Ira A. Fulton school of engineering

FULL CIRCLE

ENGINEERING, CONSTRUCTION AND COMPUTER SCIENCE NEWS FOR FRIENDS AND ALUMNI OF ASU. . . SPRING 2004

Engineering Faculty Lead $43.7 million US Army grant award

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Alumna integrates engineering with business savvy

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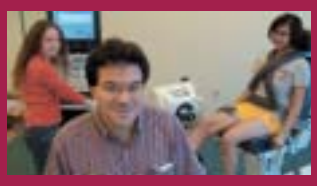

AzBio researchers go from idea to application

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Crouch's Comments

In February the U.S. Army awarded ASU a $43.7 million, five-year cooperative agreement to establish the Army Flexible Display Center. It is the largest federal contract award in the university's history. The principal investigator who led the contract pursuit, Greg Raupp, is a professor of chemical and materials engineering and is our former associate dean for research.

Dean Peter Crouch

The contract was the result of hard work on the part of the pursuit team. But it was also the result of much, much more. ASU has pursued—repeatedly—similar large projects in the past. And we have lost—repeatedly—to other institutions or consortia. The pursuit teams for those projects worked no less hard.

The difference this time was a combination of skills, capabilities and leadership that resulted in the right solution for the Army at the right time. First, Greg Raupp spent his formative years at ASU working on large, interdisciplinary proposals, and through those efforts he has learned how to bring the entire university together in order to win.

Second, Raupp was able to engage the talents of key experts, three of whom are relatively new to ASU. Tom Picraux, professor and director of materials research, was a remarkable hire for the university in 2001. Frederic Zenhausern, who launched the Center for Applied Nanobioscience in February 2003, brought an entire team of researchers with him from Motorola. And George Poste, world-renowned researcher, scholar and science policymaker, and director of the Arizona Biodesign Institute, joined us in April 2003.

The last major ingredient in this recipe for success was the setting in which it occurred. The climate at ASU under Michael Crow's administration facilitates undertaking big projects like this one. So this may be the first, but it most certainly will not be the last.

We see ourselves differently than we used to. We aspire to bigger goals, to greater challenges, to a worldwide stage on which to perform.

Students of history know that a golden age occurs when a civilization, which has grown and matured to a certain level of readiness, is matched with a leader who has the right skills and vision for that society at that time. ASU has reached a level of growth and maturity that is perfect for the strategic leadership and vision of its president, and I believe we, too, are entering a golden age.

As always, I look forward to sharing our progress with you in these exciting times. This issue of *Full Circle* will bring you more information on the new Army Research Center and several other significant accomplishments. We are also celebrating the achievements of a number of our women students, faculty and alumni on the pages that follow.

All the best,

P Crouch

Contents

Engineering software package ranked one of the top educational resources

Online courses and programs have created an enrollment boom at universities. But for online offerings in engineering, how do you successfully duplicate the hands-on tinkering and experimentation so vital to learning in the lab?

Andreas Spanias, professor of electrical engineering and an expert in digital signal processing, led efforts to develop top-ranked distance learning software.

Electrical Engineering Professor Andreas Spanias recently spearheaded efforts to develop a multi-disciplinary distance learning initiative at the Fulton School. In creating a new JAVA-based digital signal processing software package (J-DSP), Spanias has garnered national recognition from the National Engineering Education Delivery System (NEEDS), which has ranked J-DSP as one of the top three educational resources of the year. Because the J-DSP program was chosen as one of the best, the software has been disseminated to deans and chairs of engineering colleges across the country.

"This software was built from the ground up for education," said Spanias. "The idea was to develop a technology that will enable distance learners to perform computer laboratories over the Internet."

Using the software, students can manipulate the basic building blocks of DSP design, the driving force behind devices like cell phones, music synthesizers and MP3 players. "For example, we have developed some functions that will enable us to simulate speech coders so that students are exposed to a simulation of cell phone components and learn how a cell phone works," said Spanias.

At the heart of the software lies a block design approach towards creating a myriad of simulation environments. There is a block that carries different algorithms for signal generation, a block for filtering that signal, a block for frequency response and another for plots. "There are about 100 different blocks that do different things, and we keep developing more blocks," said Spanias.

Students aren't the only ones who are gaining from the experience. "This is a tool both for students and instructors," said Spanias. "Students can use it to do their labs over the web, and instructors can use it to create and embed demonstrations in their web course content." Because the software was written in JAVA, instructors can create attention-getting animation of different engineering concepts or integrate streaming video of their lectures.

In order to expand the simulation environment and the number of engineering courses that could utilize the J-DSP software, Spanias collaborated with several other Fulton School faculty in an NSF project that supported extensions to J-DSP. Among them, he relied on Dr. Tolga Duman for creating communications functions, Dr. Lina Karam for image processing, Dr. Konstantinos Tsakalis for controls and Dr. Antonia Papandreou-Suppappola for time-frequency methods.

The software audience has been expanded to include outreach programs to colleges and high schools. For example, students interested in hi-fi audio systems can learn the electronic guts behind modern technology such as MIDI synthesizers. Using the mouse pad to hit the middle C on a piano keyboard, students see the roller coaster-shaped sinusoidal wave generated from the musical note. Shift up an octave to hit a high C and the frequency doubles. Students can manipulate the digital design blocks, tweaking the filters to create a thumping bass or glass-shattering treble.

In the future, Spanias hopes that the software can be expanded to serve students in math and physics along with other engineering schools. "We will be the lead university and team up with other universities to disseminate this technology," said Spanias.

To learn more about the J-DSP software, go to: http://jdsp.asu.edu

Or contact Dr Andreas Spanias at: spanias@asu.edu or 480-965-1837

ASU Celebrates
10 years of Building Satellites

Ten years ago this month, a graduate student entered a professor's office with a question and what resulted was a satellite in space, another three on the verge of a launch, two more being designed and over 650 students with real world experience in the space industry.

How it all got started

At the time, Dr. Helen Reed was the Director of Aerospace Research at Arizona State University (ASU) and Joel Rademacher was only weeks into his master's program at ASU. On that defining October day, Rademacher simply knocked on Reed's door and asked, "Can we start a space program?"

Reed thought it was a great idea and together, looking for a launch, they took the idea of students designing and building satellites to Scott Webster at a local aerospace company, Orbital Sciences Corporation.

"Orbital made the generous offer to launch a satellite if it met certain criteria," said Reed. The criteria outlined by Orbital included a satellite that weighed less than 10 pounds, fit into the small space at the top of a Pegasus rocket, performed meaningful science, and was completely student designed and built.

It's all about the students

It was the last criterion, "to be completely student designed and built," that was key in the development of the ASU Student Satellite Program. The ASU team takes pride in the fact that the students manage the program, do all of the work and they are mostly undergraduates. "It's all about the students," said Reed, Professor of Aerospace Engineering and Associate Director of the ASU NASA Space Grant Program.

Building a satellite requires many different skills. "Students get a systems perspective," said Reed, "They learn to appreciate other disciplines."

Electronics, software, and hardware all need to be designed and built, the program needs to be managed and paperwork must be completed.

Each semester about 30 students in a variety of majors including aerospace, mechanical, electrical, computer systems and chemical engineering, as well as, mathematics, physics and business come together to build satellites. Reed said, "This program is truly a team environment."

The Satellites

ASUSat1 was the first satellite the ASU Student Satellite Program built. The ASU team successfully launched ASUSat1 on January 26, 2000, on the maiden voyage of the Minotaur rocket at Vandenberg Air Force Base. The students and the program grew from the success of their first satellite.

The team used the experience of ASUSat1 to lead a coalition of three universities to design and build Three Corner Sat (3CS), a stack of three nearly identical satellites. The University of Colorado at Boulder (CU) and New Mexico State University (NMSU) together with Arizona State represent three of the Four Corners, hence the name Three Corner Sat. Each university has a different role in the satellite design highlighting their strengths in past projects.

CU designed the main computer for the satellites, the imaging system and the software, and controls the operations of the satellites. NMSU had an extensive background in communications; therefore they designed the communications system. ASU designed the structure, the power system, wiring, assembly and testing, and was in charge of managing the entire program. The 3CS program is part of an Air Force Research Lab (AFRL) initiative. The Air Force will launch the 3CS satellite this July from the Kennedy Space Center.

The team is currently working on two new satellite projects: ASUSat3 is being built as a test bed for several different experiments, and Magnetic field Investigation of Mars by Interacting Consortia (MIMIC) is a concept study to determine if university students are capable of an interplanetary mission.

The ASUSat3 team hopes to demonstrate a micropropulsion system [Free Molecule Micro Resistojet (FMMR)] and a cell microfluidics device in conjunction with NASA University Research, Engineering and

Technology Institute (URETIs) Institute for "Cell Mimetic Space Exploration" (CMISE).

MIMIC is a student-run multi-institutional collaborative project to design and build a microsatellite to measure the residual magnetic field at Mars. ASU is leading a collaboration among eight different universities from all over the country. The concept study is a project initiated by the NASA Jet Propulsion Lab.

Building satellites between classes

The program is modeled after industry but it is not industry. The workers are students learning as they go and trying to fit in school projects, homework and exams while building satellites.

This is the first time AFRL has worked with universities in this capacity. "Although the nature of working with students is unstable, this week is midterms, that week is finals, people graduate and new students join the team," said Jeff Ganley of AFRL, "the university students do very well compared to industry in terms of performance. I enjoy working with students."

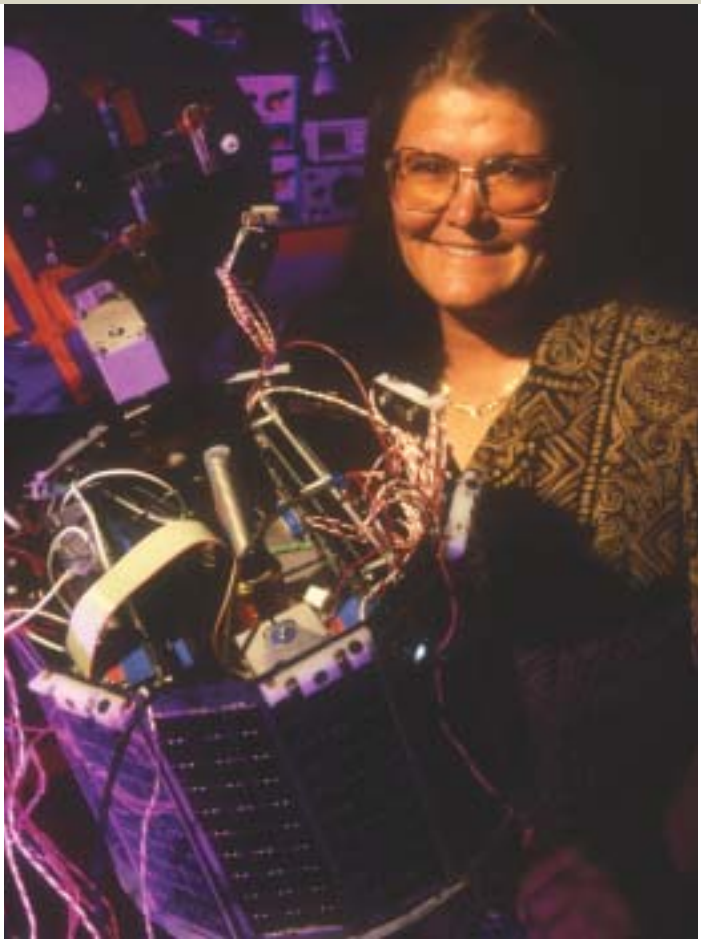
It's a win-win situation

According to Ganley the benefits of this program are many. AFRL's interest is in developing the high risk technology area of small satellites, as well as educating our future workforce in systems engineering. "The students get to learn the non-book stuff." said Ganley. "They learn real world systems engineering by building the satellite. They get a chance to experience working in teams, schedule and budget constraints." He said, "The students are great at coming up with crazy, innovative solutions which fit perfectly with a developing technology area like small satellites."

While building satellites alone gives the students a great advantage when entering the job market, working with groups at a distance makes the experience all the more true to life. Companies are seeing the benefits of programs like the one at ASU. "Companies come to the career fairs and want these students." Reed said. "Companies contact me to see if anyone is graduating soon." The space industry gets graduates that are ready to go straight to work, without having to train them about life in the real world.

The story continues

According to Reed, the original mission of the ASU Student Satellite Program was to link the university program to local industry, but as the program has grown so has the mission. Today the students are linked with industry, government and other students around the nation. She said, "We are always trying to evolve the program."



For the past decade, Helen Reed, professor of mechanical and aerospace engineering, has helped students build satellites. The Air Force will launch their latest collaborative effort, the Three Corner Satellite, this July from the Kennedy Space Center.

As far as the future goes for students building satellites, Reed said, "I see it growing with university students very excited about space." She hopes to see this type of program extend far beyond university students to space programs at the K-12 level. Reed wants "the ASU program to be at the forefront of having students create smaller more elegant systems."

"I do it because it is most satisfying when a student gets it," said Reed.

For more information about the ASUSat and NASA Space Grant programs, see http://nasa.asu.edu.

Computer Science and Engineering hits warp speed

Logarithmic. It's an appropriate scale to use when measuring the Department of Computer Science and Engineering (CSE).

Everything about the department is in multiples. For example, the research expenditures and the number of research assistants have more than doubled over the last three years. The number of Ph.D.s produced by the department last year puts it squarely within the ranks of the top 25 universities in the nation.

It's enough to make your head spin. But, then again, no one ever said the jump into warp speed was easy. So sit down. Hold on. Read on.

By 2003 CSE was bursting at the seams. Demand for its programs has continued to escalate, and the office, classroom and lab space in existing facilities was woefully inadequate. ASU's acquisition of additional space at the Brickyard on Mill Avenue in Tempe came not a moment too soon. In January 2004, CSE faculty, staff and students relocated to the new building, and guess what? Acceleration, yet again.

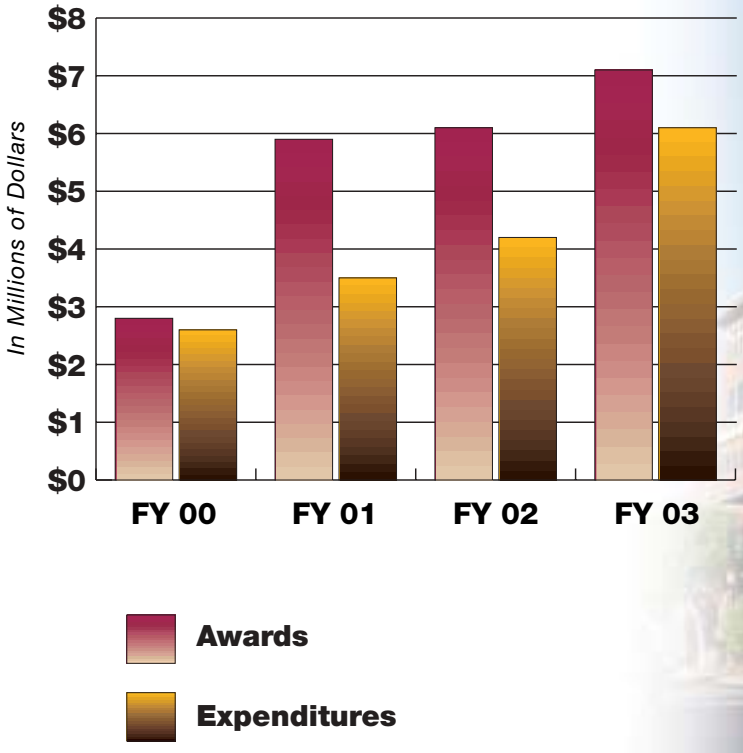
The Brickyard is more than a doubling of space for research, classrooms and offices. It is a new way of life. The building will be highly mediated—a term which means it is full of audio and video equipment along with supporting infrastructure. Brickyard classrooms can be used for in-person instruction or distance delivery of education over the Internet. This increased capacity for distance delivery enabled the school to launch the world's first executive master's degree in embedded systems in January. (For more information on this and other distance learning programs, see www.asuengineeringonline.com.)

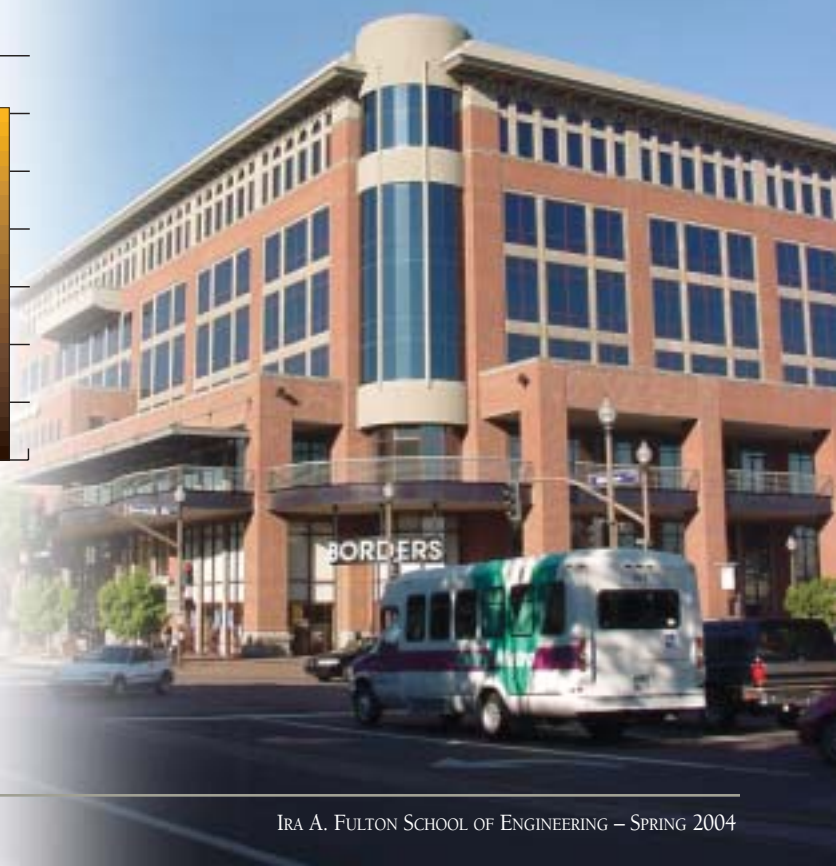
CSE researchers are in high demand with the increase in transdisciplinary projects. Computer science and engineering is fundamental to the success of virtually every use-inspired research project, whether that research is in human health or homeland security. The Brickyard will enable highly sought-after CSE researchers to use video networking to collaborate with researchers at the new Army Flexible Display Center at ASU Research Park, the Arizona Biodesign Institute (AzBio) or Translational Genomics (TGen), avoiding loss of time to routine, non-productive commuting. More importantly, as with distance delivery of education, collaborative research projects can now be undertaken anywhere in the world, with real-time communication of results.

Even with the dramatic expansion of space and technology options at the Brickyard, the demand forecast for classroom-based instruction in computer science and engineering at the Fulton School of Engineering will outstrip the capacity to supply it. Therefore, the department has undertaken a coordinated effort with ASU East to grow additional capacity on that campus. The two groups are carefully articulating their programs, and the expectation is that ASU East will have as many computing students in five years as the main campus.

Logarithmic. Yes, it's a very good scale, indeed, for CSE.

For more information about the Department of Computer Science & Engineering, see http://www.eas.asu.edu/~csedept/.





Corporate Leaders Program: The world's premier high tech leadership development program

Imagine attending school full-time as an undergraduate or graduate student, working part-time at 20 hours per week in an industry internship, performing community service weekly and attending leadership development forums, all as part of membership duties to one organization.

You have just entered the world of Sumeet Kaur, a graduate student in the department of electrical engineering.

As a member of the Corporate Leaders Program in the Ira A. Fulton School of Engineering, Kaur is responsible for managing all the aspects inherent in the program, as well as managing her personal and family obligations.

"It makes you get up early on a Saturday morning, that is for sure," said Kaur. "It is a program that changes you academically, professionally and personally."

Kaur, who has been active in the Corporate Leaders Program for two years, shares her experiences and what she has learned from the program candidly.

"Sometimes maintaining motivation is a challenge, but the results of our service work in Phoenix and in foreign countries overcome this stumbling block," Kaur said. "When you see how your actions translate into good things for other people, you gain back that motivation."

Working through the International Students With Advanced Technologies program (I-SWAT), a branch of the Corporate Leaders Program, Kaur and handfuls of other advanced Arizona State University (ASU) students since 2001 have had the ability to serve non-profit agencies in other countries, such as Singapore and Australia, with high-tech service projects. This semester, Kaur helped design and install a website for Focus on the Family in Singapore. Not only that, she, and eleven other ASU students who attended the Global Tech Leaders Symposium (GTLS) in Singapore and Tokyo also donated financially to help purchase computers and other equipment for Singaporean non-profit agencies.

The Corporate Leaders Program is the brainchild of Director Dick Filley in the Fulton School of Engineering. The corporate-sponsored program encompasses leadership training, service work, industry internship and academic study both in the U.S. and abroad, and is an innovative program focusing on the well-rounded development of tomorrow's leaders. Since 1986, the program has grown to include universities from across the globe, participating in the International Corporate Leaders Program and the annual Global Tech Leaders Symposium, all based from ASU.

"The Corporate Leaders Program at ASU gives students the opportunity for hands-on leadership development," said Dick Filley.

Corporate Leaders Program fellow Sumeet Kaur is a graduate student in the department of electrical engineering.

"They are not sitting around in chairs talking about leadership, but rather jumping in cars and driving to Phoenix or hopping on planes and flying half way around the world to perform community service and meet with leading executives. The program allows students to solve real world problems and come face to face with real issues."

"Through my involvement in the program and the hands-on lessons it provides, I have realized the importance of time management, gained the knowledge required for employment in the technology sector, and learned the importance of giving back to the community and corporate responsibility," said Kaur.

The Corporate Leaders Program is currently developing European and American GTLS versions to complement existing programs for participating international universities. The symposiums could be implemented as early as the 2004-2005 academic year.

For more information on the Corporate Leaders Program, please go to www.i-clp.org.

Arizona State University's Six Sigma Program goes global

Six Sigma, the statistical approach focused on increasing profitability by improving efficiency, has been part of the engineering world since the 1980s. Now, a new program at Arizona State University is shaking up the way Arizonans, Americans and people all over the globe are doing business.

In collaboration with two leading Six Sigma experts, former ASU alumni Dr. Mikel Harry, a founder of Six Sigma at Motorola, and ASU's award-winning professor Dr. Doug Montgomery, the Center for Professional Development (CPD) in the Ira A. Fulton School of Engineering has created a group of online, comprehensive, Six Sigma professional certifications. The programs feature Dr. Harry's third generation concept of Six Sigma and Dr. Montgomery's global expertise in statistics (a graduate certificate in statistics - Six Sigma Black Belt is also available). This new application combines older Six Sigma techniques, including defect and cost reduction, with the modern metric in Six Sigma success, value creation.

"With this Six Sigma education, the school's objective is to expand globally with innovative program delivery and a breakaway strategy to reach companies and individuals around the world, including in our own backyard," said Jeffrey Goss, CPD and distance education director.

Industrial engineering professor Doug Montgomery offers distance learning opportunities for engineers and companies around the world to obtain Six Sigma professional certifications through ASU.

If you would like to learn more about the Fulton School's Center for Professional Development, ASU's Six Sigma program, or any of the other professional programs offered online, please go to www.asuengineeringonline.com.

The Center for Professional Development is well on its way to that goal. In fall 2003, the reputation of the ASU Six Sigma Black Belt program brought thirty Korean executives to ASU from POSCO, the fourth largest steel manufacturing company in the world and one of the top 400 global companies listed by Forbes magazine. Headquartered in the southeastern port city of Pohang, South Korea, POSCO employs approximately 19,200 people and generated net earnings of approximately $671.3 million in 2001. With high goals for continuous innovation in improving efficiency, POSCO executives came to ASU for three weeks to experience the expertise and obtain master black belt certification in Six Sigma .

"The contents of the ASU master black belt program were very good," said Mr. DongMo Ahn, POSCO Education Support Team Leader. "After completing the program, our master black belts became very confident in their abilities, and the relationship between POSCO and ASU grew, providing a synergy that is benefiting both institutions."

So far, it looks like Mr. Ahn may have been right. POSCO again will send a new group of engineering executives to ASU for master black belt training in May 2004. Then, in June 2004, through a collaboration with ASU, Dr. Harry's Six Sigma Management Institute (SSMI), and the Korean Standards Association, a Six Sigma Executive Summit will be held in Seoul, Korea.

NATIONAL HONORS

Society of Women Engineers

Four years ago when Heather Storace joined the Society of Women Engineers (SWE) at Arizona State University, the section was a much smaller group with a few less awards to its name. Now they boast more than one hundred active members and a list of awards anyone would be proud of.

"It is just amazing to see how far we have come," said Heather Storace, industrial engineering senior and former president of SWE. "Our section has gone from having a presence on campus to having a presence across the nation in just a matter of years. I feel so honored to have been a part of that transformation."

ASU's SWE section won a myriad of awards at this academic year's national conference in Birmingham, Alabama, including the highest honor, Outstanding Medium Student Section. More than 2800 students and professionals from ten regions across the U.S. attended the event, including 300 SWE student sections.

Other awards received at the conference include: Student Membership Program Award for Recruitment and Retention of Members, First Place Subject Matter Expert Bowl (three of five region members from ASU SWE), Best Regional Newsletter Award, and Honorable Mention for Best Student Section Website.

Since SWE's inception at ASU in the 1970s, the section has focused on education, leadership, community service and outreach for women in engineering. This year marks the first SWE national student award for ASU. The section also recently received the Sun Devil Involvement Center Best Collaborative Program award and the Commission on the Status of Women (CSW) 2004 Achievement award.

Heather Storace

NATIONAL HONORS

National Society of Black Engineers

The Arizona State University (ASU) Chapter of the National Society of Black Engineers (NSBE) won National Small Chapter of the Year at their national conference in Dallas, Texas this year. The award is the culmination of filling out applications and waiting for two years to receive both the best regional chapter as well as the best national chapter award.

"This is a huge accomplishment for this dynamic group of young engineers," said Dana Newell, associate director of Student Outreach and Retention Programs (SORP) in the Fulton School of Engineering. "NSBE has been instrumental in increasing the enrollment and graduation of diverse engineers at ASU, and they definitely deserve this recognition."

Currently under the leadership of Tenise McGhee, ASU NSBE president, and Dr. Terry Alford, chapter advisor, the ASU chapter has been promoting professional and academic development of black engineers from middle school through graduate school since 1991.

Each year, ASU's NSBE works with middle school and high school students through events like the Kathy Preacely Youth Motivational Conference, a day long program to encourage high school students to attend college, and FOCUS, a program geared toward encouraging middle school students in engineering studies. Students learn hands-on engineering and life skills in these NSBE programs. NSBE members also participate in service activities such as food drives for local homeless shelters, social events like the "Steppers Ball" to raise money for their programs, and study sessions to support fellow members' academic success.

Students learn hands-on engineering and life skills in these NSBE programs.

For more information on NSBE, you can contact Student Outreach and Retention Programs at 480-965-6882.

MAES students win scholarships at 2003 International Symposium

Like many high school juniors and seniors, Joel Polanco was not quite sure what he wanted to do with the rest of his life. Now, as a graduate student in industrial engineering in the Ira A. Fulton School of Engineering, he credits the Society of Mexican American Engineers and Scientists (MAES) outreach programs for giving him direction.

As a high school senior in his home town of El Paso, Polanco admits, "I didn't know what I wanted to do with my life. When the MAES program came to my high school with interesting science projects, it opened my eyes to engineering and all that I could accomplish through it."

Now, Polanco isn't just a successful graduate student, he is also a student leader, co-founding the Arizona State University MAES student chapter in 2002 and representing ASU in the MAES 2003 International Symposium and Career Fair held in Phoenix last October.

Polanco and three other Fulton School of Engineering students were recognized at the MAES symposium with scholarships ranging from $1,000 to $3,000. The other students recognized included Jose Benavides, a junior in electrical engineering; Arianna Valle, a junior in civil engineering; and Brenda Flores, a junior in biology and society.

The symposium was the first to be held in Phoenix and included five days of events at the Phoenix Civic Plaza. "It was so exciting to be given recognition for our work and to be hosting the symposium," said Benavides. "It was wonderful to have such great representation at the event in Phoenix."

All are part of ASU's MAES student chapter on campus. Polanco was honored with the highest distinction the society bestows upon students, the Padrino (mentor) Scholarship, which includes a mentor from a professional chapter to encourage and lead the awardee.

They formed the chapter at ASU in the spring of 2002 when a select group of students were able to attend the 2002 symposium. It was their leadership that encouraged a professional chapter to develop in Phoenix as well. 2003 was the first year the students attended the symposium as an organized chapter. The student chapter already has approximately 20 members who actively participate in local community service and K-12 outreach programs.

Joe Polanco, MAES participant, is a graduate student in industrial engineering.

One of those programs is the Science Extravaganza. The program consists of MAES members preparing hands-on science and engineering activities for high school students, and teaching and encouraging them in those fields.

This is the same type of outreach program that encouraged Polanco to pursue an engineering degree. "It's programs like these that tell minority kids they can go to college, they can study science, and that it is an option for them. It definitely helped me choose the right path for myself," said Polanco.

Bioengineering student selected as *USA Today* academic all star

Lubna Ahmad, an undergraduate student in bioengineering, was selected from more than 600 nominees.

Lubna Ahmad, a 19-year-old junior in the Harrington department of bioengineering, was recently chosen as one of the top 20 undergraduates in the United States by USA Today. This marks the first student at Arizona State University, who was solely an engineering student, to receive this honor.

Ahmad graduated at the age of 16 from Corona Del Sol high school and went on to invent a breath sensor which measures ketone levels providing for diabetes management and obesity treatment. Working with Eric Guilbeau, the bioengineering chair, they are now focusing on patenting the breath sensor through Arizona Technology Enterprises (AzTE).

Ahmad is a Goldwater Scholar with a 4.0 GPA and the vice president of the biomedical engineering society on campus. She is an Honors College mentor and has designed a curriculum for the Women in Science and Engineering (WISE) K-12 outreach program. Above all this, she also teaches piano and works with war refugees through her mosque.

"This award is such an honor and surprise for me," she said. "For this, I am in debt to my family for their vision and insight into who I am and for their gift of moral guidance and support."

Nine ASU students, including Ahmad, have earned prestigious first team honors, which is the best record of any public university in the nation. Only Harvard and Yale have more.

The *USA Today* award winners were chosen from more than 600 top students nominated from their schools. Each year a team of judges chooses twenty outstanding students for the "First Team," each of whom receives a $2,500 award and a trophy. Twenty are also named to a second team and twenty to a third team.

The Judges awarding the distinction considered grades, leadership, activities, and most of all, how students extend their intellectual talents beyond the classroom.

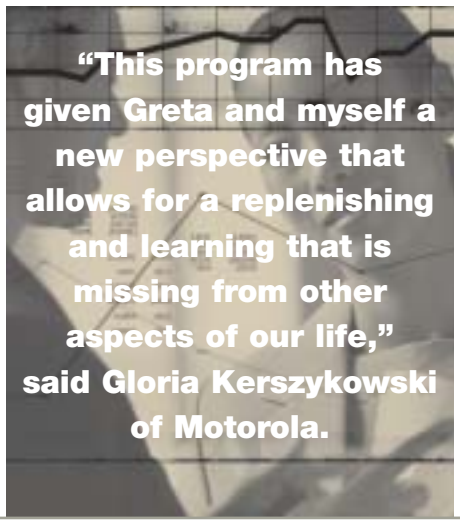
Mentorship program brings women engineers together

Gloria and Greta share a common bond; they are both women in materials science engineering. Although one is at the height of her career and the other is just starting in her undergraduate studies, they share laughter, encouragement and understanding, a reality made possible by the Women in Science and Engineering (WISE) program at Arizona State University (ASU) and the Women's Leadership Team at Motorola.

Starting last fall, a mentorship program between Motorola and the Ira A. Fulton School of Engineering was developed, and thirteen pairs of women, Motorola employees and engineering undergraduates began to meet. Through the course of a semester, mentoring pairs have developed their own relationships and begun sharing experiences as well as their dreams for the future.

The program was created by Motorola employees who wanted the opportunity to be engaged in active mentoring programs. After examining ASU's WISE program with the help of Motorola Community Relations Manager Barbara Clark, Motorola established a grant to create the mentorship program, and that is how Gloria Kerszykowski and Greta Hansen first met.

Although their relationship is based on time commitments, it has allowed them to share joy and friendship on a level they most likely wouldn't have found elsewhere. "This program has given Greta and myself a new perspective that allows for a replenishing and learning that is missing from other aspects of our life," said Gloria Kerszykowski of Motorola.



For Gloria and Greta's time together, they have gone out for dinner and participated in social events with the mentorship program, such as the Phoenix Science Museum and Zoolights.

There are many requirements for the program, including: a signed contract involving commitments to meet once a month, communicating frequently by email, to attend mentorship program events, to keep open lines of communication, and to respect each other in all situations. In addition to the contract, the relationship comes with a list of responsibilities, such as keeping track of the other's new developments at work, in school, and in personal matters when applicable.

Gloria joined the program because she remembers what it was like when she was in Greta's shoes. "For me it was hard," said Kerszykowski. "Calculators were just starting to come out when I went from an all-girl Catholic high school to being the only woman at Lawrence Technological University in Michigan. I graduated 25 years ago, and now I am at the point in my life where I want to guide and give back to another woman in engineering."

And that experience provides the perfect encouragement for Greta. "It is amazing to see what Gloria has done," said Greta Hansen, chemical and materials science freshman. "She has shown me that there are so many options and that anything is possible. Now I am not intimidated anymore."

For more information about the WISE program, go to http://www.eas.asu.edu/~wise

FLEXIBLE

Engineering Faculty Lead $43.7 million grant award

ASU-Army Flexible Display Center

The U.S. Army has awarded Arizona State University a $43.7 million, five-year cooperative agreement — the largest federal award in ASU's history — to establish and lead the Army's Flexible Display Center, a major collaborative university-government-industry partnership designed to develop flexible, information displays for the future warfighter and other military and commercial applications.

The $43.7 million cooperative agreement has a performance period of five years with an option for an additional $50 million over an added five-year period.

"The ASU-led Center will be the focal point in a large-scale national effort to provide tomorrow's warfighters with ubiquitous, conformal and flexible displays that are lightweight, rugged, low power and low cost," said Greg Raupp, ASU professor of chemical engineering, Associate Vice President for Research and director of the Center. "These displays will be integrated with computation, communications and global positioning subsystems to significantly enhance the soldier's situational awareness, survivability and effectiveness."

Display technology is critical to the Army's network-centric Future Force.

"Flexible display technology has the potential to be implemented in a wide variety of applications from command centers, to vehicle platforms, to individual soldiers. It will revolutionize the way in which information is disseminated on the battlefield," said Acting Director U.S. Army Research Laboratory, John Miller.

"The outstanding capabilities of our facility and its manufacturing R&D infrastructure will enable us to work side-by-side with our partners to intensively co-develop new breakthrough technologies."

In addition to military uses, flexible display technology promises to provide a boost to U.S. display companies by helping to create many significant future commercial applications. The mission of the ASU-led FDC is to dramatically accelerate flexible display technology while catalyzing growth of a vibrant U.S.-based flexible display industry. Raupp said the center will seek creative opportunities to leverage intellectual, physical and technological capability to establish one or more "product cooperatives" that could substantially accelerate technology advancement and market readiness, enhance prototyping and manufacturing capability and strengthen the overall domestic flexible display industry.

The Flexible Display Center will be a national asset and technology development force through the combined intellectual capacity, technological capability, and combined financial resources of the Army, ASU and industry. There are currently sixteen industry and five university partners in the center. The university partners include Cornell University, the University of Southern California, Penn State University, the University of Arizona's Optical Sciences Center and the University of Arkansas. Industry partners in the proposal effort included DuPont Displays, Kodak, Honeywell, General Dynamics, Raytheon, Universal Display Corporation, Kent Displays, E Ink, FlexICs, Three-Five Systems, General Atomics, Optiva, ECD, Southwall, the U.S. Display Consortium and Abbie Gregg, Inc. Raupp anticipates that a substantial number of additional partners will be engaged in the coming year or two. "The outstanding capabilities of our facility and its manufacturing R&D infrastructure will enable us to work side-by-side with our partners to intensively co-develop new breakthrough technologies," noted Raupp.

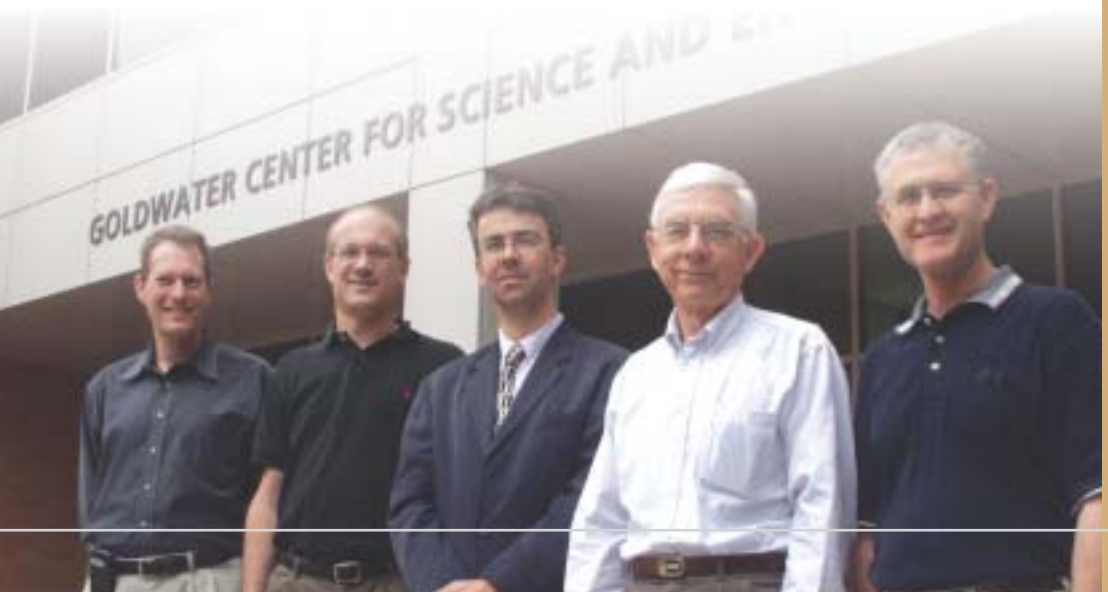
For Raupp, the challenge will be coordinating and implementing the center vision and multi-dimensional strategic plan as the technology comes to fruition. The Army, academic and industry partners will participate in defining the center activities though a governing board chaired by George Poste, director of ASU's Arizona Biodesign Institute (AzBio). The research effort will be led at ASU by nine AzBio and Center for Solid State Electronics Research (CSSER) faculty: Frederic Zenhausern and Shawn O' Rourke at AzBio; David Allee, Dieter Schroder and Trevor Thornton from electrical engineering; Terry Alford and James Mayer along with newly-recruited Ghassan Jabbour from chemical and materials engineering; and Al Chasey from the Del E. Webb School of Construction.

"The Army's Flexible Display Center will integrate the best research being done in the government, universities and industry to rapidly bring to the soldier the full potential of flexible display technology," said Acting Deputy Assistant Secretary Research and Technology, Dr. Thomas H. Killion. "This paradigm shifting technology will make obsolete printed matter and the printing press."

The Flexible Display Center is a major undertaking by the U.S. Army that is being launched after an intense, nearly year-long, national merit-based competition. "This award is further evidence that ASU can compete with the nation's elite institutions for awards of this magnitude and importance on an international scale," said ASU President Michael Crow. "There is keen interest in our capability to develop advanced technologies, integrate those technologies together into working devices and deploy them in the most critical and demanding applications. It has enabled us to compete successfully to get this center against very stiff competition and a rigorous review process."

The award is testament to ASU's ability to attract vital resources to the university and advance high tech-based economic growth in the Valley. The reputation of the Arizona Biodesign Institute (AzBio), where most of the science for the flexible display initiative will be conducted, is key in winning such path-breaking proposals. The director of AzBio, world-renowned scientist George Poste, said passage last year of the Research Infrastructure Bill, which allocated $450 million to the state universities for the construction of world-class research infrastructure facilities, was an essential element in ASU's success.

Key Fulton faculty and researchers involved in this award, shown below (left-right): Frederic Zenhausern, David Allee, Trevor Thornton, Dieter Schroder and Al Chasey.
Not pictured: Terry Alford, James Mayer and Shawn Orourke.



During a site visit last September, representatives from the Army toured ASU's proposed location for the center, a state-of-the-art 250,000 square foot multi-functional display manufacturing R&D facility in the ASU Research Park. This headquarters for the new Flexible Display Center includes 43,500 square feet of advanced clean room space and extensive wet and dry labs. ASU's acquisition of this one-of-a-kind facility will allow a rapid deployment of physical infrastructure and start up for the project, a scenario the Army deemed important to the success of the project.

In addition to purchasing the Motorola facility, ASU is in midst of a rapid expansion of its research infrastructure, with facilities already purchased, under construction, and planned, which will add 1 million sq. ft. of world-class research space. The state of Arizona, with passage of the research infrastructure bill last June, has committed $185 million to ASU for research facilities that will attract top scientists and additional revenue, as well as spawn new business and industry in Arizona.

FLEXIBLE displays continued

"ASU's success in winning this award is the result of a well-thought-out, strategic and coordinated effort," said Jonathan Fink, Vice President for Research and Economic Affairs. "It is proof our new style of rapid, focused competition, including making major investments and commitments up front, positions us to triumph over more mature competing institutions.

"An incredible amount of work went into obtaining this award, and it has been inspiring to witness the teamwork, collaboration and extra effort that have gone into the process," said Fink. "I'm extremely proud, and I want to commend the entire ASU collaboration team and our industry partners for their leadership and tireless commitment throughout this effort."

With the lead efforts of the Ira A. Fulton School of Engineering faculty, the university-government-industry collaborative will provide innovative research involving backplane electronics, designing and developing novel materials for high performance thin-film transistors (TFT) on flexible substrates while creating new technologies relying on flexible reflective and emissive displays. Raupp said within the first year, the center will have a fully operational 6-inch (TFT) and an organic light emitting diode (OLED) pilot line, as well as a state-of-the-art OLED R&D laboratory, along with design and testing laboratories. Transition to larger display size will occur within a few years, as a so-called GEN II pilot line processing 370 mm x 470 mm substrates will become operational.

The first full color, conformal display prototype will be built in 30 months, with later phases of the research technology creating true flexible displays capable of withstanding repeated flexing and bending, and paper-like displays (e.g., a paper road map) that can be folded or crumpled arbitrarily.

"Think of these displays as thin computer screens that can be rolled up or folded and put in a warfighter's pocket," said Raupp. "The displays would be integrated with wireless communications technology linked to central command and control, enabling continual updating of information vital to a successful operation."

For example, these real-time displays will provide improved operational communications by supplying information on troop and enemy positions and movements, weather and environmental conditions and other important variables providing dynamic situational awareness.

As part of the Flexible Display Center, a suite of candidate display technologies will be developed and fully evaluated. Select technologies will be integrated into working prototypes and demonstrators for controlled field-testing by the Army and partner companies. The Flexible Display Center will have the capability of providing the Army and the partners pilot line quantities of displays. Learning gained through the prototyping activities will feed back into the research program to drive further advances in display size, capability and performance.

Illustrations produced by:
Michael Hagelberg, *ASU Research* magazine

Day in the life: Pamela Maass

My Schedule

Monday:

6 a.m.	wake up!
6-8 a.m.	work out at SRC (triathlon training)
8:15-9 a.m.	study group
9:15-10:30 a.m.	international management class
10:40-11:55 a.m.	senior design class, update on group project
12-1 p.m.	lunch with Heather in Manzy Square
1-3 p.m.	office hours
3-7 p.m.	homework
7-8 p.m.	dinner
8-10 p.m.	RELAX!

Tuesday:

7:40-8:55 a.m.	electric networks class
9:25 a.m.	meet Paula (RA) in Manzy Lobby to walk to swim class
9:40-10:30 a.m.	swim class cancelled, power outage
12:15-1:30 p.m.	cable TV class
6:00 p.m.	print flyers, and pack stereo to bring to hip hop meeting
6:30-7:30 p.m.	SWE hip hop night (leave early)
7-8:45 p.m.	Sun Devil Star Awards ceremony (leave early)
8-9:30 p.m.	conference council meeting
9:40-10:30 p.m.	answer emails, check phone messages
	Sleep ZZZZzzz

A day spent with Pamela Maass is a day spent in constant motion. From 6 a.m. work-outs to 9:30 p.m. staff meetings, her day is filled with school, work and volunteer activities around the clock.

Following her schedule for a day, one finds a list of who's who in the Fulton School of Engineering, all rolled up into one spunky, senior industrial engineering student.

By 9 a.m., Pamela has already put in two hours of exercise at the Student Recreation Center on campus, preparing for her upcoming triathlon, and one hour leading a study group for her international management class.

At 9:15 a.m., she is seated in her international management class, an elective for her certificate in international business, and is filling out her day's schedule and what she has to accomplish. When the professor begins his lecture on business culture in foreign countries and asks for class participation, Maass is the first student with her hand raised.

"I have learned that the more involved I get in an organization or a process, the more I get out of it," said Maass. "By being involved in campus life, I have had the door open to so many opportunities. I get to meet members of industry, sit on councils and make suggestions for improving ASU, and of course, get loads of free food. My involvement has taken me to conferences all over the U.S, and has allowed me to build countless friendships and gain mentors."

After attending international management, Maass stops by the Society of Women Engineers (SWE) table at the ASU engineering awareness day festivities to drop off a tablecloth for their display. As president of SWE, Maass spends many hours supporting women engineering students on campus through meetings, committee work and behind-the-scenes implementation.

Minutes later, she is with her senior design project team, and on her way to perform senior design project research at Honeywell.

"Our senior design project involves Honeywell's scrap material process and efficient and cost-reducing ways that we can restructure it," said Maass. "But my real interests lie far from that. I really want to apply problem-solving techniques to global challenges, such as the deteriorating environment facing human beings worldwide."

Upon arrival at Honeywell, the students are met by an enthusiastic employee, one who seems devoted to helping them with every aspect of their work. For three hours this employee supports the students' needs, answers every question and provides background information regarding their design project. Slightly after 2 p.m., the students begin packing up and preparing to return to ASU for more classes and homework. Maass, on the other hand, returns to ASU to finish planning and preparing for the evening's "Engineering Jeopardy" residence hall program.

As the hall coordinator for Manzanita's Engineering Living and Learning Community, Maass's responsibilities include developing and implementing weekly activities for freshman engineers living in Manzanita Hall. "Engineering Jeopardy" is this week's event, with prizes and of course, food; last week it was pizza with a professor. By 6 p.m., Maass meets volunteer resident assistants in the lobby of Manzanita to knock on dorm room doors and invite engineering students to the main floor classroom for Jeopardy and sub sandwiches.

"I recommend surrounding yourself with experiences, like 'Engineering Jeopardy,' that force you to meet new people," said Maass. "What inspired me the most during my undergraduate studies was the good influence from the new people I met along the way."

After leading Engineering Jeopardy, Maass turns her sights to facilitating the Fulton Freshman Engineering Student Council meeting from 8 to 9 p.m., and lastly, from 9:30 to 10:30 p.m., Maass attends a Manzanita Hall staff meeting with team building activities, to round out her day.

For some, Maass's day is too hectic with activities, appointments and hard work, but she would be the first to tell them, "anything worth getting in life is worth working for." This is definitely a motto Maass lives by.

Women Pick Up the Pace

The number of women in ASU engineering, computer science and construction has grown significantly since the early 1990s. In fact, undergraduate enrollment of women in the Fulton School has increased 77 percent from 1991 to 2003, three times the national average of 24 percent for the same time period.

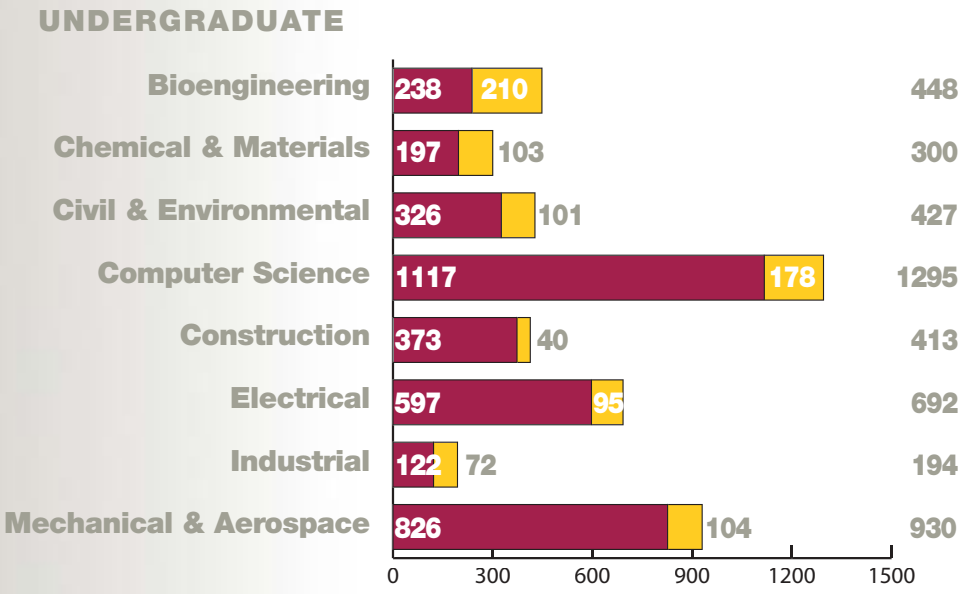
But even with such dramatic growth, only about one in five students in the school is female. Nineteen percent of undergraduates are women; the number is slightly higher—at 21 percent—for graduate students.

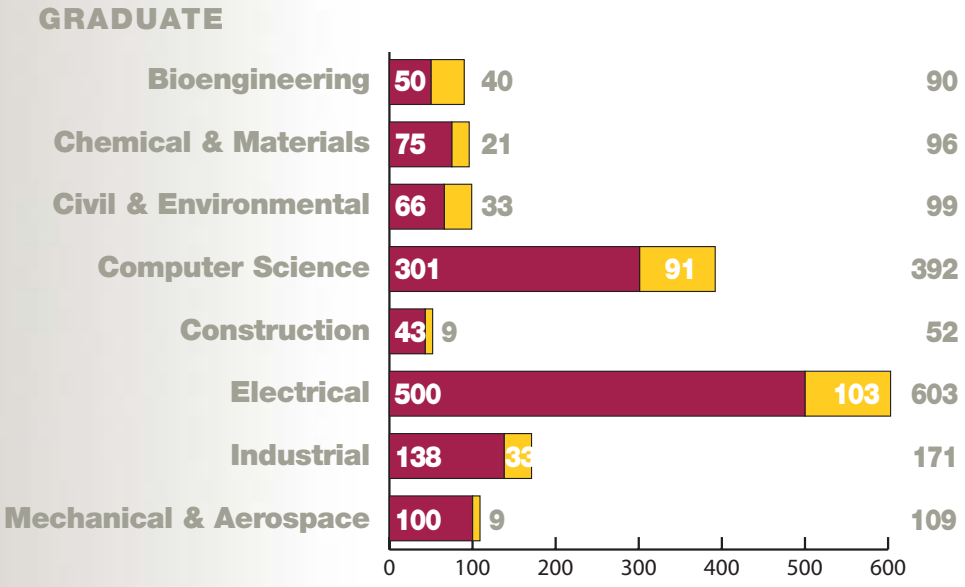
The averages mask underlying differences by department, however. A closer look at the data shows that women comprise almost half of all students in bioengineering (see the table on this page). One third of all chemical and materials undergraduates are women, as are one third of all graduate students in civil and environmental engineering. And 37 percent of the undergraduate students in industrial engineering are women.

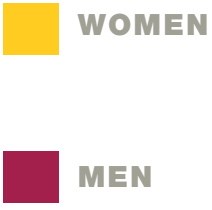
Smaller numbers of women have chosen computer science and engineering, electrical engineering, construction, and mechanical and aerospace engineering as majors. Three of these four are also the largest departments in the school, which impacts the overall average.

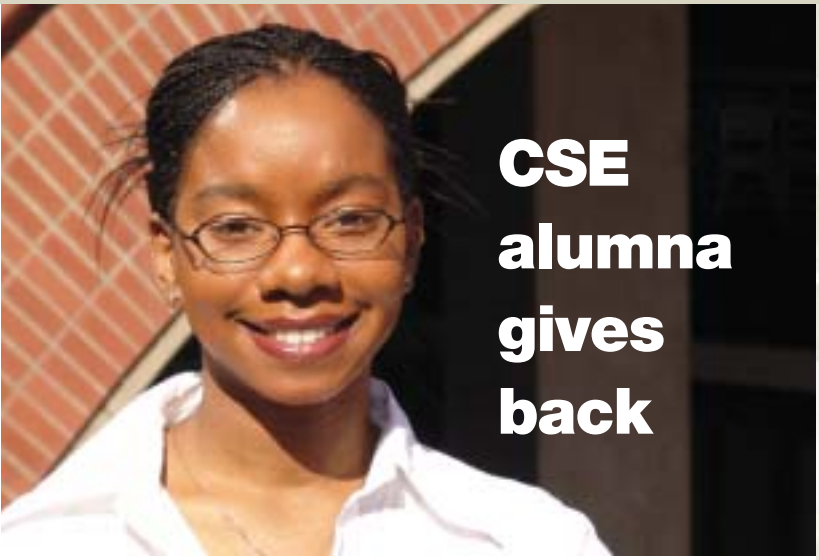
Diversity among the student and faculty populations is an important objective for almost all institutions of higher learning. It ensures a rich cultural and intellectual environment that facilitates growth and innovation.

As we continue to build our programs for recruiting and retention of underrepresented groups, we must understand the dynamics that attract individuals to an area of learning and motivate them to pursue it as a profession. In this issue of *Full Circle*, we are highlighting several successful women in engineering, computer science and construction in order to gain insight into what has led to their success.









CSE alumna gives back

When Sabrina Brown was a student at North High School in Phoenix, she spent her summers attending ASU's "Math and Science Honors Program." During her senior year, she received the prestigious Maroon and Gold Scholarship from ASU which enabled her to pursue a four-year degree in computer science and engineering.

"I think if you're fortunate enough to be on the giving, rather than receiving, end," said Brown, "then it's incumbent on us to give back."

After graduating in 2000, she established the Sabrina Brown Annual Book Scholarship for high school seniors. She is now a full-time systems engineer for Boeing and a part-time graduate student in computer science while still participating in numerous volunteer activities.

On average, Brown's schedule is packed with things like the Junior Achievement and Boeing's Math Academy, an after school program for sixth graders who need help in math. This past summer, however, she decided to add inaugural program coordinator to her resume by spearheading the AIMing for Success (AIMS) summer program—a 5-week Saturday class that taught seventh and eighth grade students how to design and create web pages. Brown contacted Dr. Mary Anderson-Rowland, associate dean of student affairs in the Ira A. Fulton School of Engineering, with her idea for AIMS. Anderson-Rowland was able to assist Brown with promotional materials such as applications and flyers as well as securing classrooms for the students. Brown not only taught the courses, but organized the material – including the workbooks, the program and the funding from Motorola.

Through the program, while learning about design, the students also learned about technology. More importantly, they could see the value of finishing high school and college to improve their choices for their future. Brown continues to mentor several students from her program.

"The driving factor behind creating AIMS stems from the fact that I can connect with people and inspire them to fulfill their dreams and aspirations," Brown said. "If I can share my experiences with people and teach them how to balance school with other activities, then I'm all for it."

For more information on the AIMS program or the Sabrina Brown Annual Book Scholarship, you may contact Brown directly at sabrinasbrown@yahoo.com

Del E. Webb alumnus helps the homeless

Most of the homeless population in Phoenix would go without food and shelter each night if it wasn't for the generous help of the community.

Now, the city, alongside numerous benefactors, is taking bold steps to address the problem. They've enlisted the help of D.L. Withers Construction, owned and operated by '74 ASU alumnus Dan Withers. The downtown project, when completed, will be called the Human Health Services Campus., The campus will be a multi-agency center for Phoenix's homeless by providing food, shelter, job training and health care to people in need. Withers Construction has set a tentative completion date for the end of 2004.

"It's our biggest project right now," said Withers.

But it is certainly not the only project. Withers Construction has been in existence for the past 25 years, with an annual volume of construction projects that exceeds $180 million in revenue. They have worked on more than 120 school projects—everything from elementary schools to university facilities. Withers Constructions annually ranks among the top ten of the general contractors and construction managers in Arizona.

For his efforts, Withers was honored as the recent recipient of the outstanding Del E. Webb School of Construction (DEWSC) alumni award for 2003. Other personal credits include being a founding member of the Alliance for Construction Excellence (ACE), a regional center that supports construction and associated fields in the southwest, an active member of the DEWSC Industry Advisory Council and president-elect for the College of Architecture Industry Council.

A success story such as this one is made over time. When Withers originally began in the construction program at ASU, he cited down-to-earth people and professors, and program diversity as having a huge influence in his career.

"The construction program at ASU is the first launching point for professionalism," said Withers. "It helps develop an attitude to take into industry."

Before breaking out on his own in 1981, Withers worked for five different companies, picking up valuable business skills with each one. Because he had to work two, sometime even three jobs to get by, he understands the hard work and dedication it takes to finish school, making him appreciate the fortunate position he is in today. D.L. Withers Construction currently sponsors a needs based scholarship worth $60,000 as well as a contracts class for students in the DEWSC program.

On why it's important for alumni to contribute to today's students, Withers said, "It's good for students to see industry professionals because it brings reality to their future."

For more information on the Del E. Webb School of Construction, see http://construction.asu.edu

Alumna integrates engineering with business savvy

1999 ASU alumna Brenda McCaffrey has a touch of what the industry calls "the entrepreneurial spirit."

From the beginning, McCaffrey knew the potential pitfalls and failure rates of an engineering start-up company. McCaffrey, however, was exposed to success in business at a young age from her father's entrepreneurial enterprises in Hawaii.

After spending some time with companies such as Motorola and the Brooktree Corporation in San Diego, McCaffrey left to pursue a Ph.D. at ASU and later to start and become president and CEO of White Mountain Labs (WML) in 1999. WML is an independent test facility for electro static discharge and latch-up in semiconductor components. Now, WML is leading the industry in technology and experience in the field of integrated circuits, with over 2,000 completed projects for more than 50 different companies worldwide. In just four years, the company has passed the one million dollar mark in annual revenue.

"I credit ASU with everything I needed to start my technical business and the knowledge to have been successful with it," McCaffrey said.

While McCaffrey received her Ph.D. in electrical engineering, she also participated in business classes through the industrial engineering department, enabling her to create a business plan and emerge from ASU with the knowledge to start WML.

Brenda McCaffrey at White Mountain Labs, a company she started after receiving her Ph.D. from ASU.

"I didn't originally think of having my own business while in my Ph.D. program," McCaffrey said. "However, through the guidance of professors such as Dieter Schroder, Kevin Dooley, Michael Kozicki and David Allee, I saw the options available," McCaffrey said.

McCaffrey plans to expand her ties with ASU by establishing a research partnership between WML and the Fulton School. The venture will provide new directions for WML by establishing student internships and joint grant writing opportunities with professors.

McCaffrey regularly invites engineering students into her lab so they can see first-hand tangible possibilities of their degrees. She also encourages students to make contacts with future employers by interviewing industry leaders in their field of interest and to include taking business classes in their studies.

"The students must have the confidence to get out there and take risks," McCaffrey said. "This is what ASU did for me."

For more information, go to http://www.whitemountainlabs.com

Accolade

Subhash Mahajan honored

Subhash Mahajan has received dual honors: The Minerals, Metals & Materials Society's 2004 Educator Award for outstanding contributions to education in materials science and engineering and the coordinating editorship position for ACTA material science journals. Mahajan will serve as coordinating editor for a five-year period.

Annihilating Alzheimer's

Thanks to the continuing development of modern medicine, the average human life expectancy is well into one's seventies; however, more than 10 percent of the population over the age of 65 and more than 30 percent of the population over the age of 85 becomes afflicted with Alzheimer's disease.

Warren Marcus is a postdoctoral researcher assisting Michael Sierks in eradicating the scourge of Alzheimer's through antibody-based therapeutics.

"Alzheimer's is a very debilitating disease," said Michael Sierks, associate professor in chemical engineering in the Ira A. Fulton School of Engineering, "The person loses the ability to function normally—their ability to communicate, their spatial orientation, and their memory are gone—it's very hard on them and their family."

Sierks' interest in the disease stemmed from first hand experience within his own family. While he was reading up on Alzheimer's for personal knowledge, he discovered how applicable his background in protein engineering would be to neurodegenerative disease research.

"It's an engineering approach to biomedical research," said Sierks.

The exact cause of Alzheimer's has yet to be discovered. Why some people develop the disease and others don't is still a major debate in the research and scientific community. There are, however, two leading pathological culprits involving naturally produced proteins inside the body. The beta-amyloid and tau proteins, found normally in healthy people, aggregate and misprocess to form what are called amyloid plaques and neurofibrillary tangles. These anomalies are found in abundance inside the brain of an Alzheimer's patient. It is not known whether these protein aggregates specifically cause the disease, but it is agreed they play a major role in its progression.

Sierks' research focuses on developing antibodies that will prevent the formation of the plaques. He is exploring different methods of attacking the proteins before they reach a toxic level by focusing on two different approaches: the creation of bound antibodies that prevent aggregation, and the creation of catalytic antibodies that will break apart the proteins. Sierks is currently testing these methods *in vitro* and preliminary results have yielded positive results, encouraging Sierks to get ready for the next step, which will be broadening his research into animal models to develop more specific and stable antibodies.

While reading up on Alzheimer's for personal knowledge, Sierks discovered how applicable his background in protein engineering would be to neurodegenerative disease research.

As with AIDS, there is not likely to be one single cure for Alzheimer's disease.

"In the way of therapeutics," said Sierks, "I think we're going to find that a little bit of each treatment method is going to work better than a lot of just one."

Sierks is collaborating with other research facilities such as Sun Health Research in Phoenix and the Wadsworth Center in New York, and with the School of Life Sciences at ASU. Sierks is expanding his research to treating Parkinson's and Huntington Diseases, two other protein-based neurodegenerative diseases.

For more information, you can contact Michael Sierks directly at Sierks@asu.edu

National leader in water quality research and environmental sustainability comes to ASU

John Crittenden, a national leader in water quality research and environmental engineering and a member of the National Academy of Engineering, is joining Arizona State University to continue his cutting-edge research in the area of sustainability.

Crittenden said the opportunity to expand his research onto a regional scale was an important factor in coming to ASU.

"There is a framework in place at ASU to support research into sustainability," he said. "Programs like Greater Phoenix 2100 and the Consortium for the Study of Rapidly Urbanizing Regions will help expand our work in sustainability into what will likely have a greater impact. We could help make the Valley a more sustainable place in which to live.

"Pollution prevention focuses on designing more environmentally friendly products," Crittenden added, "but sustainability rises to a level above that. It considers the social, environmental and socio-economic aspects of technology advancement.

"Students are very excited about working in this field, because the new contributions of environmental engineers and scientists will be in sustainability," Crittenden said. "The only practical solution to our environmental problems is to engineer systems that sustain the entire world's population now and into the future."

Crittenden will hold the Richard Snell Presidential Chair in the department of civil and environmental engineering at ASU's Ira A. Fulton School of Engineering. He began his appointment in January 2004.

Sustainability strives for development of technologies that are ecologically sound, economically viable, socially just and humane.

John Crittenden, a member of the National Academy of Engineering, will hold the Richard Snell Presidential Chair in the Department of Civil and Environmental Engineering and brings to ASU a wealth of expertise in sustainability issues.

"The development of knowledge and tools to advance economic and environmental well-being will be a critical area of interest on campus and off," said ASU President Michael Crow. "John Crittenden is a leader in this area, and his work will play a crucial role in mapping out a future that will achieve economic vitality and environmental sensitivity to the Valley and beyond."

"John Crittenden brings considerable talent and enthusiasm to a very important and emerging branch of engineering, that of sustainability," added Peter Crouch, dean of the Fulton School of Engineering. "His ideas on sustainability are ambitious, his influence on students is significant, and he will challenge all of us to think about common problems in new ways."

Crittenden was formerly Presidential Professor in civil and environmental engineering at Michigan Technological University, Houghton. He is a leader in air- and water-treatment technologies, particularly the development of processes for the removal of toxic organic compounds. Crittenden and his colleagues have developed and patented a variety of technologies that remove dangerous compounds, such as benzene, from drinking water supplies.

It is for this work that he was elected to the National Academy of Engineering in 2002, one of the highest honors bestowed upon an engineer.

Crittenden also played a crucial role in development of the National Center for Clean Industrial Treatment Technologies, a consortium between Michigan Tech, University of Wisconsin, Madison, and the University of Minnesota, Minneapolis. The center, which performs research into various aspects of sustainability, includes the participation of 57 companies and 33 governmental agencies. Its work has led to 200 publications and seven patents.

The center also involves the work of 60 faculty and more than 300 students, a key component in spreading the influence of sustainability.

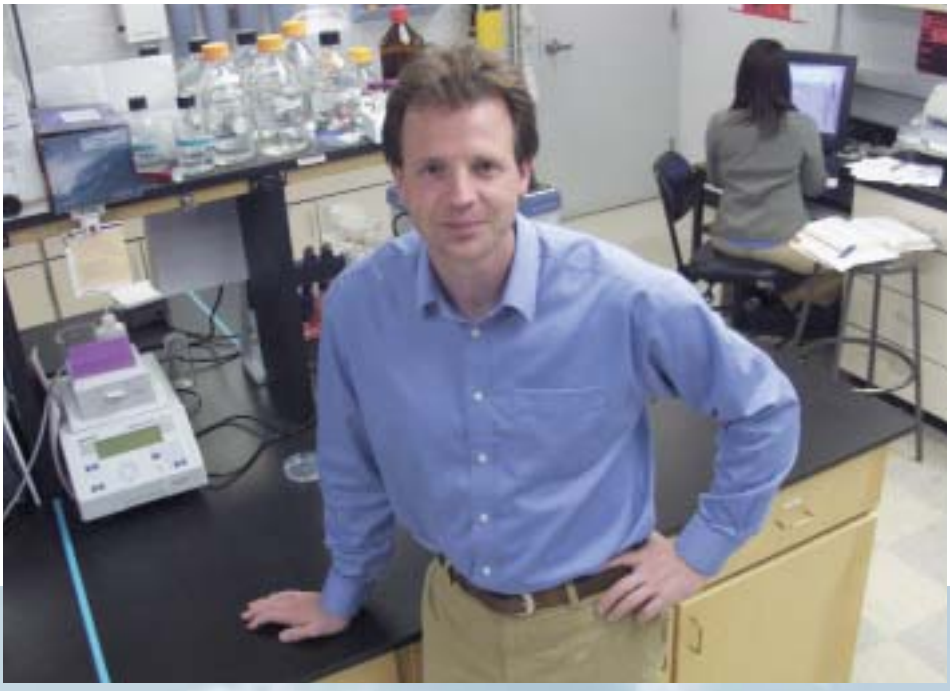
"Ira Fulton provided our school with significant sponsorship," said Dean Crouch. "John Crittenden is one result of that investment. We want to improve the school by attracting the best engineering talent to ASU."

The Richard Snell Presidential Chair is a rotating appointment that can be used in any ASU discipline or school, and is designated by the ASU President.

Sustainability strives for development of technologies that are ecologically sound, economically viable, socially just and humane.

NSF CAREER award winner seeks to understand environmental effects of biosolids

Backyard gardeners have long valued the benefits of composting. Since the 1970s, the EPA has recommended recycling a wastewater treatment product, or biosolids, to use as a fertilizer on agricultural land. However, an EPA-sponsored National Academy of Sciences report on biosolids recently concluded that the data in which the EPA has to say biosolids are safe for agricultural use was outdated.



Jordan Peccia's research characterizes microbial populations in biosolids using DNA microarrays.

"Of the options available, what really makes the most sense is putting biosolids on agricultural land," said Fulton School assistant professor of civil and environmental engineering, Jordan Peccia. "On the other hand, biosolids are full of heavy metals and they do have pathogens in them—not all of them die. Right now, there is insufficient evidence out there to say whether it's a public health safety issue or not."

Now, Peccia's research will provide the first detailed environmental analyses of biosolids-treated agricultural land. Peccia recently was the recipient of a five-year $400K NSF CAREER Award for early career development, given to researchers deemed most likely to become the academic leaders of the 21st century.

After biosolids are placed on agricultural fields, environmental forces such as wind gusts, storms or plowing can aerosolize the biosolids into a plume that can reach downwind populations. "The trick is how you sample the wind," said Peccia. "How much does the wind have to blow to get particulate matter in the air?" To address this question, Peccia has designed a special wind tunnel, which he can place directly on the ground to determine the effect physical properties such as soil type and wind speed have on aerosolizing the particulate matter.

In order to characterize the amount and types of microorganisms present in the air, Peccia relies on liquid impingers that, through a high vacuum, suck in air samples. Peccia's group also determines the amount of heavy metals and other chemical contaminates that may be present.

From pilot studies, Peccia determined that the amount of wastewater indicator bacteria in the air increases as much as ten-fold on a windy day. Using the wind tunnel combined with state-of-the-art DNA microarray analysis will ultimately confirm the identity of aerosolized microorganisms and provide evidence to support or not support the hypothesis that pathogens can become aerosolized microbial soil pathogens.

"DNA microarrays are like a computer chip with sequences of DNA from all the different pathogens and antibiotic resistance genes," said Peccia. Peccia's group can take a soil and air sample, isolate the DNA, and use the microarray to match the test soil DNA against the DNA of known microbial pathogens.

Peccia hopes that from the results of these studies, he can gain a true understanding of the physical and environmental properties that contribute to biosolids aerosolization to help ensure that the practice is safe and sustainable. Additionally, he will take his results directly into the curriculum to use as case studies for environmental engineering courses and expand offerings to the non-scientist by focusing on environmental issues.

Peccia also plans to expand the international scope of the project through continued collaborations with the University of Baja California in Mexico that look at water issues in developing countries. "I want to take care of my own research group and provide them with opportunities to be more well-rounded, other than just doing research in the lab," said Peccia.

For more information, see http://www.fulton.asu.edu/civil/Faculty/Peccia.htm

AzBio Researchers Go From

Idea to Application

to Help People with Disabilities

A car crashes. An athlete crumples to the ground from a blow to the back. In the unfortunate tragedies that result in spinal cord injuries, in an unforgiving flash, worlds are forever changed.

The research work of Ranu Jung and James Abbas, both associate professors in the Harrington Department of Biomedical Engineering and co-Directors of the Center for Rehabilitation Neuroscience and Rehabilitation Engineering at the Arizona Biodesign Institute (AzBio), aims to better understand how the nervous system is affected by such trauma, and in the process, help people rehabilitate and regain some of their lost function.

"We are trying to design and develop the systems or the knowledge base that will improve the quality of life for people with disabilities," said Abbas.

Both Jung and Abbas, who also has a joint appointment as director of Clinical Rehabilitation Engineering at the Banner Good Samaritan Medical Center in Phoenix, focus on clinical outcomes as they collaborate with other basic scientists, engineers and physicians to improve the quality of life for people with spinal cord injury.

In order to better understand the nervous system, Jung and Abbas take a learning cue from nature in order to advance their research. "A lot of the things we do are based on the idea of neuromorphic engineering," said Jung. "What we're trying to do is design a system to replace the nervous system." The neuromorphic engineering concept, attempts

Ranu Jung is an associate profession in the Harrington Department of Bioengineering and co-director of the Center for Rehabilitation Neuroscience and Rehabilitation Engineering.

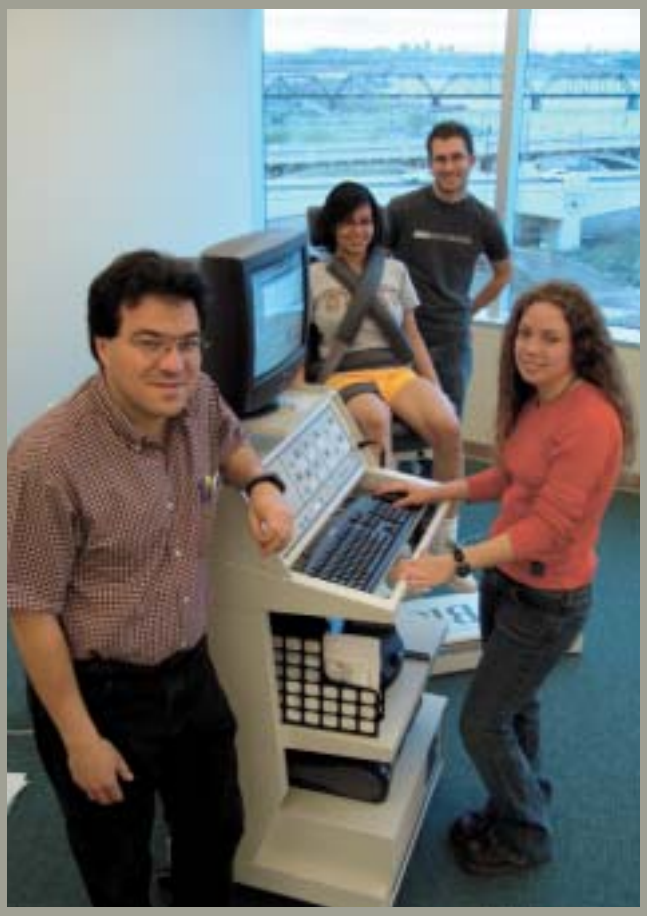
to mimic how our bodies' own nervous system functions and use this knowledge as the foundation for designing engineering systems. "The goal is to get FDA approval for our devices," said Jung. "It would be the translation from an idea all the way up to a clinical application; the concept of going from lab bench to bedside."

The spinal cord creates electrical signals in order to get muscles to contract, so by recording this electrical signal and measuring the biomechanical movements generated by the contractions, they can reproduce the signal to create a desired response. "It's a matter of abstraction," said Jung. "We perform animal studies to understand how the nervous system works, how it is affected by trauma and to understand how our devices can interact with the nervous system." Jung and Abbas apply the results from these animal studies into designing devices that help people with spinal cord injury regain function. "We have studies going on that look at the idea of using electrical stimulation to activate muscles in therapy to promote better recovery after incomplete spinal cord injury," said Abbas.

Another useful feature integrated into the control system is an adaptive logic that responds to an individual's rehabilitation program. "Much of the research we are doing is on how we can improve the quality of control by automatically adjusting the stimulation levels," said Abbas. "We're refining the design and we're doing animal studies and human subjects testing behind this concept of adaptive control and electrical stimulation to get better recovery after incomplete spinal cord injury,"

This approach is also being applied to help other patients with neurological disabilities like Parkinson's disease. "There are some opportunities for using similar types of approaches to develop systems to assist people with stroke, or brain injury or Parkinson's disease," said Abbas. He and his collaborators from clinical sites around Phoenix are developing new techniques to improve deep brain stimulation systems, which are implants that alleviate the tremors associated with Parkinson's disease. "We hope we can help shape the evolution of the next generation of deep brain stimulation systems."

For more information on spinal cord injury rehabilitation work, see http://eas.asu.edu/~bme/new/.



James Abbas (above) with research students at the Center for Rehabilitation Neuroscience and Rehabilitation Engineering. Students (below) demonstrate muscle rehabilitation using equipment in the lab.

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Former ASU engineering professor's Unified Approach applies to more than measurement

"It's an almost cult-like following." That's what Jack Freytag, former ASU student and now director of Charles Salter Associates of San Francisco says about Pete Stein, a retired ASU measurement systems engineering professor.

"Every week I run into something that came from his class," Freytag said. "But more importantly, "we have a unique and special relationship in the sense that it began as a student-professor association and has been maintained and developed into a professional and personal association."

Stein is the creator of the Unified Approach to measurement systems, the first rational, self-contained and systematic approach to engineering measurement problems not discussed by the educational system. It is measurement theory that combines all the engineering disciplines with reality.

"I feel strongly about keeping up student relations," Stein said. Of his Unified Approach,

For more than 35 years Pete Stein has continued to influence the lives of students through his active participation in alumni programs.

"My students were able to take something with them that I had personally created and of course, they left something personal of themselves, as students always do."

He had been an educator in the university system for more than 23 years. Stein's Unified Approach was the basis of the B.S., M.S. and Ph.D. degrees in measurement systems Engineering at ASU. During his time here, he also created the Laboratory for measurement systems engineering.

Stein left ASU in 1977 after serving 18 years, but continued an impressive assemblage with his former students, partly through the distribution of an underground alumni-type newsletter, which was completely supported by outside sponsors.

The semi-annual newsletters that have spanned 25 years covered the current careers and positions of Stein's students–all 960 of them. Each issue gives detailed, up-to-date coverage on the activities of everyone who has passed through Stein's classrooms. The last issue ran 255 pages.

The Fulton School would like to bestow Stein with Emeritus status, which will enable a scholarship to be set up in his name.

To find out more about Pete Stein, and the Unified Approach to the engineering of measurement systems, go to http://home.global-crossing.net/~meas-sys/