engineering, a center associated with ChNE, also have created educational outreach programs. For fifth grade classes, Chemical and Nuclear Engineering Assistant Professor Heather Canavan has designed an informal presentation on "What is Biomedical Engineering?" The students are shown a "medicine bag" consisting of a variety of implants and then become bioengineers for a day, building an artificial finger from materials such as rubber bands, chalk, a straw, and tongue depressors.

Canavan has also developed a talk where high school students learn "How to mend a broken heart." Students are given a more advanced presentation on cardiovascular tissue engineering, followed by a game of "Name that Implant" where they are asked to name the properties of donated implants in the "medicine bag." From this group of more than 200 students, those with the best scores and highest interest in bioengineering are invited to tour the labs in UNM's Center for Biomedical Engineering. From those students, three will be offered a paid, mentored research position in the laboratories of participating faculty.

The department also offers introductory to advanced workshops in nuclear criticality safety taught by faculty drawn from universities, government, national laboratories, and industry. The workshop is held annually in Albuquerque and every other year near Sellafield, England. "The educational outreach programs and nuclear criticality safety workshops have enhanced our reputation—within the state, nationally, and internationally," adds Busch.

Chair: Julia Fulghum  
505-277-5431 ■ chne@unm.edu



Outreach to high schools includes classroom visits and tours of ChNE labs to spark interest in engineering activities and careers.



Grade school students build a model of a simple human finger joint and test how well their design matches the engineering criteria.

#### 1984

The undergraduate BS in nuclear engineering is first accredited by ABET.

The Institute for Space and Nuclear Power Studies (ISNPS) is established by Professor Mohamed El-Genk. The research organization focuses on advancing space and nuclear power technologies and promoting the peaceful use of nuclear energy.

#### 1989

The Waste-Management, Education and Research Consortium (WERC) is funded to develop people and technologies needed to address environmental issues.

#### 1994

The Center for Micro-engineered Materials (CMEM) is established under the leadership of Professor Doug Smith to serve as a focal point for material science research and education at UNM.

#### 2002

Professor Julia Fulghum becomes chair of ChNE and is the first woman to lead a School of Engineering department.

#### 2006

The Center for Biomedical Engineering (CBME), under the direction of Professor Gabriel Lopez, is established to foster collaborative biomedical engineering research at UNM.

The Center for Nuclear Non-proliferation Science and Technology (CN2ST) is established with Idaho National Laboratory.

#### 2007

The Nanoscience and Microsystems (NSMS) interdisciplinary MS and PhD program is approved, under the leadership of Professor Abhaya Datye.

## Computer Science Department

Computer science courses have been taught at UNM since the mid-60s, but the Computer Science Department wasn't officially established until 1976. Demand for courses was high and the department grew quickly.

From the outset, the department was a vanguard; moving the University away from mainframe computers and becoming the first organization in Albuquerque to have Sun Microsystems work stations, the precursors to today's desktop computers.

In the 90s, the department began to focus on research spurred in part by an NSF Research Infrastructure Grant. Through innovative research and interdisciplinary collaborations, the computer science faculty has established a reputation for excellence in several fields, including biocomputation and digital media.

### Students Spark Interest in Digital Animation

Two students' passion—and willingness to forego sleep—helped create a new area of teaching and research in the Computer Science Department. In 1995, Thomas Keller, a UNM art student, stopped by

the CS Department to talk about his interest in digital animation with Ed Angel, professor of computer science and electrical and computer engineering. Angel connected Keller with Jim Pinkerton, a computer science graduate student and research assistant at Sandia National Laboratories, who also had an interest in animation.

The two were soon collaborating with other students to create a film using Wavefront animation software loaded on Sandia's computers. The group dubbed themselves "Too Stupid To Sleep Productions," and worked nights and weekends on "I Thought, Therefore I Was," an animated film about a robot.

The project sparked interest in digital animation among students and thus the school's first digital animation class was born. That class led to more courses and ultimately the development of the ARTS Lab and The Garage. Through their teaching and talent, Keller and Pinkerton also inspired many CS graduates to pursue successful careers in animation. ♦

Chair: Stephanie Forrest  
505-277-3112 ■ [csinfo@cs.unm.edu](mailto:csinfo@cs.unm.edu)

CS students create animations, simulations, and visualizations, applying their skills to problems ranging from artificial neural networks to gaming. Here a motion capture subject wears a body suit fitted with reflective dots. Cameras throughout the room transform the reflective dots into data used in character animation. Photos by Barbara Gibson.



### CS timeline

1970	1973	1976	1980	1988	1994	2000	2005	2005
A computer science option for an MS in mathematics is offered.	An independent division is created for computer science.	Computer science becomes a department.	The department offers a PhD.	The computer science program is accredited by the Computing Sciences Accreditation Board.	The High Performance Computing Center opens to support faculty led, computing-based research throughout the University of New Mexico.	The Prince of Asturias Endowed Chair in Information and Technology is established to advance research and strengthen international partnerships.	The Art, Research, Technology and Science Laboratory (ARTS Lab) opens. The innovative interdisciplinary center is a catalyst for education and research that will help sustain an advanced media industry in New Mexico.	The Digital Media Garage opens. The facility, filled with digital media equipment and high performance computers, is a meeting ground for people interested in digital media.



# memories AND reflections

A centennial is a wonderful time to reflect on the past and to share memories. Here are reflections from a few faculty at the School of Engineering. If you have a memory you'd like to share, please send an email to [soe.unm.edu](mailto:soe.unm.edu) and we'll post it on the School's web site: [www.soe.unm.edu](http://www.soe.unm.edu).

## **Memories of the UNM Campus**

**Chuck Hawkins, professor of electrical & computer engineering**

I've been here since 1972 and when I was first offered the position over the telephone, I didn't know anything about New Mexico. I said, "Are there mountains out there?" Oh yes, there are mountains out here! It was quite a different campus back then. There was no landscaping. The duck pond was a gravel parking lot with Quonset huts from WW II. City streets ran through campus and they were just starting to close them off. Now I can walk around here, look at all the adobe architecture, the grass, the xeriscape gardens, the large variety of trees, and say, "This really is a pretty place! How fortunate I am to be here and see snow on the Sandia Mountains behind the campus." It's been great to watch the University and the School of Engineering grow.

## **Technology's Early Adopters**

**Ed Angel, professor of computer science and electrical and computer engineering**

When I arrived in 1978, students were still entering computer jobs on punch cards. There was a single central computer for everything with

a remote job entry station in a big room in Farris Engineering Center where students would punch their cards.

Then a couple of things happened. We went away from the mainframe idea. The UNM Computer Science and Electrical and Computer Engineering departments were early adapters of the UNIX operating system which we recognized was key to the future of computer science education and research. We started to get Vaxes (machines that were the forerunners of the modern architecture we use today) and graphics workstations, which really changed the computing resources available for students. We were early adapters of email and getting on the fledgling Internet. These advances were soon extended to the whole University.

The Computer Science Department was always very good at seeing where the best schools were going and saying, "That's where we're going too."

## **Partnering with National Laboratories**

**Greg Starr, professor of mechanical engineering**

In May of 1980, I was the first inhabitant of the Mechanical Engineering building, because I had just received the robot manipulator and we needed space to put it in. So we put it in room 100, which became basically the UNM robotics lab.

My first graduate student was Cliff Loucks—who still works in the Sandia

Robotics Center to this day—and we had been doing research for about a year when a gentleman from Sandia named Ray Harrigan walked in the lab and said, "We hear you have a robot down here."

So Ray and I talked. We had the same kind of research and career goals, and that led to a 25-year collaboration between myself and Sandia laboratories. Due largely to his management, the Sandia Labs Robotics Center was started. Today it is a world class center and it has the RMSEL (Robotics Manufacturing Science and Engineering Laboratory). We're still doing robotics work to this day, primarily at the MTTC building in the manufacturing and engineering program on the south campus. And it all started the day that Ray walked in my door.

## **The Emergence of Research**

**Gerald May, professor emeritus of civil engineering, reflecting on his term as SOE Dean (1980-1986) and as UNM president (1986-1990)**

The first talk of 'high tech' occurred in the 1980s. During that time we created our first research centers. These centers crossed the traditional borders of engineering. The new developments in engineering were not strictly civil, mechanical or electrical; they crossed disciplinary lines. It was a time where we really stepped forward at the University from sort of a sleepy regional school when I first came here to a much larger and sophisticated system. ♦

# A History of Leadership



*The School of Engineering has a rich history of distinguished faculty, administrators, and graduates who have contributed to the school's success. Here are four individuals who were particularly important in shaping the future of the School through their leadership, talent, and dedication.*

## **Charles Lembke**

Charles Lembke is one of the SOE's most famous and most successful graduates. So it's fitting that he was born in Albuquerque in 1889, the same year that the University of New Mexico came into being. Lembke's life would be intertwined with UNM for the next century.

In 1912, Lembke became the first person to earn a BS from the Department of Civil Engineering. A natural leader, Lembke was president of his 1912 class and participated in almost every athletic, dramatic, choral, and social activity on campus.

Lembke fought in World War I and received several decorations for valor. After the war, he joined his father, Edward E. Lembke, in the Lembke Construction Company, which became the largest home-grown construction firm in the state. The company built 17 UNM campus structures, including Popejoy Hall, Johnson Gym, and the original Zimmerman Library, as well as many Albuquerque landmarks.

Over the years, Lembke remained active with the University and the community, serving as UNM regent from 1923-1927, mayor of Albuquerque from 1935-39, and working on the Albuquerque City Commission for 12 years. In 1989 he was named to UNM's Athletic Hall of Honor.

Lembke's special relationship with UNM extended until his final days; his last social event was a UNM Centennial dinner the evening before he died. This extraordinarily accomplished SOE graduate was 100 years old.

## **Bill C. Wagner**

Department chair, professor, leader, pioneer, Lobo fan—Bill C. Wagner was a colorful and influential member of the UNM community for 33 years. Wagner joined the civil engineering faculty in 1929 and taught courses ranging from municipal design to soil mechanics. With his warmth and genuine concern for students, he not only inspired students, but made it possible for many to attend UNM by hiring them to work for him in the materials lab. Wagner was a pioneer in

materials research, became a national authority, and helped advance UNM to a position of leadership in materials research. During his early years, he planned most of the University's present street system. He also helped establish the New Mexico Society for Professional Engineers and went on to become the organization's national director.

Appointed chairman of the Department of Civil Engineering in 1943, Wagner served in the position for 17 years. An avid Lobo fan, he also served as president of the intercollegiate conference and chairman of the University Athletic Council. Wagner retired from UNM as professor emeritus of civil engineering and in 1969, the civil engineering building was re-named Wagner Hall in honor of his work as an educator and leader.

## **Marshall E. Farris**

Marshall E. "Mike" Farris, originally from Missouri, earned his bachelor degree in mechanical engineering in 1922



Charles Lembke



Bill C. Wagner



Marshall E. Farris



Ralph W. Tapy

from Purdue University and his master's degree in the same field from the University of Texas three years later. By the time he came to UNM, Farris had years of teaching and administrative experience from working at three other universities.

UNM was operating on a tight budget when Farris arrived in 1931, so he served as Chair of the Department of Mechanical Engineering and Dean of Engineering. Recalling the early days of his tenure, Farris said, "We started from the floor up. Faculty and students had to do all sorts of things. We all built our own shops; if there was anything to install, we installed it."

Farris oversaw big changes at the School, including the design and construction of new facilities and national accreditation. Recognizing that many students were enrolled in a pilot training program in 1940, Farris recommended that the University start a school of aviation; his plan was approved by the regents and grew into an important wartime program. During WWII, he was appointed head of the naval

aviation training program for many of the western states.

Farris served as ME department chair until 1942 and as dean until 1960. He went on to direct the Sandia Technical Development Program before retiring in 1963. During these three years, he coordinated the start of the UNM branches at Los Alamos National Labs and White Sands Proving Grounds. The building housing the Computer Science and Chemical and Nuclear Engineering departments bears his name.

### Ralph W. Tapy

It didn't take long for Ralph W. Tapy to make an impact on the UNM campus. He arrived in 1939 as head of the electrical engineering department and quickly made improvements that helped the department earn full accreditation from the Engineering Council for Professional Advancement. Tapy had set a precedent of change and leadership that would continue during his long tenure at UNM.

He came to UNM with a strong academic background in electrical engineering; an undergraduate

degree from Rose Polytechnic Institute and a master's in engineering from the University of Michigan. He would later receive a doctorate in the field. Tapy was a driving force behind the growth of the UNM branch of the American Institute of Electrical Engineers (AIEE), a student organization that sponsored scholarly events, professional programs, and many highly-publicized social events.

In 1943, Tapy oversaw the establishment of the Navy College Program, a wartime training effort that prepared military engineers for service in World War II. Under his leadership, the EE program expanded to include a master's degree and the department awarded its first BS degree to a woman, Pid Urquhart. In 1954, the department moved from the confines of Hadley Hall into a new electrical engineering building—Tapy Hall.

Tapy left the electrical engineering department chairman post in 1955, leaving a tremendous legacy and setting the department on a strong path toward the future. ♦

# The Arc of Change

Transformation through Technology and Vision

The more things change, the more they stay the same: the classic rule holds true when applied to the SOE's first 100 years. What began as a small institution focused on teaching the fundamentals of engineering is now an internationally recognized school that integrates teaching with innovative research and commercializes new technology. The constant throughout the decades is SOE's commitment to delivering a high-quality education to future generations of engineers.



The Visualization Lab in the UNM Center for High Performance Computing provides extensive computational resources and is one of dozens of research and teaching labs at the School of Engineering.

## The Foundation: Education

In the last century, new programs, updated curricula, expanded facilities, and better approaches to instruction have all shaped the way SOE faculty teach and inspire students. Yet it's the rise of technology that has made the biggest difference in education at the SOE. Laptop computers have replaced pencils and paper and the Internet has taken the place of the card catalog. With a click of the mouse, global information and ideas are available to facilitate learning.

"Technology increases the capabilities of teaching," explains Joe Cecchi, dean of the School of Engineering. "Today we can pose a problem in class for each student to do on his or her own computer. The software is much more sophisticated than we could manipulate on the board. With visualization and simulation, computers can show you things you couldn't otherwise see and give you the ability to try out new ideas."

By continuing to invest in sophisticated equipment and high tech facilities, the SOE gives students hands-on learning opportunities in state-of-the-art, "real world" settings. But technology doesn't replace the most fundamental interactions between instructor and student and among students. "You might think that since technology enables asynchronous delivery of instruction—students can access materials any time of the day or night from anywhere—that it would diminish the relationship between instructors and students," says Charles Fleddermann, associate dean for academic affairs. "It is surprising that technology can actually enhance the interactions of students with each other and with faculty. Students and faculty can participate in chat-rooms related to their classes, allowing students to work with each other on problems and projects, guided by the instructor."

Despite the school's educational advances, the old adage about change still holds true. "The educational tools change, but there are ways of thinking and approaches to problems that will always be the same," says Kevin Malloy, associate dean for research. "Thinking in terms of function, analysis, and design will always be at the heart of engineering education."

## Integrating Research with the Classroom

The school's first students were also some of its first researchers. Annual reports from the early 1900s tell of students tinkering with motor generator sets in the research laboratory. Engineering research accelerated in recent decades and UNM evolved from an educational institution to a research university. "A research university delivers a different kind of education—the 'value added' is tremendous," says Cecchi. "Engineering is a discipline of practice and the synergism between practice and research is something that we have emphasized strongly."

For the SOE, proximity to the national labs was crucial to successfully expanding research. "The creation of the national labs made New Mexico unique and the state realized that this was an untapped resource," says Malloy.

The investment in research spurred growth in facilities and equipment throughout the University, and the SOE benefited tremendously. A research park, developed in the early 1990s south of the main campus, is now home to many SOE faculty and students who collaborate with staff from the national labs, government agencies, and private high tech companies. Annual funded research at the SOE grew from \$2 million in 1980 to almost \$30 million in 2006.

Today research is the basis of all doctoral degrees and most master's degrees awarded by the SOE. Many undergraduates take advantage of the opportunity to participate in research projects, which expand learning and give invaluable hands-on experience.

## Into the Next Century: Innovation for Life

The 21st century finds the SOE entering a new phase. In addition to education and research, the school is working on commercialization, finding ways to transfer technology developed at the SOE into the public and private sectors.

It's a natural progression from the emphasis on research. "Research leads to new ideas that create new technologies which can then be patented and commercialized," says Cecchi. "That's the flow of the development that has brought us from just teaching in the classroom to an environment that goes all the way to deploying things."

In 1995, UNM formed the Science and Technology Corporation @ UNM, which markets the University's innovative technology. To date through STC, 148 patents have been issued with an inventor from School of Engineering, thirteen start-up companies have been created by SOE faculty, and dozens of students have talked to STC about commercializing their inventions.

The SOE is now unveiling Innovation for Life, a new culture that promotes creative thinking, more interdisciplinary collaborations, and new approaches to education. "We're really developing a culture where we produce students who are very innovative in everything they do and we're going to be innovative in the way we do that," promises Cecchi. The symbolic "home" of Innovation for Life will be the new Centennial Engineering Building. And the goals for this newest phase at the SOE? Innovations and technological advances to improve the way the world lives and works for decades to come. ♦

# CHANGING the FACE

## of the School of Engineering



For decades, the roster of UNM School of Engineering graduates read much the same way: male and mostly Caucasian. Due to a concerted effort to develop a diverse student body, the face of the SOE has literally and figuratively changed.

In the mid-60s, the demand for engineers soared and SOE administrators began to address the shortage of women and minorities in engineering. "It was an issue of making it possible for all students to aspire to—and to access—higher education," says Gerald May, past president of UNM and past dean of the School of Engineering.

### Pioneering Programs

The School gained national recognition when it established groundbreaking programs to encourage minority students to pursue engineering. In 1975, the Native American Program, School of Engineering (NAPCOE) was started with a grant from the Sloan Foundation. The goal was to increase the number of Native American students earning degrees in engineering by providing scholarships, workshops, and professional

development programs. It was—and still is—the only program of its kind in the nation.

That same year, local chapters of national organizations were formed at UNM, including the Hispanic Engineering Organization (now the Hispanic Engineering and Science Organization or HESO) the Society for Women Engineers (SWE), the American Indian Science and Engineering Society (AISES), and the National Society of Black Engineers (NSBE). Each program offers its own unique mix of support—scholarships, tutoring, networking, and social events—to help students integrate and succeed academically.

In 1979, with the support of then dean Bill Gross and funding from the MESA Foundation, the New Mexico Math Engineering and Science Achievement (MESA) program was started. The program's goal was to fill the "pipeline" with high school students interested in studying engineering at universities throughout New Mexico. To date, the MESA program has helped thousands of students pursue higher education in technical fields.

### Achieving Success

In just over three decades, these programs have had a dramatic effect on enrollment. Today almost 40% of the student body is from a minority population, a high percentage for an engineering school. Determination and foresight were key to success, as was New Mexico's inherent diversity. "We have a multicultural population and we strive to reflect that," says Steve Peralta, director of Engineering Student Services. "Having a diverse enrollment also helps our students understand how diverse the work force is."

Today the multicultural programs are part of Engineering Student Services, which also includes the Academic Advisement Center. The consolidation of these programs helps the SOE continue its commitment to developing a multicultural enrollment, says Peralta. "Now that we have multicultural programs, recruiting, scholarships, tutoring, and mentoring under one umbrella, it's easier for students to access services and easier to share resources, and that should lead to even greater success." ✦

Director: Steve Peralta  
505-277-1403 ■ [mepsoe@unm.edu](mailto:mepsoe@unm.edu)





# Undoubtedly Successful

## A Profile of SOE Alumnus Stephen C. Mitchell

“I was less than self confident when I started,” says Mitchell. “But through the strong support of people like Dick Huzarski and Marion Cottrell, I learned that I could indeed manage the academics in engineering.”

Ironically, one of the School of Engineering’s more successful graduates had doubts about making it through the program. Now there’s no doubt: Stephen C. Mitchell (BSCE ’66, MSCE ’68) has had a long, distinguished career and has served his profession and community outstandingly well.

Growing up in Albuquerque, Mitchell spent many days at UNM, where his mother worked in the records and admissions office. After graduating from Albuquerque High School in 1961, Mitchell enrolled in UNM’s engineering program.

His mother introduced him to Richard Huzarski, a professor of civil engineering, who became Mitchell’s mentor. “I was less than self confident

when I started,” says Mitchell. “But through the strong support of people like Dick Huzarski and Marion Cottrell, I learned that I could indeed manage the academics in engineering.”

With Cottrell’s encouragement, Mitchell continued on to graduate school. “I’d never thought of it, but Marion really triggered my thinking about going on to graduate school in engineering,” says Mitchell.

Mitchell moved to Chicago for work, only to be drafted into the Army a few months later. He served in the U.S. Army Corps of Engineers and afterwards earned an MBA from the University of Chicago in 1974.

In his most strategic career move, Mitchell joined Lester B. Knight & Associates, a highly-respected engineering and architecture firm. With talent and hard work, he advanced and helped the company establish a thriving civil engineering subsidiary.

In 1986, Mitchell and some partners purchased the firm and continued to expand it worldwide. With Mitchell as president and COO, the company completed many sophisticated and critical high-tech infrastructure projects for blue chip clients around the world.

By the late 90s, the partners began divesting themselves of all but one part of the company, which was billing more than \$100 million annually. Today, Mitchell oversees the remaining

business, Knight Facilities Management, which provides facilities management to manufacturing plants, commercial, governmental, and sports venues nationwide.

In his “spare time,” Mitchell consistently gives back through his involvement in professional societies and by working as an advisor and board member for companies and organizations around the country.

The SOE is fortunate to have Mitchell’s support and guidance. He started a scholarship fund to help UNM civil engineering students, helped establish the SOE Board of Visitors, and serves as co-chair of the National Steering Committee for the School of Engineering Capital Campaign. Mitchell says he supports the SOE because the school supported him. “The professors were really committed and they cared about the students. It was a supportive environment that was really conducive to accomplishment,” says Mitchell.

“Steve Mitchell is a passionate supporter of the School of Engineering,” says Dean Joseph Cecchi. “Most recently he has committed to helping with the School’s strategic planning efforts and leading a major fund-raising effort that will address many critical areas of need throughout each of our departments and programs.” No doubt about it—the SOE is fortunate to have Steve Mitchell as an alumni and supporter. ♦



## Distinguished Alumni Awards

More than 125 friends, colleagues, faculty and students gathered in the University's Student Union Building to honor the 2006 Distinguished Engineering Alumni on October 5. Current students displayed their research and alums caught up with old friends while enjoying wine, hors d'oeuvres, and music by the Onyx String Quartet. Following the reception, guests were treated to a sit-down dinner with one of Albuquerque's most popular talk radio hosts, Jim Villanucci, as emcee of the awards ceremony.

Award recipients, chosen by a peer review committee, represented a wide cross-section of industries, including space, energy, construction, electronics, software and academia. In addition to being leaders in their respective fields, the recipients were recognized for contributing to their communities by serving on various boards, fundraising for non-profit organizations, and mentoring students and young professionals.

Event sponsors included Martha Benton, Randy and Victoria Velarde, William and Teresa Moulds, Kenneth Prestwich, John Weir, Karen Douglas, John and Jo Margaret Farris, Dr. Robert Busch, Associated General Contractors–New Mexico Building Branch, and Bridgers & Paxton Consulting Engineers, Inc.

Nominations for the 2007 awards will be accepted until May 15, 2007. The nomination form can be downloaded at <http://www.soe.unm.edu/community/alumni.html>.

## 2006 Distinguished Engineers



**Dr. Larry W. Bickle,  
PhD, ME 1972**

As Co-founder and Executive in Residence for Haddington Ventures, Larry Bickle has taken the lead in the development and construction of over \$1 billion of natural gas transportation and storage. This has

proven vital to the efficiency and reliability of the now unregulated gas storage markets.



**J. Howard Mock,  
BS, CE 1964**

Howard Mock began working for The Jaynes Companies in 1971 and by 1978 had become Chairman and CEO. He has grown the company to be one of Albuquerque's most prominent, employing over 450 people and

currently working on over 60 projects in four states. Mock gives back to his community in many areas, including serving on several local boards and in leadership roles at UNM.



**Samantha Lapin,  
MS, NE 1988**

POD Associates, Inc. is one of New Mexico's largest software developers and one of the top 25 women-owned businesses. In 1994 Samantha Lapin became President and CEO and was charged with turning the company around.

Within two years, the company was profitable. Lapin serves her community by being active on a number of boards that help shape public policy.



**Dr. Kun-Shan Lin,  
MS, EE 1974 and  
PhD, EE 1976**

Kun-Shan Lin is credited as being one of the pioneers in fostering Digital Signal Processing (DSP) commercial applications and holds ten patents. He is currently Vice President of Texas Instruments,

responsible for Asia Application Specific Products and China Strategic Business Development. His 27-year career at TI includes numerous U.S. and international assignments in Speech R&D, DSP applications and marketing, and start-up business management. Lin also serves as an advisor and mentor to young professionals.



**G. Thomas Marsh,  
BS, EE 1969**

As Executive Vice President of Lockheed Martin Space Systems Company, Thomas Marsh was responsible for business operations and approximately 18,000 employees across the U.S. He received NASA Public

Service Awards for his work as principal designer of the electronic and power equipment for the Viking Mars Lander, as a member of the Viking Lander Team and for his work on the Space Shuttle's external tank. He also serves on many community boards.

## 2006 Young Distinguished Engineer



**Dr. William G.  
Fahrenheitz, PhD,  
Engineering 1992**

An Associate Professor of Ceramic Engineering at University of Missouri-Rolla, William Fahrenheitz has been recognized with numerous awards for teaching and research excellence and has

published extensively. He has also worked to establish the WYSE academic challenge, a statewide math and science competition for high school students in Missouri. He serves as Missouri WYSE Coordinator and is a member of the WYSE Board of Advisors. ♦



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