



**we build  
engineers**

**ASU** Ira A. Fulton  
Schools of Engineering  
ARIZONA STATE UNIVERSITY

# fulton engineering students

**8,775**

fall 2012

enrollment (+13%)

**1,542**

first-time freshmen

(+21%)

## building engineers

E2 Camp for all freshmen  
Welcome week activities  
Residential communities  
Retoiled introductory classes  
Community service via EPICS  
Undergraduate research  
Student organizations  
Mentoring opportunities  
Competitive teams  
Undergraduate teaching assistants  
Study abroad opportunities  
Internships  
Career planning and events  
4+1 bachelor's+master's programs  
K-12 outreach: engineering camps,  
*FIRST* LEGO League,  
Engineering Open House

**15%+** of engineering undergraduates are enrolled in the **honors college**  
(highest % at ASU)

**151 National Merit Scholars**  
1207/26 average SAT/ACT

## student scholars

18 Flinn Scholars                      National Achievement Scholar  
6 Gates Millennium Scholars      58 National Hispanic Scholars

**1,653**

degrees granted, 2011-12

843 baccalaureate degrees; 810 graduate degrees  
23% increase over 2010-11

**34,000+** alumni

## new facilities

eSpace, Brickyard Mezzanine and ISTB4

**Read more about our students:**  
[engineering.asu.edu/achieve](http://engineering.asu.edu/achieve)



FlashFood had a first place finish in the 2012 U.S. Finals of the Microsoft Imagine Cup.



SafeSIPP took the top prize at ASU's 10,000 Solutions Showcase.



Members of the 33 Buckets team visit a girls' school in rural Bangladesh. The team had a top five finish in the 2012 world finals of the Dell Social Innovation Challenge.



# use-inspired research

# faculty awards

James Adams, Fellow of ASM International–The Materials Information Society

Ron Adrian, Regents' Professor

Soyoung Ahn, National Science Foundation CAREER Award

Brad Allenby, President's Professor and 2012 Lewis Mumford Award for Outstanding Scholarship in the Ecology of Technics

Samuel Ariaratnam, 2012 Trenchless Technology Person of the Year

Chaitali Chakrabarti, IEEE Fellow

Nikhilesh Chawla, Fulton Professor of Materials Science and Engineering

James Collofello, Engineers Week 2012 Outstanding Educator of the Year

Joseph Davidson, Charles Kettering Lifetime Achievement Award, The Ohio State University

David Frakes, National Science Foundation CAREER Award

G. Edward Gibson, Jr., appointed to the Board on Infrastructure and the Constructed Environment

Michael Goryll, National Science Foundation CAREER Award; Fulton Engineering Teaching Excellence Award

Stephen Helms Tillery, Centennial Professor honoree

Lina Karam, 2012 Intel Outstanding Researcher Award in High Volume Manufacturing

Edward Kavazanjian, Karl Terzaghi Award (ASCE) and elected member of the National Academy of Engineering

Rosa Krajmalnik-Brown, Phoenix Business Journal's 2012 "Forty Under 40" list recognizing young leaders in the metropolitan area

Amy Landis, Carnegie Science Award

Jing Li, National Science Foundation CAREER Award

Jerry Y.S. Lin, Regents' Professor

Huan Liu, IEEE Fellow

Barzin Mobasher, Best Paper, Journal of Advanced Concrete Technology

Bruce Rittmann, IWA Fellow and Distinguished Member of the American Society of Civil Engineers

Clifford Schexnayder, elected member of the National Academy of Construction and Lifetime Achievement Award from the American Society of Civil Engineers

Vijay Vittal, 2013 IEEE Herman Halperin Electric Transmission and Distribution Award

Junshan Zhang, IEEE Fellow

Initiated **Fulton Entrepreneurial Professors Program** to promote and support the translational efforts of our faculty

Initiated **Tooker Professors Program** to recognize and encourage innovation in our academic mission

**\$75.1M**  
**research awards**  
external sponsored project awards (+11.6%) FY 2012

**\$77.6M**  
**research expenditures**  
FY 2012

**101** invention disclosures  
a 42% increase over FY2011

## faculty honors

- 1 Nobel Laureate
- 9 Members of the National Academy of Engineering
- 2 Members of the National Academy of Sciences
- 3 Members of the National Academy of Construction
- 9 Regents' Professors
- 2 ASU President's Professors
- 2 PECASE Awards
- 56 NSF CAREER Awards (1995-2012)

**56 NSF CAREER**  
**awardees** 1996-2012

**235** hired 25 new faculty  
**tenured and tenure-track faculty** 2012-13

**31 patents** 2010-2012



Quantum Energy and Sustainable Solar Technologies  
**ASU's first NSF-DOE Engineering Research Center**

## global

\$30M in commitments from Intel, Vietnam and the U.S. to scale the HEEAP project, increasing the faculty and leaders trained from 140 to 4,000 in the next five years.

3+2 international bachelor's + master's program growth from 39 students in fall 2011 to 67 students in fall 2012.



# inspiring future engineers

**ASU** Ira A. Fulton  
Schools of Engineering  
ARIZONA STATE UNIVERSITY

# the fulton difference

**Transcending the traditional:** We have moved past traditional disciplinary-driven cultures, programs and organizations.

**Focusing on student success:** We care. Our unique first-year program has led to nearly 90 percent retention of our incoming freshmen within the university.

**Enhancing the student experience:** It's more than coursework. We offer a wide range of experiential opportunities to enhance the overall student learning experience.

**Leading use-inspired research:** We create solutions to problems in energy, health, sustainability, security and education.

**Attracting top faculty:** It is the success of our students and the impact of our research and entrepreneurial activities that matter.

**Inspiring future engineers:** We are engaged in creative programming and activities designed to inspire and attract young minds to engineering.



Senior capstone projects prepare graduating seniors for the transition from student to practicing engineer.



The

# ACADEMIC

# BOWL

at ASU

Ira A. Fulton Schools  
of Engineering  
M...

8.885



Wesley

John

Albert

Pradyumna

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# IRA A. FULTON SCHOOLS OF engineering

Dean  
Paul C. Johnson

## school of biological and health systems engineering

School Director  
**Marco Santello**  
enrollment **806**  
undergraduate **686** graduate **120**

## school of computing, informatics, and decision systems engineering

School Director  
**Ronald G. Askin**  
enrollment **2,313**  
undergraduate **1,570** graduate **743**

### research themes

**education**

**energy**

**health**

**security**

**sustainability**

medical devices and  
diagnostics  
biosensors

molecular, cell and  
tissue engineering  
regenerative medicine  
human-machine  
interfaces  
neuroscience

assistive and  
rehabilitative devices  
motor control

biomaterials and  
therapeutics delivery

synthetic and systems  
biology  
imaging

nano/micro biodevices  
lab-on-a-chip  
predictive health  
analytics

computational  
biological engineering

bioengineering  
education research

bioinspired complex  
adaptive systems

nonlinear dynamics of  
biological systems

personalized learning  
educational gaming

assistive devices

biomedical informatics  
low power computing

green datacenter  
operations

healthcare system  
engineering

information assurance  
production logistics

artificial intelligence  
transportation

data mining

sustainable supply  
chains

social computing  
network science

embedded and  
cyberphysical systems

quality and reliability  
engineering

### degree program

biomedical engineering  
(Harrington Bioengineering program)

### degree programs

computer engineering  
computer science  
computer systems  
engineering

engineering  
management  
industrial engineering  
informatics

# school of electrical, computer and energy engineering

**School Director**

**Stephen M. Phillips**

enrollment **1,692**

undergraduate **719** graduate **973**

power and energy  
systems

analog and digital  
circuits

solid state devices/  
materials

semiconductor devices  
and materials

sensors and control  
systems

communications and  
networks

wireless and mixed-  
signal circuits

**degree programs**

computer engineering  
electrical engineering

electromagnetic fields  
and waves

signal processing/  
communications

photovoltaics and solar  
energy

biosensors and  
bioelectronics

biosignatures discovery  
automation

flexible substrate  
electronics/displays

power grid  
management/stability

# school for engineering of matter, transport and energy

**School Director**

**Kyle Squires**

enrollment **2,604**

undergraduate **2,091** graduate **513**

electrical and thermal  
energy storage

energy conversion  
processes

metabolic  
engineering

rehabilitation robotics

neural control of  
movement

therapeutics and  
bioseparations

adaptive and  
intelligent materials  
and systems

**degree programs**

aerospace engineering  
chemical engineering  
materials science and engineering  
mechanical engineering  
solar energy engineering and commercialization

risk assessment and  
damage prognosis

CO<sub>2</sub> capture

remote sensing

multiscale modeling

materials  
characterization

computational  
mechanics

membranes

personalized learning

engineering  
education

# school of sustainable engineering and the built environment

**School Director**

**G. Edward Gibson, Jr.**

enrollment **1,106**

undergraduate **881** graduate **225**

biofuels

waste conversion to  
energy

public health-  
technology-  
environment  
interactions

connections between  
human health and  
micro-organisms

infrastructure and  
product life cycle  
analysis

**degree programs**

civil, environmental and  
sustainable engineering  
construction engineering  
construction management  
(Del E. Webb School of Construction program)

earth systems  
engineering

water purification

resource-climate  
interactions

indoor air quality

SMART innovations

transportation  
materials and systems

project performance

underground  
infrastructure

Participation in E2 Camp has been shown to increase retention.

A group of diverse young adults are gathered outdoors in a wooded area, participating in an activity. They are holding up numerous colorful foam rollers (in shades of purple, pink, orange, green, and teal) high above their heads, creating a vibrant, vertical display. The participants are smiling and looking upwards, suggesting a fun and collaborative exercise. Some individuals are wearing lanyards with identification badges, and one person in the foreground has a colorful tie-dye shirt. The background shows trees and a wooden building, indicating a camp or outdoor education setting.

**student experience**

# engineers from day one

**We strive to create a strong engineering community and support network that help our students be successful and make the most of their educational experience.**

## **E2 Camp**

E2 Camp, our orientation for freshmen, is the first step in our “Engineers from Day One” initiative, and an integral part of our student success strategy.

Held in the mountain town of Prescott, Ariz., the three-day camp is designed to create a strong sense of community for our incoming class and introduce core concepts of team-building and problem-solving. Students learn engineering principles through team projects, physical challenges, competitions and workshops. Our new students have the opportunity to meet current students, faculty, staff, alumni and supporters in a welcoming environment that students say not only prepares them to start college, but gets them excited about being engineers.

In 2008, the first year that E2 Camp was initiated, 665 freshmen attended. Consistent with our growing enrollment, nearly 1,300 students attended the 2012 camps.

## **Engineering residential community**

First-year students have the opportunity to enrich their academic experience through the Engineering Residential Community, a smaller campus community within the larger university.

Residents have easy access to undergraduate academic support services such as tutoring, workshops, advising and study groups. Countless activities from sports to games to social events help connect new students to academic peers, mentors, faculty and others who share similar interests.

The on-campus living and learning community significantly contributes to the successful transition into the university for freshmen.

## **Barrett, The Honors College**

Barrett is a selective residential college that recruits academically outstanding undergraduates from across the nation. Engineering courses with an honors designation provide opportunities for collaboration with faculty on special projects and an expanded understanding of the course subject matter.

In fall 2012, over 15 percent of all undergraduate engineering students were concurrently enrolled in Barrett—the highest percentage of any school or college at ASU.

## **Experiential curriculum**

As freshmen, our students take Introduction to Engineering (FSE 100), an interactive class designed to provide hands-on experiential projects and innovative curriculum from day one. Working in teams, students are introduced to the engineering profession as they learn the design process, engineering models and critical communication skills.

Our engineering students complete their experience with a senior design class. During this capstone class, students bring the knowledge and skills gained during their undergraduate experience to bear on actual design problems. Many capstone projects are done in conjunction with ASU researchers and industry partners to create equipment and solutions that solve an immediate need.

We are working to create an intermediate design class that sits between the freshman and senior classes, which would provide our students another valuable opportunity to put their growing skillset to work.

## **Senior capstone**

Our senior capstone provides comprehensive design experience for our engineering students in the last year of their undergraduate studies, preparing them for the transition from student to practicing engineer. The capstone solidifies their knowledge and experience, giving students the opportunity to put their skills to work by solving a practical engineering design problem.

Working individually or in teams, students take a project through definition, design, implementation and testing. They also must take into account budgetary, environmental, ethical, political and health and safety considerations, as well as design for manufacturability and sustainability.

The capstone projects provide a bridge between coursework and industrial application. A critical component of the program is our network of industry partners. By offering a wide range of real-world projects, students can find the right match for their academic interests and career goals.

## Undergraduate research

Hands-on experience is an important component of our undergraduate experience and students are encouraged to explore opportunities to work with faculty, graduate students and other undergraduates on real-world research projects. Students develop confidence in their ability to be creative and innovative and gain insight to what it is like to be a graduate student at a research-intensive university.

Our signature program is the Fulton Undergraduate Research Initiative (FURI). Students can participate in the program from the second semester of their freshman year through graduation. The research program combines research, mentorship, a stipend and research supply budget to enable undergraduate students to gain hands-on experience early in their education. The travel grant program helps students participate in national conferences and present their research.

FURI began in 2005 with 35 students. Participation has quadrupled to more than 150 students last year. Over 180 students presented their research at the semiannual symposiums, attracting over 400 visitors.



### Fulton Grand Challenge Scholars Program

Endorsed by the National Academy of Engineering (NAE) in February 2009, the NAE Grand Challenge Scholars Program is designed to engage and encourage exceptional students through an innovative curriculum and cutting-edge research experiences.

Through completion of the five components of the program, students have the opportunity to engage in research relating to their selected grand challenge, explore interdisciplinary coursework, gain an international perspective, engage in entrepreneurship and give back to the community through service learning.

Fulton Engineering was selected as the first non-founding partner in the program. Founding schools include Duke University's Pratt School of Engineering, the Franklin W. Olin College of Engineering and the University of Southern California's Viterbi School of Engineering.

Fulton students who complete the program achieve the distinction of Grand Challenge Scholar, endorsed by ASU and the National Academy of Engineering.

### Bachelor's plus master's accelerated programs

The 4+1 programs offer high-achieving students an opportunity to earn both a bachelor's and master's degree within five years. It is a cost-effective way to gain additional technical depth and specialization that can lead to expanded career opportunities as well as preparation for doctoral studies.

Ten degree programs within the Fulton Schools of Engineering offer the accelerated 4+1 option.



# fostering success

Engineering is a rigorous program. We are committed to helping our students achieve their academic goals and go on to pursue their dreams.

## Student support services

Fulton Engineering offers a number of resources to help students make the transition from high school to college, and be successful throughout their time with us.

**Online workshops** in time management, study skills and test preparation—aimed specifically at engineering students—help students learn to study smart.

The **Engineering Tutoring Center** is a free resource to help students in engineering subjects and prerequisites.

Tutors in the center are paid student workers, gaining valuable leadership and mentoring skills, and solidifying their knowledge of the subject matter.

Our **Undergraduate Teaching Assistant (UGTA)** program selects successful undergraduate students to serve as teaching assistants in freshman-level engineering classes. UGTAs assist faculty members by engaging students in exploratory and collaborative learning activities. UGTAs act as a cultural bridge from high school to the university environment, help freshmen navigate the institution, promote self-confidence and self-reliance, and act as role models for new students.

## Creating connections

The Engineering Career Center is a comprehensive resource that serves students, alumni and industry. The center combines both in-person and online resources from career coaching to serving as a single-point of contact to connect industry recruiters and job seekers.

For new engineering students, the Career Center hosts a Career Exploration Night. Now in its third year, the annual event is designed to get first-year students thinking of themselves as engineers and planning early for a successful career. The event attracts over 1,000 students and hundreds of professional engineers and industry representatives each year.

Students and alumni have access to a robust, nationally networked online system to post resumes and search for jobs.

The Center has held semiannual career fairs since 2008—growing from 59 companies and 788 students in fall 2008 to over 105 companies, 300 recruiters and 2,000 students in fall 2012. More than 400 individual interviews were scheduled for the day following the event.

Through the internship program, the Career Center helps technically trained students gain valuable industry experience. In turn, employers gain highly skilled, motivated talent to fill short-term or seasonal needs.

The Engineering Career Center also helps with career path planning, preparation of technical resumes and application letters, career fair strategies, job search techniques, interview skills and salary negotiation, along with graduate school application reviews.



## Engineering is a team sport

### ASU teams win big at the ASC Reno Competition

ASU students brought home five team awards and four individual recognitions from the 25th Annual Associated Schools of Construction regional student competition held in February 2012. Seven Fulton Engineering teams entered the student competition, held in conjunction with the ASC Construction Management Conference. Known as the Reno Competition, the event attracts over 1,200 students from about 35 schools.

At the competition, student teams assume the role of a real company bidding on a project. Each competition

category has a corporate sponsor who presents a real-world construction project. Teams have less than 24 hours to address the problem and submit a proposal, then present to a judging panel the next day.

ASU teams took first place in the design build category, second place in the commercial, building information modeling and concrete solutions categories, and third place in the LEED Construction competition. The second place commercial team was also recognized with the Ingenuity-Innovation Award by Mortenson.

In individual awards, commercial team member Chris Freier was recognized with a Superintendents Award; John Safstrom, a member of the building information modeling team, was



recognized with an outstanding performance award and an internship from the problem sponsor, Webcor; Kim Rahberger was given special recognition for her work on the safety portion of the concrete team's project; and William Fugett was on the team that took first place in the alternate problem category.

### Students master digital forensics challenge

A team of four computer science students won top awards in the U.S. Department of Defense Cyber Crime Center's DC3 Digital Forensics Challenge.

Dominic Chen, James Fiacco, Jose Ibarra and Christopher Thornton placed first among more than 600 teams vying for the overall award for competitors

from the United States, as well as first among 220 teams of undergraduate students from around the world.

The online competition, which took place throughout most of the past year, tested skills in data extraction, challenging participants to devise methods to uncover encrypted data and other hidden information, and find messages encoded in digital sources.

The team members won a trip to the 2012 Department of Defense Cyber Crime Conference, where they received their awards and had an opportunity to present their work.

### Society of Women Engineers student section honored for achievements

The Society of Women Engineers (SWE) gave its Silver Award to the SWE student section at ASU, recognizing it as one of the top-achieving sections nationwide.

The ASU group has been steadily expanding its community outreach and other efforts to promote engineering education to girls, encourage young women to enter the engineering professions and provide its members opportunities to network with professional engineers.

About 50 active members have been volunteering their time in the past year to organize and coordinate education outreach events such as GEAR Day and WOW! That's Engineering.

## Students building satellite to help NASA learn more about solar flares

In 2010, aerospace engineering and aeronautics undergraduate Aaron Goldstein organized some fellow students to start the Sun Devil Satellite Laboratory. Within several months, they attracted the attention of a solar science research team at National Aeronautics and Space Administration's Goddard Space Flight Facility with their ideas for an earth-imaging satellite. That led to Sun Devil Satellite 1, aimed at providing NASA with a small satellite equipped with components designed to help study solar flares.

The mission team has since completed successful preliminary NASA design reviews and is planning to have a satellite built in time for a projected 2015 launch.

The group is developing the Flare Initiation Doppler Imager as the main instrument to be attached to the roughly nine-pound satellite, and is building the platform on which the imager will operate. If it works as planned, the imager will take rapid-fire photos of the Sun to capture solar flares as they emerge. The data it collects could aid research to predict the intensity of flares and forecast potential impacts on the Earth.

## Clubs and professional societies

ASU is home to over 45 engineering student organizations, ranging from honors and professional societies to groups programming robots or building race cars. These groups help close the gap between the classroom and the workplace—and for many, provide a way to reach out, give back and have fun.

Air Devils

American Concrete Institute

American Indian Science and Engineering Society (AISES)

American Institute of Aeronautics and Astronautics (AIAA)

American Institute of Civil Engineers (AIChE)

American Society of Civil Engineers (ASCE)

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

American Society of Mechanical Engineers (ASME)

Associated General Contractors of America Student Chapter (ACG)

Association for Computer Systems Security

ASU Linux User's Group (ASULUG)

Biomedical Engineering Society (BMES)

Bridges to Prosperity

Chi Epsilon

Construction Graduate Network

Construction Students Abroad

Daedalus Astronautics

Engineering Group for Socialization and Organization for the Undertaking of Projects (EG SOUP)

Engineering World Health

Engineers Without Borders

EPICS Maroon

Eta Kappa Nu, International Honor Society for Electrical Engineers

Fulton Ambassadors

Fulton Engineering Student Council

Game Development Studio

iGEM

Institute for Operations Research and Management Science (INFORMS)

Institute of Electrical and Electronics Engineers (IEEE)

Institute of Electrical and Electronics Engineering Computer Society (IEEECS)

Institute of Transportation Engineers Student Chapter

Institute of Industrial Engineers

International Council on Systems Engineering-Student Chapter (INCOSE)

Material Advantage at ASU

NASA Space Grant Robotics

National Association of Home Builders

National Society of Black Engineers

North American Society of Trenchless Technology

Project C.U.R.E.

Sigma Lambda Chi, ETA Chapter, International Construction Honor Society

Society of American Engineering

Society of Automotive Engineers

Society of Hispanic Professional Engineers (SHPE de ASU)

Society of Women Engineers (SWE)

Software Developers Association at ASU (SoDA)

Students for the Exploration and Development of Space (SEDS)

Sun Devil Satellite Laboratory (SDSL)

Tau Beta Pi

Theta Tau

Women in Computer Science



## Student awards

### NSF Graduate Research Fellowships

Five graduates and two engineering graduate students were awarded National Science Foundation (NSF) Graduate Research Fellowships to support their pursuit of advanced degrees. Considered one of the most prestigious graduate research fellowships in the country, the program aids graduate students studying science, engineering, technology and mathematics who are judged to have the potential to be future research, teaching and innovation leaders in those fields.

**William Bowman** holds a bachelor's degree in materials science and engineering, and is now pursuing his doctoral degree in the same field from ASU. His research focuses on using electron microscopy to gain more fundamental understanding of the atomic-level characteristics of ceramic materials that can be applied to advanced energy-generation technologies.

**Nathan Dunkin** holds a bachelor's in civil, environmental and sustainable engineering and a master's in environmental engineering. He is pursuing his doctoral degree in the field at ASU. Dunkin's focus is on water treatment and sanitation research that he hopes to eventually use in work to raise the quality of life in developing countries.



Brian Perea was the 2012 Outstanding Graduate of the Ira A. Fulton Schools of Engineering, the chemical engineering program and Outstanding Graduate in Research of Barrett, The Honors College.

**Denzil Frost** is pursuing a doctoral degree in chemical engineering at ASU after earning a bachelor's degree in the field through studies at Brigham Young University. His research examines ionic liquids and how particles behave at the interfaces of these liquids. The work can be applied to carbon capture that prevents air pollution and developing more environmentally friendly replacements for industrial solvents.

After receiving his bachelor's degree from ASU in mechanical engineering, **Kyle Karber** spent a year as a research associate at Oak Ridge National Laboratory—the largest science and energy lab in the U.S. Department of Energy System. He is pursuing a master's

degree in mechanical engineering at the University of Colorado, Boulder, continuing energy and environmental research started at ASU.

**Edward Lee** graduated from ASU as a Barrett honors college student with a bachelor's in electrical engineering. He is pursuing a doctoral degree in the field at Stanford University. His research focuses on, among other things, development of nanoscale integrated electronic circuits that will be able to travel through the bloodstream to deliver medicinal drugs into the body to destroy cancer cells and remove plaque near the heart.

**Elizabeth Nofen (Walker)** holds a bachelor's degree in chemical engineering and is pursuing a doctoral

degree in the same field at ASU. Her graduate research includes work with materials at the nanoscale, specifically the use of poly-ionic liquids. She is participating in a project that explores the use of these specialized nanomaterials on the wings of aircraft for stress-related sensing applications.

**Brian Perea** graduated with a bachelor's degree in chemical engineering. He is pursuing a doctoral degree in chemical engineering at the University of California, Berkeley. His research in materials-based chemical engineering has spanned the study of nanoscale structures of materials from improvement of consumer products to enhancing the performance of semiconductors used in computer chips.



Tina Hakimi

### Whitaker Fellowships

The Whitaker International Fellows and Scholars Program sends emerging leaders in U.S. biomedical engineering overseas to undertake a self-designed project that will enhance their own careers in the field. In the first five years of the Whitaker Program, 140 grants have been awarded to Fellows and Scholars to conduct projects in over 25 countries worldwide.

Tina Hakimi is working with the Vision Cooperative Research Center in Sydney, Australia with the Brien Holden Vision Institute. Hakimi is completing her master's degree while working on a project dedicated to replacing the diseased natural lens of the eye with a soft-gel polymer which mimics the natural lens' ability to be manipulated and change power. This is novel because it will replace current intra-ocular lenses that are hard, and cannot change shape like the natural lens of the eye.



Lauren Meiss

Lauren Meiss is continuing her education at the University of Gothenburg in Sweden. The graduate of Horizon High School in Scottsdale will work with researchers in Sweden who are pursuing advances in medical treatments for people living with cystic fibrosis. Meiss was diagnosed with cystic fibrosis when she was three months old. In addition to the Whitaker Fellowship, she has won a Fulbright grant and a University of Gothenburg scholarship. Meiss hopes to earn a master's degree in genomics and systems biology, and pursue a career as a clinical geneticist to do research on genetic diseases.

### IEEE Power and Energy Society scholarships

Four Fulton Engineering undergraduate students received scholarships from the IEEE Power and Energy Society in the inaugural round of the Scholarship Plus Initiative™. Carrie Culp, Abhishek Dharan, Anthony Pelot and Alban Shemsedini



IEEE Power and Energy Scholars

are among approximately 93 recipients chosen from 51 U.S. universities.

ASU had the second highest number of recipients in the nation.

The PES Scholarship Plus Initiative™ is a new program established to attract high quality engineering students to the power and energy field. The industry faces challenges of responding to enormous growth, replacing aging infrastructure and adapting to new green technologies—challenges compounded by a projected energy workforce shortage.

### Engineering student one of 12 to receive national scholarship

Civil engineering student Adriana Ruiz was named an Obama Scholar by the Hispanic Scholarship Fund. The scholarship was given to 12 Hispanic students nationwide—including students from University of Southern California, Harvard and the University of Arizona—

who plan to pursue a career teaching high school science, technology, engineering and math classes. Ruiz plans to pursue teaching after earning her master's degree.

### Engineering major named ASU's international undergrad of the year

Chemical engineering major and Barrett honors student Javier Corral Clayton was named Arizona State University's 2012 Outstanding International Undergraduate Student Award winner.

The award is given by ASU's International Students and Scholars Office. It recognizes students' academic performance, leadership and community service efforts.

# faculty



Edward Kavazanjian, Jr.

## Faculty appointments and awards

### Contributions to soil mechanics earn Kavazanjian election to National Academy of Engineering

Edward Kavazanjian, professor in the School of Sustainable Engineering and the Built Environment, attained one of the highest professional honors in his field, election to the National Academy of Engineering.

The academy made Kavazanjian a member for his achievements in geotechnical engineering for municipal solid-waste landfill design, reducing hazards presented by earthquakes and providing for safety in design and construction of transportation-related structures and facilities such as bridge foundations, roadways, tunnels, embankments and retaining walls.

In recent years he has won the Ralph B. Peck Award, the Thomas A. Middlebrooks Award and the Karl Terzaghi Award, three prestigious honors for geotechnical engineering research given by the American Society of Civil Engineers.

Most recently, he was elected to the Board of Directors of the U.S. University Council for Geotechnical Engineering and Research, representing 128 U.S. universities with geotechnical engineering programs.

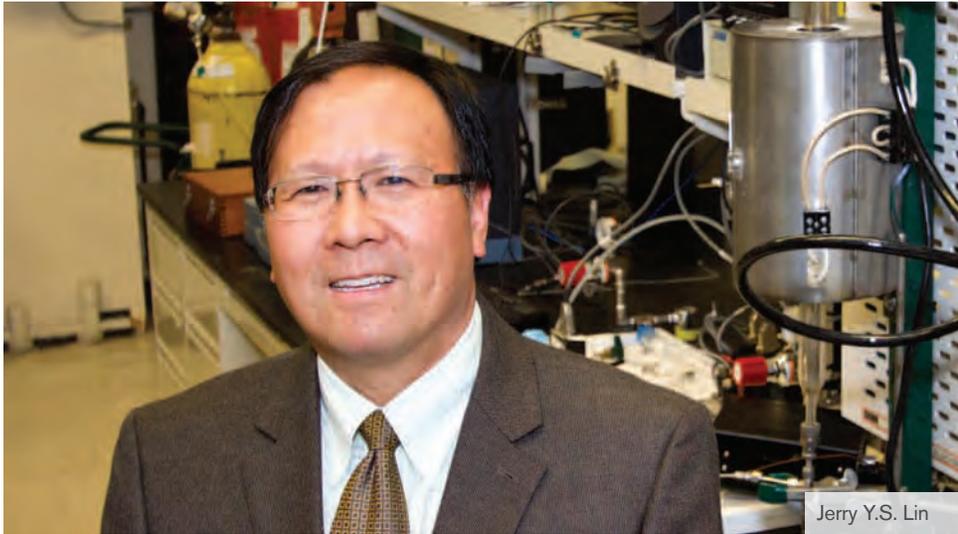
He has been the lead engineer for the analysis and design of some of the most significant municipal solid-waste sites in the world, as well as for the seismic analysis and design for more than 40 landfills and hazardous-waste facilities throughout the United States.



Brad Allenby

### Allenby named ASU President's Professor

Brad Allenby, Lincoln Professor of Engineering and Ethics, and professor, School of Sustainable Engineering and the Built Environment, was named a 2011 President's Professor. President's Professor awards honor those faculty who have made substantial contributions to undergraduate education at ASU. Allenby was selected "for his unique ability to bridge engineers, scientists, policymakers, students and the broader public, and engage, challenge and excite undergraduate students." He was also praised for pioneering modern industrial ecology and his passion for the environmental and societal implications of developing technologies.



### **Lin and Adrian named Regents' Professors, ASU's highest faculty honor**

Jerry Y.S. Lin and Ron Adrian, both professors in the School for Engineering of Matter, Transport and Energy, were awarded one of the university's highest faculty honors, the title of Regents' Professor. The annual accolade recognizes professors who have made pioneering contributions in their areas of expertise, who have achieved a sustained level of distinction and who enjoy national and international recognition for these accomplishments.

Lin is an internationally recognized pioneer of modern inorganic membrane science. He is also known for his work with adsorbents. Combining expertise in materials science and chemistry, Lin creates new adsorbents and membranes and designs the processes for using them for specific purposes.

Lin considers his main achievement his students. In the past 20 years, Lin has become a sought-after mentor, serving as advisor to 70 graduate students and post-doctoral students who are starting their careers.

Adrian is a prominent expert in fluid dynamics. He has been at the forefront in developing techniques and tools that have spawned new kinds of research endeavors, earned patents and become foundations for new branches of industry.

New experiments he devised boosted understanding of the fundamental mechanisms that govern behavior of turbulent flows. Mathematical models he developed revealed new knowledge about structure and organization within their chaotic behavior.

Among his foremost achievements are contributions to two techniques –



laser Doppler velocimetry and particle image velocimetry – that provided groundbreaking tools for quantifying and measuring some of the most complex aspects of fluid mechanics.

### **Three among 2012 class of IEEE Fellows**

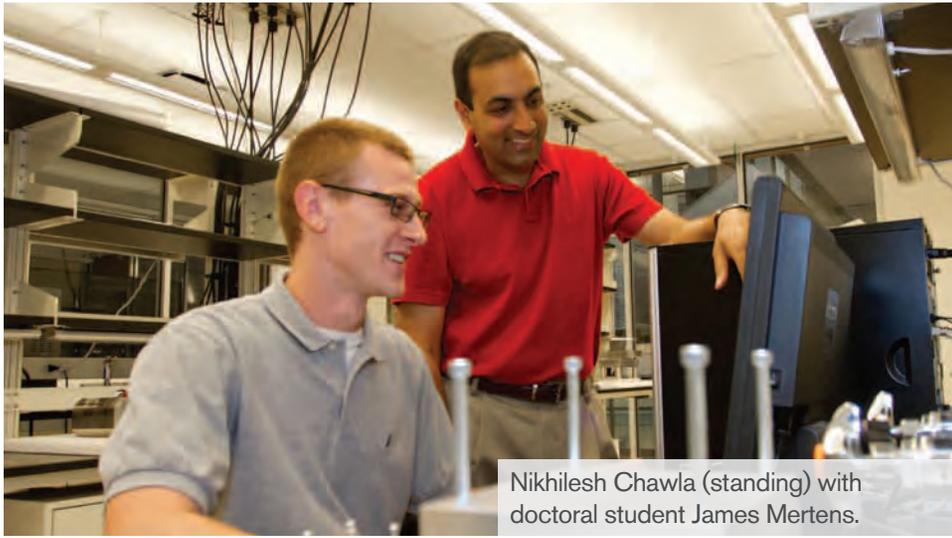
Three Fulton Engineering faculty members were named to the Class of 2012 IEEE Fellows. IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE Fellow is a distinction reserved for select IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation.

**Chaitali Chakrabarti**, professor, School of Electrical, Computer and Energy Engineering, for contributions to low-

power embedded system design and to very large scale integration architectures for signal processing.

**Huan Liu**, professor, School of Computing, Informatics, and Decision Systems Engineering, for contributions to feature selection in data mining and knowledge discovery.

**Junshan Zhang**, professor, School of Electrical, Computer and Energy Engineering, for contributions to cross-layer optimization of wireless networks.



Nikhilesh Chawla (standing) with doctoral student James Mertens.

### **Chawla named Fulton Professor of Materials Science and Engineering**

Nikhilesh Chawla, a professor in the School for Engineering of Matter, Transport and Energy, was named Fulton Professor of Materials Science and Engineering.

In 2010, Chawla served as acting chair of the materials science and engineering program. He serves on ASU President Michael Crow's Academic Council, which provides input to the president on academic, structural and strategic matters.

Prior to joining ASU in 2000, he was a postdoctoral fellow jointly at Ford Motor Company and the University of Michigan, and a senior development engineer at Hoeganaes Corporation.

Chawla is a Fellow of ASM International, member and past board member of

The Minerals, Metals & Materials Society. Among his recent awards, Chawla is the recipient of the 2011 Distinguished Lectureship given by Tsinghua University, China.

### **Panchanathan named senior vice president for Knowledge Enterprise Development**

Sethuraman "Panch" Panchanathan, ASU's deputy senior vice president for Knowledge Enterprise Development, university chief research officer, and professor in the School of Computing, Informatics, and Decision Systems Engineering, was named senior vice president for Knowledge Enterprise Development.

In his new position, Panchanathan oversees ASU's growing annual research portfolio, currently at a nearly \$350 million, ranking ASU as one of the top 20 research institutions in

the country without a medical school. The university's major interdisciplinary research institutes and initiatives are part of the Office of Knowledge Enterprise Development (OKED). These include the Biodesign Institute, Global Institute of Sustainability, Flexible Display Center, LightWorks, Complex Adaptive Systems Initiative and Decision Theater.

### **Rittmann receives high honor from civil engineering society**

Regents' Professor Bruce Rittmann was named a "Distinguished Member" of the American Society of Civil Engineers (ASCE), recognized "for exemplary advances to research and practices in environmental engineering, contributions to the technical literature, education of students and professional leadership around the world."

An ASCE Distinguished Member honor is bestowed on those who have attained acknowledged eminence in a branch of engineering or in the arts and sciences, including the fields of engineering education and construction.

Rittmann is a leading expert in development of microbial systems to capture renewable resources and alleviate environmental pollution. His research combines microbiology, biochemistry, geochemistry and microbial ecology for the purposes of restoring water purity and generating usable energy from waste products.

### **Schexnayder honored with ASCE Lifetime Achievement Award, election to National Academy of Construction**

Clifford Schexnayder, emeritus eminent scholar in the Del E. Webb School of Construction Program in the School of Sustainable Engineering and the Built Environment, was honored by the American Society of Civil Engineers for his lifetime achievements in education.

This year, Schexnayder was also elected to the National Academy of Construction for his accomplishments as a "powerful advocate for bringing industry experience into the classroom to create a bridge between theory and application of engineering knowledge."

Schexnayder held the eminent scholar positions at ASU from 1994 to 2003. He returned as faculty associate in 2011. He began his teaching career at Purdue University and later taught at Louisiana Tech, Virginia Tech and the U.S. Air Force Academy.

He's the co-author of the textbooks Construction Planning, Equipment, and Methods, now in its eighth edition, and Construction Management Fundamentals.

## Adams elected fellow of leading materials society

James Adams, ASU President's Professor and professor, School for Engineering of Matter, Transport and Energy, was elected a Fellow of ASM International – The Materials Information Society, the leading professional organization for materials engineers and scientists. The honor recognizes Adams' "distinguished contribution in computational materials science, in particular, the development of highly reliable interatomic potentials."

## Gibson appointed to Board on Infrastructure and the Constructed Environment

G. Edward Gibson, Jr., director, School of Sustainable Engineering and the Built Environment, has been appointed to the Board on Infrastructure and the Constructed Environment (BICE), an active board within the Division of Engineering and Physical Sciences for the National Research Council. Gibson will serve a three-year term through 2015.

BICE advises the executive and legislative branches of government, other governmental and private sector organizations and the general public on questions of technology, science and public policy.

Board members are recognized experts in the built environment disciplines, chosen from industry, academia, research institutes and government.

Gibson joined ASU and the Del E. Webb School of Construction in 2009 as its program chairman. He is professor and Sunstate Chair of Construction Management and Engineering, and has served as director of the School of Sustainable Engineering and the Built Environment since 2011.

## Haynes elected councilor for the Institute of Biological Engineering

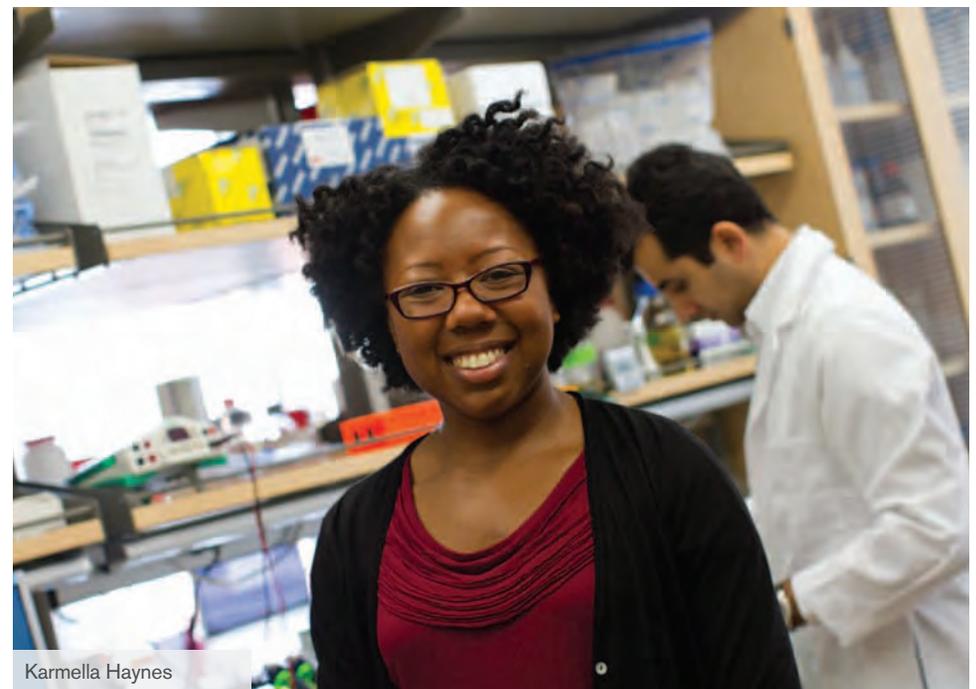
Karmella Haynes, assistant professor in the School of Biological and Health Systems Engineering, was elected for a two-year term as councilor for the Institute of Biological Engineering.

She's now one of five councilors who serve as liaisons between IBE members nationwide and the organization's executive committee. The position gives her a role in setting the agenda for the IBE's annual conferences—gatherings that have an impact on shaping the course of education and research endeavors in the biological engineering field.

Haynes's work focuses on combining natural materials to develop various kinds of engineered systems. Among other things, she is working on "making a synthetic protein that has a predictable behavior in cells," which can aid development of safer methods of injecting medicinal drugs into the body. She also sees promising applications in renewable fuel production.



G. Edward Gibson, Jr.



Karmella Haynes



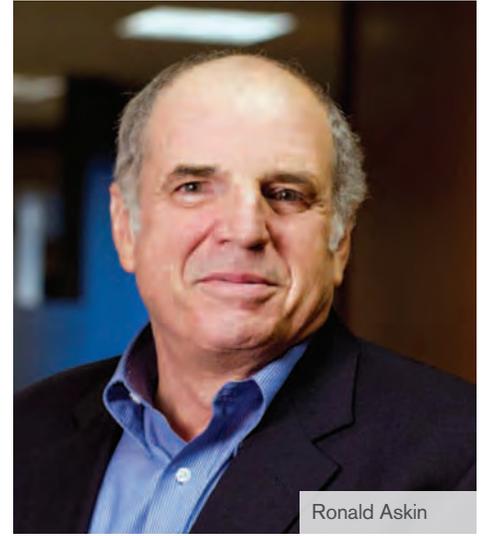
Claudia Zapata



Lina Karam



Joseph Davidson



Ronald Askin

### Zapata takes larger role in advising on U.S. transportation challenges

**Claudia Zapata**, assistant professor in the School of Sustainable Engineering and the Built Environment, has begun a three-year term as chair of Transportation Research Board's Committee on Engineering Behavior of Unsaturated Soils.

The 30-member committee advises the board on matters important to establishing adequate engineering, construction and environmental-protection standards for transportation infrastructure.

Zapata has served on the board's unsaturated soils committee since 2007 and on the Seasonal Climatic Effects on Transportation Infrastructure committee since 2008. She has played a leading role in various projects for the National Cooperative Highway Research Program.

Her expertise is in geotechnical engineering, concentrating on the behavior of soils under various climatic conditions and the impacts that construction and operation of transportation facilities have on soil stability.

### Karam recognized as Intel Outstanding Researcher

**Lina Karam**, professor in the School of Electrical, Computer and Energy Engineering, received the 2012 Intel Outstanding Researcher Award in High Volume Manufacturing.

This award recognizes outstanding contributions—including fundamental insights, industrial relevance, technical difficulty, communication and potential student hiring associated with the research—by researchers funded by Intel's Semiconductor Technology Council and associated Strategic Research Sectors (SRS).

### Alma mater honors Davidson with lifetime achievement award

The Department of Mechanical and Aerospace Engineering at The Ohio State University gave **Joseph Davidson** its Charles Kettering Lifetime Achievement Award, named in honor of the late famous inventor, engineer and Ohio State graduate. Davidson is an emeritus professor in the School for Engineering of Matter, Transport and Energy.

He earned undergraduate and graduate degrees at Ohio State. When he received his doctorate in 1965, he was one of the youngest students ever to have earned a doctorate in engineering at the university.

Davidson came to ASU in 1973 and has since been teaching mechanical engineering and related subjects. His research focus has been kinematic geometry of mechanisms and robots, geometric tolerances in design and manufacturing, and mechanical design.

### Askin takes reins as editor of leading industrial engineering journal

**Ronald Askin**, professor and director of the School of Computing, Informatics, and Decision Systems Engineering is the new editor-in-chief of IIE Transactions, the flagship journal of the Institute of Industrial Engineers.

Askin says his primary mission as the monthly journal's leader will be to "promote and disseminate excellence in industrial engineering research."

Beyond reporting on new research in the field, he wants the publication to tell how the advances enabled by the work "are helping to solve a broad range of societal problems," and he hopes the journal will heighten public understanding of the breadth and importance of this branch of engineering.

## Selected Best Paper Awards

**Michael Caplan**, SBHSE: Jeanette Wilkins Award for best basic science paper/Musculoskeletal Infection Society Meeting

**Karam Chatha**, CIDSE: Best Paper Award at IEEE Symposium

**Guoliang Xue**, CIDSE: Best Paper Award for ORPA, IEEE International Conference on Mobile Ad-Hoc & Sensor Systems and the Communications and Systems Symposium at IEEE Globecom

**Aditi Chattopadhyay**, SEMTE: Best Paper, American Ceramic Society

**Pedro Peralta**, SEMTE: Neutron Award, Thermal Mention, from the Advanced Test Reactor National User Science Facility for poster presentation

**Kiran Solanki**, SEMTE: 2011 Light Metals Magnesium Best Paper award for the report detailing their research on lightweight metal alloys by the Minerals, Metals and Materials Society

**Barzin Mobasher**, SSEBE: Best Paper Award of 2011 by Japan Concrete Institute in the field of advanced concrete technology

**T. Agami Reddy**, SSEBE: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Technical Paper Award

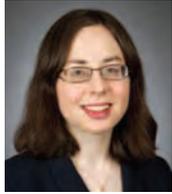
**Kenneth Sullivan**, SSEBE: ASCE 2012 Leadership and Management in Engineering–Best Feature Article Award



Guoliang Xue



# new faculty



**Spring Berman**, assistant professor  
School for Engineering of Matter, Transport and Energy

Ph.D., mechanical engineering and applied mathematics, University of Pennsylvania

Expertise: modeling, analysis, control and optimization of multi-robot systems including robotic swarms; analysis of collective behaviors in biology



**Srabanti Chowdhury**, assistant professor  
School of Electrical, Computer and Energy Engineering

Ph.D., electrical and computer engineering, University of California, Santa Barbara

Expertise: power electronics, gallium nitride material for device application in high-voltage and high-frequency electronics



**Yang Jiao**, assistant professor  
School for Engineering of Matter, Transport and Energy

Ph.D., materials, Princeton University

Expertise: multi-scale modeling of complex materials, particle modeling, granular materials, and colloidal systems



**Amy Landis**, associate professor  
School of Sustainable Engineering and the Built Environment

Ph.D., civil and materials engineering, University of Illinois, Chicago

Expertise: industrial ecology, byproduct synergies, biofuels, biopolymers and life cycle assessment



**Mariana Bertoni**, assistant professor  
School of Electrical, Computer and Energy Engineering

Ph.D., materials science and engineering, Northwestern University

Expertise: solar cells, defect engineering, transparent conducting oxides; synthesis, growth and deposition; electrical and optical characterization



**Mounir El Asmar**, assistant professor  
School of Sustainable Engineering and the Built Environment

Ph.D., construction engineering and management, University of Wisconsin-Madison

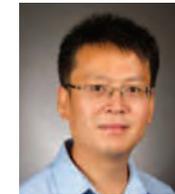
Expertise: alternative delivery systems and sustainable construction



**Jennifer Kitchen**, assistant professor  
School of Electrical, Computer and Energy Engineering

Ph.D., electrical engineering, Arizona State University

Expertise: efficiency, power management and integration for high-frequency circuits and systems



**Yongming Liu**, associate professor  
School for Engineering of Matter, Transport and Energy

Ph.D., civil and environmental engineering, Vanderbilt University

Expertise: multiscale damage mechanics of materials, probabilistic methods for risk assessment



**Daniel Bliss**, associate professor  
School of Electrical, Computer and Energy Engineering

Ph.D., physics, University of California, San Diego

Expertise: multiple-input multiple-output (MIMO) wireless communications, cognitive radio networks, anticipatory physiological monitoring



**Zachary Holman**, assistant professor  
School of Electrical, Computer and Energy Engineering

Ph.D., mechanical engineering, University of Minnesota

Expertise: novel uses of nanoparticles in solar cells, optical and electronic properties of nanoscale materials, plasma synthesis of powders



**Oliver Kosut**, assistant professor  
School of Electrical, Computer and Energy Engineering

Ph.D., electrical and computer engineering, Cornell University

Expertise: information theory, power systems and smart grids, security and sparse recovery



**Kristen Parrish**, assistant professor  
School of Sustainable Engineering and the Built Environment

Ph.D., civil engineering systems, University of California, Berkeley

Expertise: innovative project design and delivery, particularly existing construction rehabilitation



**Matthew Peet**, assistant professor

School for Engineering of Matter, Transport and Energy

Ph.D., aeronautics and astronautics, Stanford University

Expertise: computational aspects of control



**Soroush Saghafian**, assistant professor

School of Computing, Informatics, and Decision Systems Engineering

Ph.D., industrial and operations engineering, University of Michigan

Expertise: healthcare operations, stochastic modeling and control, supply chain optimization, contract theory



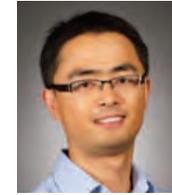
**Meng Tao**, professor

School of Electrical, Computer and Energy Engineering

Ph.D., materials science and engineering,

University of Illinois at Urbana-Champaign

Expertise: terawatt photovoltaics for solar energy conversion, semiconductor surfaces, interfaces, thin films



**Liping Wang**, assistant professor

School for Engineering of Matter, Transport and Energy

Ph.D., mechanical engineering, Georgia Institute of Technology

Expertise: near-field radiation heat transfer



**Yulia Peet**, assistant professor

School for Engineering of Matter, Transport and Energy

Ph.D., aeronautics and astronautics, Stanford University

Expertise: fluid/thermal flow phenomena with application to engineering systems, turbulent and transitional flows



**Lalitha Sankar**, assistant professor

School of Electrical, Computer and Energy Engineering

Ph.D., electrical engineering, Rutgers

Expertise: information privacy and secrecy in distributed and cyberphysical systems, wireless communications, network information theory

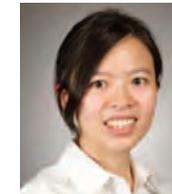


**Shane Underwood**, assistant professor

School of Sustainable Engineering and the Built Environment

Ph.D., civil engineering, North Carolina State University

Expertise: multiscale modeling of asphalt concrete



**Carole-Jean Wu**, assistant professor

School of Computing, Informatics, and Decision Systems Engineering

Ph.D., electrical engineering, Princeton University

Expertise: computer architecture, chip-multiprocessors (CMPs) with an emphasis on the last-level cache

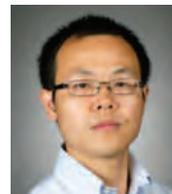


**Heather Pon-Barry**, assistant professor

School of Computing, Informatics, and Decision Systems Engineering

Ph.D., computer science, Harvard University

Expertise: spoken language processing, multimodal human-computer communication



**Pingbo Tang**, assistant professor

School of Sustainable Engineering and the Built Environment

Ph.D., civil and environmental engineering, Carnegie Mellon University

Expertise: construction management, facility management, bridge CAD/CAE and bridge management

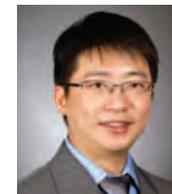


**Erin Walker**, assistant professor

School of Computing, Informatics, and Decision Systems Engineering

Ph.D., human-computer interaction, Carnegie Mellon University

Expertise: adaptive collaborative learning support, intelligent tutoring systems, education technology



**Lei Ying**, associate professor

School of Electrical, Computer and Energy Engineering

Ph.D., electrical engineering, University of Illinois at Urbana-Champaign

Research expertise: information networks including wireless, mobile ad hoc, P2P and social networks

A close-up photograph of a person's hands holding a transparent, curved substrate, possibly a flexible electronic device. The substrate is covered with intricate, dark-colored circuit patterns, including various components like resistors, capacitors, and interconnecting lines. The person's hands are visible, with fingers gripping the edges of the substrate. The background is blurred, suggesting a laboratory or research setting.

**research centers  
and institutes**



QESST Solar Power Lab



Center for Embedded Systems annual meeting

Adaptive, Intelligent, Materials and Systems (AIMS)

Arizona Initiative for Renewable Energy

Arizona Institute for Nano-Electronics

ASU Advanced Photovoltaics Center

Center for Adaptive Neural Systems

Center for Applied Nanoionics

Center for Bioelectronics and Biosensors

Center for Biosignature Discovery Automation

Center for Cognitive Ubiquitous Computing

Center for Computational Nanoscience

Center for Earth Systems Engineering and Management

Swette Center for Environmental Biotechnology

Center for Environmental Fluid Dynamics

Center for Environmental Security

Center for Photonics Innovation

Center for Renewable Energy Electrochemistry

Center for Research on Education in Science, Mathematics, Engineering and Technology

Center for Solid State Electronics Research

Center for Sustainable Health

Construction Research and Education for Advanced Technology Environments

Decision Theater

Flexible Display Center

Information Assurance Center

LeRoy Eyring Center for Solid State Science

National Center of Excellence on SMART innovations

Partnership for Research in Spatial Modeling

Security and Defense Systems Initiative

**Engineering Research Center (ERC)**

Quantum Energy and Sustainable Solar Technologies (QESST) an NSF-DOE Engineering Research Center

**NSF Industry/University Cooperative Research Centers (I/UCRC)**

Center for Embedded Systems

Center for Excellence in Logistics and Distribution

Connection One

Power Systems Engineering Research Center

Sensor, Signal and Information Processing Center

Water and Environmental Technology Center

# energy



With expertise in chemistry and materials science and engineering, Candace Chan is working on novel silicon materials for use in batteries, thermoelectrics and superconductors.

## **Chan's NSF grant will boost silicon materials research**

Candace Chan, assistant professor, was awarded a grant from the National Science Foundation to support her work on novel silicon materials.

She is researching ways to expand the applications of silicon clathrates, a form of silicon distinguished by its cage-like structure.

The structure allows ions to be placed inside the silicon clathrate "cage." Chan is determining if ions can be electrochemically placed inside these cages in a tunable and reversible manner, which can lead to new structures and compositions that have never before been observed. These materials could have applications in batteries, thermoelectrics and superconductors.

The NSF grant will provide \$390,000 over three years to fund Chan's research.

## **Strengthening metal alloys would provide energy, environment conservation benefit**

Fundamental discoveries in optimizing the performance of light-weight metal alloys have earned recognition for Kiran Solanki, assistant professor.

The Minerals, Metals & Materials Society (TMS) has awarded Solanki and two co-authors its 2011 Light Metals Magnesium Best Paper award

for the report detailing their research on light-weight metal alloys. Mehul Bhatia, a doctoral student in mechanical engineering at ASU, and Amitava Moitra, who worked with Solanki at Mississippi State University are the paper's co-authors.

Titled "Effect of Substituted Aluminum in Magnesium Tension Twin," the paper addresses a major challenge in development of new alloys: finding ideal concentrations of new solutes that can be added to base metals to optimize their performance. Solanki's research team demonstrates use of a nanoscale simulation technique to reveal how an aluminum substitution in pure magnesium affects its deformation and its behavior when the material fails.

The results of the work promise to help engineers and scientists better understand how to enhance the performance of new light-weight materials used in a wide variety of technological applications. These materials can be particularly effective in helping to improve the energy efficiency of motor vehicles and reduce their polluting emissions.

"Our research provides a fundamental understanding of the role of solutes on deformation and fracture modes of metal alloys," Solanki says. "This will guide the science of designing structural materials with enhanced properties and performance capabilities."

## Strides in battery technology promise progress in energy efficiency

Advances in materials science, engineering design and chemistry are promising breakthroughs in energy storage that would improve the efficiency of energy production, distribution and consumption.

That progress is being pursued in efforts to develop a better thermal battery. Details are given in an article in the March 23, 2012, issue of Science magazine.

Among the three authors of the report is researcher Ravi Prasher, an adjunct faculty member.

Prasher also is working for the Advanced Research Projects Agency under the U.S. Department of Energy, and doing research supported by the National Science Foundation and the Office of Naval Research.

Improved materials coupled with new engineering designs could produce thermal batteries that store heat more effectively, according to the article. That achievement would open the way to more energy-efficient heating and cooling systems, as well as enhance energy generation from solar-thermal power plants.

## QESST research program engages students in technology, application

Hilario Pio-Martinez and Victoria Chavez, two students from the Tohono O'odham Community College, and neither an engineer, embarked on a five-week, intensive photovoltaic technology summer research program as part of the Research Experience for Undergraduates through the Quantum Energy and Sustainable Solar Technologies Engineering Research Center.

"In the first week, we made a solar cell," says Chavez, "It was really cool." They joined about twenty undergraduate students from universities across the country for a unique experience to participate in real-world research, learning more about manufacturing solar cells on ASU's industrial-scale pilot line in the Solar Power Lab.

Led by ASU electrical engineering graduate students Guy Pickett and Tim Reblitz, students worked in teams on one aspect each week—learning the fabrication and analysis of technologies on commercial equipment. Teams were tasked with increasing cell efficiency by one to two percentage points.

Pio-Martinez and Chavez found the focus for their final presentation when education director, Jenefer Husman, guided the pair to a sustainability project focused on solar energy on their own tribal lands.



Electrical engineering seniors, Carrie Culp, Patricia Markison and Martin Solis, partnered with QESST for their senior design project to develop a solar powered dialysis machine.

Currently on the Tohono O'odham Nation, there is a solar home that is a tester for renewable energy—a first step in providing electricity to rural areas. The community is also the future site for the Tohono O'odham renewable energy plant, a five megawatt utility scale solar energy plant.

The two students focused their energy on learning how the solar cells work and designing a customized efficient cell for the location. Pio-Martinez says one of the most interesting things that he learned is the planning process. "I have a much better understanding of the challenges that manufacturers face from budgeting that puts the whole plan in motion, to researching the climate and region to assess the most resourceful use of solar technology."

Both noted the unique challenges faced in solar development on tribal land.

"Education is a factor, so is language," says Chavez. For example, there is no translation for "solar energy" making it challenging to explain to people in their community who do not speak English.

As part of their research project, the two identified ways that they might mitigate these barriers.

Their community is in southeastern Arizona and northwest Mexico. Pio-Martinez and Chavez say the land selected for the solar power site has the "highest density radiation, ideal for solar."

They plan to educate members of their community about solar energy and the benefits their particular location holds due to this high radiation.

# health



Michael Goryll (center) with students in the lab.

## NSF CAREER Awards advance research in biosensors, cardiovascular fluid dynamics

Supported by National Science Foundation CAREER Awards, two faculty members are advancing fundamental research that can have significant impacts on disease diagnostics.

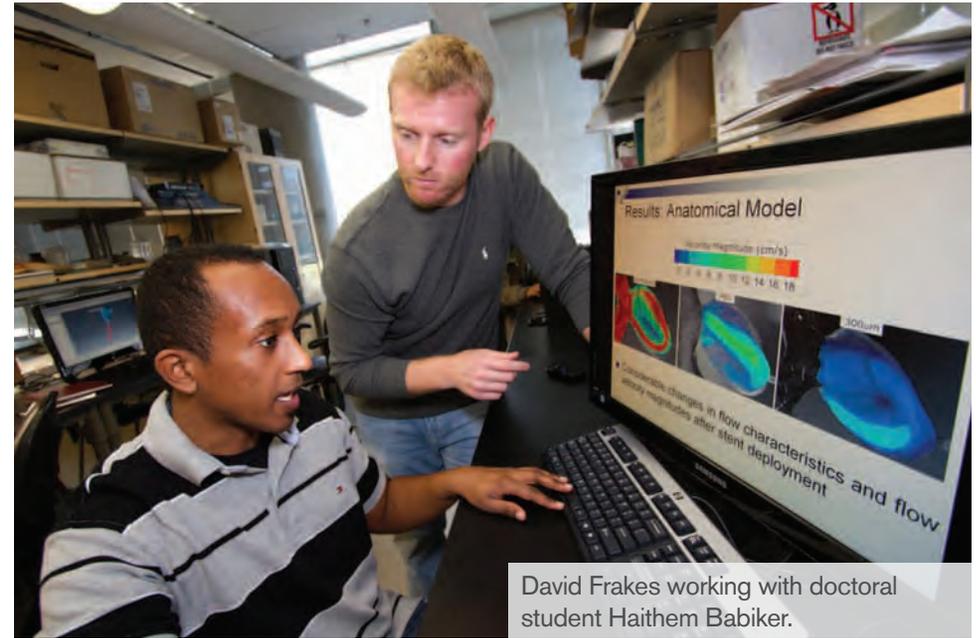
**Michael Goryll**, assistant professor, School of Electrical, Computer and Energy Engineering, is recreating the functionality of a natural ion channel using a solid-state nanopore. Goryll is working to create a more robust, versatile solution using electrostatically controllable solid-state nanopores.

One aspect of his research is gaining a better understanding of how natural

channels allow some ions and molecules to pass through the channel, but not others. That knowledge is used to reproduce electric field geometries that repel or attract molecules in a similar way to natural channels.

The use of engineered nanopores as biosensing elements is a rapidly developing area. The sensors can be used for a wide range of applications from testing water quality to disease diagnostics.

Goryll cites drug discovery as an area of particular interest. For example, several drugs have been pulled from the market, or denied regulatory approval due to potentially life threatening reactions including clinical arrhythmia. Preclinical testing for these interactions can only be done by ion channel research.



David Frakes working with doctoral student Haithem Babiker.

Goryll and students in his lab have already made advances in ion channel research, including development of an acrylic cup array that allows parallel measurement of four channels at the same time and a multichannel, low-noise amplifier, which allows recording of the extremely small ionic current through the ion channels.

**David Frakes** will further his research of cardiovascular fluid dynamics and the impact on the onset, progression and treatment of major diseases such as heart disease, stroke and aneurysms.

Frakes, assistant professor in the School of Biological and Health Systems Engineering and the School of Electrical, Computer and Energy Engineering, is focusing on advanced simulation and modeling of intracranial aneurysms

(ICAs) to help design and execute optimal patient treatments.

ICAs account for approximately 20,000 deaths in the U.S. alone. Current endovascular devices used to treat ICAs have led to a 50 percent reduction in the death rate over the last decade. Frakes' research aims to reduce that even further.

ICA treatment is a relatively tractable fluid dynamic problem, Frakes says. Unlike vessels near the heart that require very complicated simulations, cerebral vessels can be modeled more robustly, which presents an attractive starting point for cardiovascular fluid dynamic research. Yet the general methods developed through this research hold promise for much wider application in disease treatment.

Frakes is using imaging-driven engineering tools, physical and computational modeling, and fluid dynamic measurement and simulation as the methodological basis for development of advanced device-based cardiovascular disease treatment.

### **New brain-hand connection research aims to improve therapies, prosthetics**

The National Science Foundation awarded a \$640,000 grant to fund a research collaboration between Marco Santello, professor and director, School of Biological and Health Systems Engineering, and Columbia University scientist Andrew Gordon to expand their studies in the brain-hand connection.

Santello and Gordon have worked together for several years in pursuit of deeper knowledge about interactions between sensory feedback and motor actions involved in control of the hand.

In their current project they are seeking to determine the neural mechanisms that control learning and planning of the grasping and manipulation of objects. They're examining the visual cues people use to assess object properties before they grasp or otherwise manipulate objects. In addition to using cues such as object shape or density, people often use memory of similar actions performed in the past.

By taking decision-making functions into account, they're trying to provide a more comprehensive view of the brain-

hand relationship—how, for instance, the brain and hand work together to create a memory of the position and force necessary to manipulate particular objects.

The proposal submitted by Santello and Gordon for the research grant was among only about 10 percent of the 120 proposals recently approved for new funding by the Perception, Action and Cognition Advisory Panel, which is under the NSF's Division of Behavioral and Cognitive Sciences.

### **New center to focus on environmental security**

Rolf Halden, professor in the School of Sustainable Engineering and the Built Environment, is heading up a new center that focuses on managing environmental stress in order to improve human health. Halden is also the associate director of the Swette Center for Environmental Biotechnology in the Biodesign Institute.

The Center for Environmental Security (CES) protects human health and critical ecosystems by detecting, minimizing and ultimately eliminating harmful chemical and biological agents through engineering interventions.

CES works at the systems level (regional, national or global scale) to optimize chemical safety and biosecurity. Work on chemical safety includes the identification of harmful compounds in the environment and a determination of associated human health impacts as well as suitable intervention strategies

in engineering and policy. This work also supports the broader "biosecurity" area in ASU's Security and Defense Systems Initiative (SDSI). Examples of ongoing and planned research activities include:

- detection of chemical and biological threats on the regional and national scale
- development of instrumentation for environmental monitoring and public health preparedness
- human health effects from environmental exposures
- food safety

### **NSF grant funds project to expand mathematical framework for engineered gene networks**

Xiao Wang, assistant professor, School of Biological and Health Systems Engineering, was awarded a grant from the National Science Foundation to use a combination of mathematical, engineering and biological techniques to develop mathematical methods to expand the analysis of gene networks from two dimensions into higher dimensionalities.

Novel systematic understanding of cell differentiation and reprogramming derives from the study of synthetic multistable gene networks. Synthetic multistable systems provide unique opportunities to study the core mechanisms of cell pluripotency and differentiation because highly connected small transcription networks regulating cell differentiation have topological

similarities with the synthetic gene networks under consideration in Wang's project. Constructing and analyzing small multistable gene network deepens our understanding of multistability, which can arise from similar topologies in stem cell gene regulations. Additionally, mathematical theories and tools to study high dimensional nonlinear dynamics and stochasticity in the context of gene networks are developed.

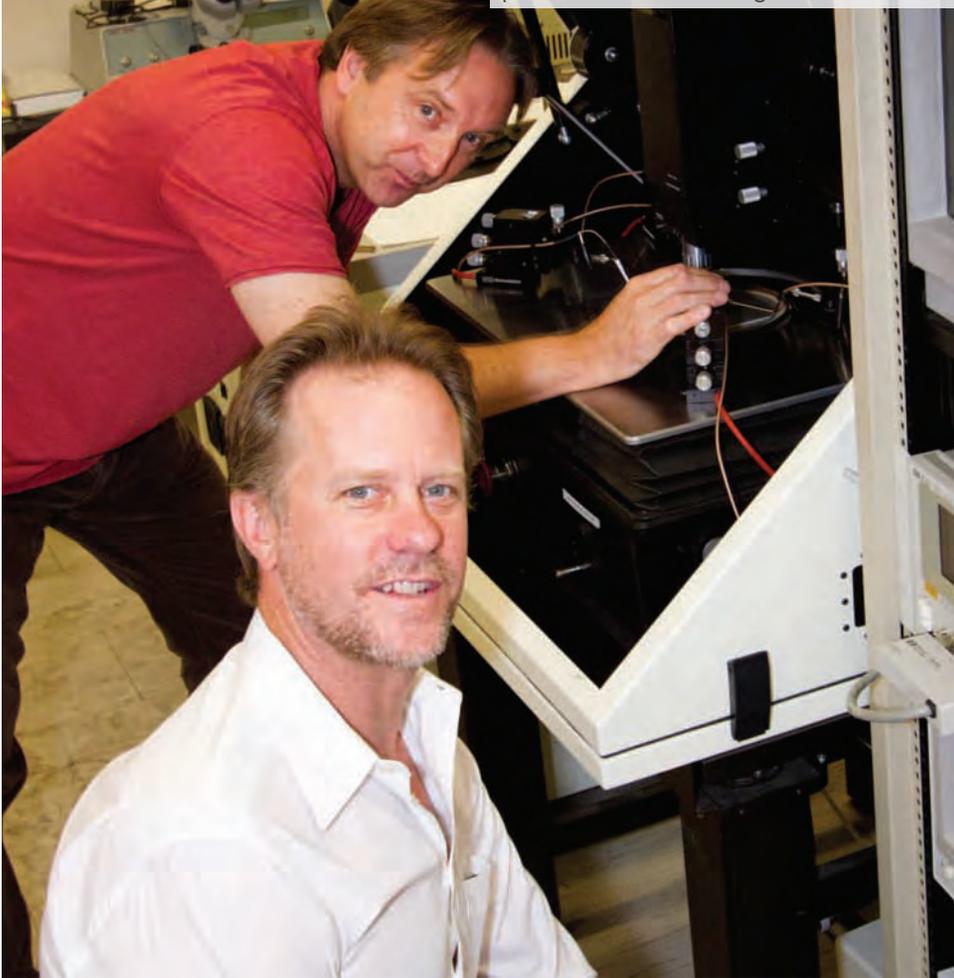
Wang's goal is to expand the theoretical efforts to study cellular multistable systems and fill the gap between technological progress and available analytical tools to facilitate future biotechnological development.



Xiao Wang

# security

In the Nanoionics Prototyping Facility, electrical engineers Hugh Barnaby (front) and Michael Kozicki use equipment that enables them to deposit films as thin as 10 billionths of a meter to form the test structures needed to determine the characteristics of various materials and perform electrical testing.



## Engineers aim to make technology work better in extreme environs

It's what the experts call "hostile-environment technology." These are the machines, devices and various mechanisms made to perform tasks in places that are dangerous or impossible for humans to tread, like in outer space, on other planets or inside nuclear reactor facilities.

Two ASU electrical engineers are leading research to aid in developing the next generation of these technologies, supported by a \$1.7 million grant from the Defense Threat Reduction Agency of the U.S. Department of Defense.

Hugh Barnaby, associate professor, and Michael Kozicki, professor, in the School of Electrical, Computer and Energy Engineering are working to help ensure new versions of the technologies will be more resilient and perform more effectively in environments with high levels of radiation and extreme hot and frigid temperatures.

Specifically, their focus is on specialized materials that are used in components of very small and low-power integrated circuits in electronic sensors and communications systems designed to process, store and wirelessly transmit information from hostile environments.

The specialized materials involved are chalcogenide glasses, which are compounds formed from such elements

as sulfur and selenium. What makes these compounds particularly useful is that they change physical and electrical properties when electronic signals are used to redistribute metal atoms within their nanostructured interiors.

"This mechanism of physical change, which is much more stable than the control of electrical charge used in conventional electronics, will help the material better withstand high radiation and extreme environments," Kozicki says.

The work is part of larger efforts to provide the nation with enhanced exploration technologies, more reliable public-safety systems and stronger defense systems.

## New nanomaterial combinations produce leap in infrared technology

ASU researchers are finding ways to improve infrared photodetector technology that is critical to national defense and security systems, as well as used increasingly in medical diagnostics, commercial applications and consumer products.

It's being accomplished by using multiple ultrathin layers of the materials that are only several nanometers thick. Crystals are formed in each layer. These layered structures are then combined to form what are termed "superlattices."

Photodetectors made of different crystals absorb different wavelengths of light and convert them into an electrical signal.

The conversion efficiency achieved by these crystals determines a photodetector's sensitivity and the quality of detection it provides, explains electrical engineering professor Yong-Hang Zhang.

The unique property of the superlattices is that their detection wavelengths can be broadly tuned by changing the design and composition of the layered structures. The precise arrangements of the nanoscale materials in superlattice structures helps to enhance the sensitivity of infrared detectors, Zhang says.

Zhang, a professor in the School of Electrical, Computer and Energy Engineering, is leading the work on infrared technology research in ASU's Center for Photonics Innovation.

Additional research in this area is being supported by a grant from the Air Force Office of Scientific Research and a new Multidisciplinary University Research Initiative (MURI) program established by the U.S. Army Research Office. ASU is a partner in the program led by the University of Illinois at Urbana-Champaign.

The team is using a combination of indium arsenide and indium arsenide antimonide to build the superlattice structures.

Zhang says the team's use of the new materials is reducing this loss of optically excited electrons, which increases the electrons' carrier lifetime by more than 10 times what has been achieved by other combinations of materials traditionally used in the technology. Carrier lifetime is a key parameter that has limited detector efficiency in the past.

Another advantage is that infrared photodetectors made from these superlattice materials don't need as much cooling. The need for less cooling reduces the amount of power needed to operate the photodetectors, which will make the devices more reliable and the systems more cost effective.

The advances promise to improve everything from guided weaponry and sophisticated surveillance systems to industrial and home security systems, the use of infrared detection for medical imaging and as a road-safety tool for driving at night or during sand storms or heavy fog.

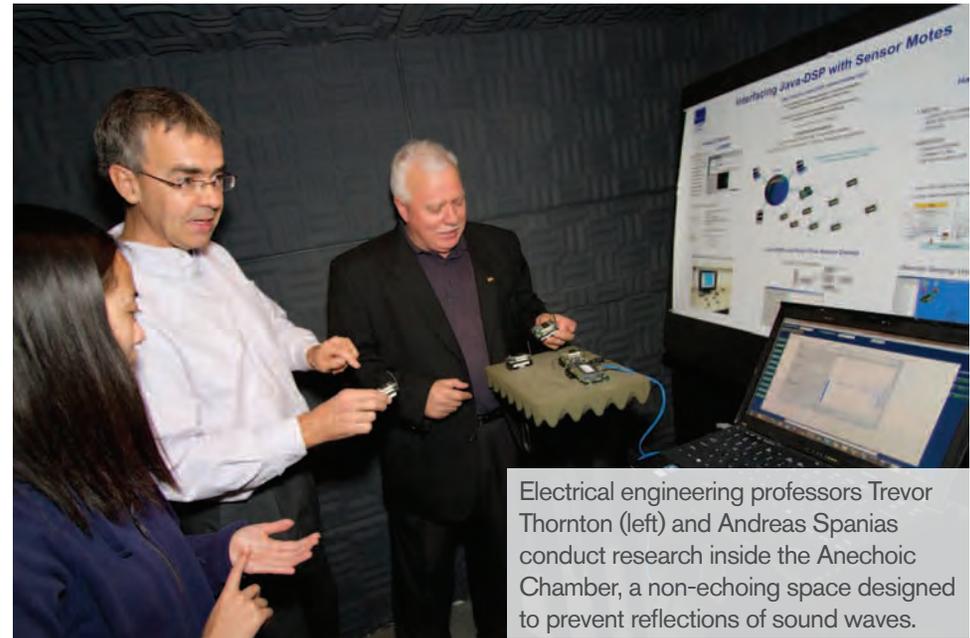
### **Collaboration will help advance sensor-array technology**

ASU's Sensor, Signal and Information Processing (SenSIP) research center is extending its global reach, joining forces with leading research universities in Europe.

Most recently, the Imperial College London, one of the leading science and engineering universities in Europe, has become a SenSIP partner.

Imperial College is the home of the University Defence Research Centre (UDRC)—funded by the United Kingdom's Ministry of Defence—which pursues advances in signal processing technology for use in national defense systems.

A joint project involving Imperial College's UDRC and ASU's SenSIP



Electrical engineering professors Trevor Thornton (left) and Andreas Spanias conduct research inside the Anechoic Chamber, a non-echoing space designed to prevent reflections of sound waves.

has been granted support from the prestigious British Council UK Prime Minister Fund. It was one of fewer than 30 research projects selected for funding from among 230 recent proposals to the British Council.

"This collaboration will help accelerate the advance of sensor-array technology for the benefit of both countries," says Cynthia Jaskie, president of BRE Systems, based in Scottsdale, Ariz., an information technology and computer consulting company and associate member-at-large of the SenSIP consortium.

The wireless sensor array with integrated data fusion that SenSIP will develop with its news partner "is an important technology with immediate military and security applications," Jaskie says.

The partnership's research focus aligns with the goals of the U.S. Department of Defense Small Business Innovation Research Program, says Joseph Marvin, president of Prime Solutions Group, an Arizona aerospace industry consulting firm, and a SenSIP consortium member.

"The work will add tremendous value to the emerging portfolio of aerospace and defense initiatives in Arizona targeted at a global community," Marvin says.

Andreas Spanias, SenSIP director and Trevor Thornton, both professors in the School of Electrical, Computer and Energy Engineering, led efforts to establish the new partnership. More than a dozen ASU electrical and computer engineering faculty contribute to SenSIP's work.



Soyoung Ahn is advancing traffic efficiencies with the help of an NSF CAREER Award.

## **NSF CAREER Award will help advance traffic efficiency, safety research**

Soyoung Ahn, assistant professor, School of Sustainable Engineering and the Built Environment, was awarded an NSF CAREER Award for her work modeling traffic flow to help manage congestion more effectively and improve driver safety.

Ahn's research focuses on transition points—changes in traffic conditions such as speed—and how driver behaviors such as lane-changing and car-following impact traffic flow.

"Traffic scientists often treat vehicles as fluid particles and model them using concepts borrowed from fluid dynamics," Ahn says. "We can describe equilibrium traffic quite well using these models, but we don't understand very well the

mechanism of how traffic changes from one state to another."

Her research involves analyzing how drivers make decisions and how that process changes as they go through areas of disturbance.

"Driver behavior can vary widely," Ahn says. "If we can identify those reactions in a state of non-equilibrium, it will give us a better understanding of the affect on traffic conditions and traffic evolution."

Her research will encompass collecting new individual vehicle data, analyzing the general features (e.g. changes in traffic flow, density and speed) and analyzing driver behaviors relative to the traffic features. The goal is to develop models capable of reproducing these phenomena in order to help plan long-term solutions.

# sustainability

"We want to find out how congestion originates so we can devise strategies to help alleviate bottlenecks and avoid crashes due to sudden changes in speed," Ahn says.

"Transportation is an essential component of civil engineering, but there are still many challenges that we face," Ahn says. "Probably everyone can relate to how this research can impact their daily lives."

## **Costs of parking include big 'environmental footprint'**

If all of the economic, environmental, health and energy impacts are factored in, is it costing us more to drive our automobiles or park them? Assistant professor Mikhail Chester is working to provide data that can serve as a reliable guide for public policymakers to devise sustainable solutions to transportation-planning challenges.

Chester estimates that there are as many as 844 million parking lot and parking structure space in the United States, or roughly three spaces for every automobile. He and colleagues at the University of California, Berkeley—Arpad Horvath and Samer Madanat—examined costs of parking facilities over their life cycles, considering the resources and energy expended in building and maintaining the infrastructure, as well as the cause-and-effect relationships between parking systems, air pollution, urban congestion, health risks and energy use in an article published in the University of California Transportation Center's ACCESS magazine.

Their studies show that with the amount of certain pollutants resulting from construction and maintenance of parking facilities, the environmental impact is

more extensive than that resulting from driving automobiles.

In other recent research, Chester and research partners at Carnegie Mellon University in Pittsburgh studied the impacts of automobile emissions in more than 80 metropolitan areas throughout the country. Their results are published in the Journal of the Transportation Research Board.

They estimate the economic costs for treating health impacts of driving and congestion at more than \$140 million a day. These costs average to 64 cents per person per day, or 3 cents for every mile traveled.

While the costs of air emissions “are small relative to the overall cost of driving, the total external costs imposed on society [due to environmental impacts] are substantial,” the researchers write.

### **Ariaratnam named ‘Person of the Year’ by leading construction industry publication**

Samuel Ariaratnam, a construction engineer, was named the 2012 Trenchless Technology Person of the Year by Trenchless Technology magazine, the leading North American publication in this field of construction.

Ariaratnam is a professor in the Del E. Webb School of Construction Programs within the School of Sustainable Engineering and the Built Environment and serves as chair of the construction engineering program.

The magazine's Person of the Year award recognizes the recipient's career achievements.

Ariaratnam describes the growing sector of trenchless technology as “finding economical, sustainable and environmentally friendly ways” to install, repair or replace underground infrastructure—including pipelines, water and sanitation systems, and other utility networks. Its methods seek to achieve those goals with less disturbance to roadways and buildings than conventional underground construction techniques.

Within the field, Ariaratnam is a leader in research and education in urban infrastructure management and rehabilitation, trenchless pipe replacement and underground utility asset management.

Ariaratnam's stature in the field led to his selection last year to serve a three-year term as chairman of the International Society for Trenchless Technology, which has more than 5,000 members through affiliate societies in 34 countries.

He has particular expertise in horizontal directional drilling, a method used to install water, sewer, telecommunication, electrical and gas lines with minimal impact on surface ground. His research has helped numerous municipal agencies to use trenchless technology construction methods to reduce infrastructure installation and repair costs by millions of dollars.



Samuel Ariaratnam, 2012 Trenchless Technology Person of the Year.



Rebekah McKenna, chemical engineering doctoral student, and David Nielsen, assistant professor of chemical engineering, are working on more sustainable ways to produce a chemical used to make many of our most common products.

## Making styrene from biomaterials would bring big benefits

Styrene is one of the major building-block chemicals used to make many of the rubbery polymers and plastic materials we use today. More than six billion tons of it is manufactured each year in the United States alone, most of which goes into producing insulating materials, automobile tires, footwear, medical devices and hundreds of other widely used products.

The problem is that all styrene is currently derived from a dwindling resource—petroleum—and its production requires one of the most energy-intensive processes in the petrochemical manufacturing industry. More than three metric tons of steam is necessary to produce just one metric ton of styrene.

That excessive energy consumption also produces significant amounts of carbon dioxide, contributing to the detrimental buildup of greenhouse gases in the atmosphere.

At Arizona State University, David Nielsen and Rebekah McKenna are seeking ways to make styrene—and other common petrochemicals—using renewable resources. They want to produce materials that are more sustainable, require less energy to produce, and alleviate negative environmental impacts when they are manufactured.

Nielsen is an assistant professor in the School for Engineering of Matter, Transportation and Energy.

McKenna is studying to earn a doctoral degree in chemical engineering.

They're experimenting with engineering microorganisms to act as catalysts for making styrene from renewable resources—in this case biological materials, like sugars from plants.

"What we've done is create a new metabolic pathway," Nielsen explains. "We've found the particular genes and enzymes required to achieve the necessary chemistry, and we have strung them together in a way that enables our engineered bacteria to function as a sort of biological catalyst. In this way the cells can perform all of the biochemical reactions required to convert sugars like glucose into styrene."

He and McKenna are doing what he describes as building "microscopic microbial chemical factories," designed to synthesize the raw ingredients required to make products with characteristics identical to those that in the past have been derived only from petroleum.

If that is achieved, it could be possible for these chemicals produced from renewable materials to "plug directly into existing infrastructure, and be ready to use in current manufacturing systems that provide many of the products we use every day," Nielsen says.

## Scientific advances promise better ways to engineer water-safety systems

In a project supported by a \$500,000 grant from the Environmental Protection Agency (EPA), Paul Westerhoff will lead exploration of ways to improve the effectiveness of water treatment systems in the nation's small communities. He will also head a project supported by the National Science Foundation (NSF) to optimize the use of new technology for reducing a prevalent contaminant in groundwater.

Westerhoff is the associate dean for research in the Fulton Schools of Engineering, and a professor in the School of Sustainable Engineering and the Built Environment.

The EPA project will focus on ways to improve monitoring, testing and treatment of water systems in communities with populations of roughly 50 to 500 residents. Aiding these communities isn't simply a matter of scaling down larger systems used in urban areas, Westerhoff says. Typically such communities must deal with multiple pollutants and limited resources, making treatment and compliance with health regulations complicated.

For the NSF project—supported by a grant of more than \$295,000—the research team will seek advances in the use of photocatalysts to reduce the amount of nitrates in water supplies.

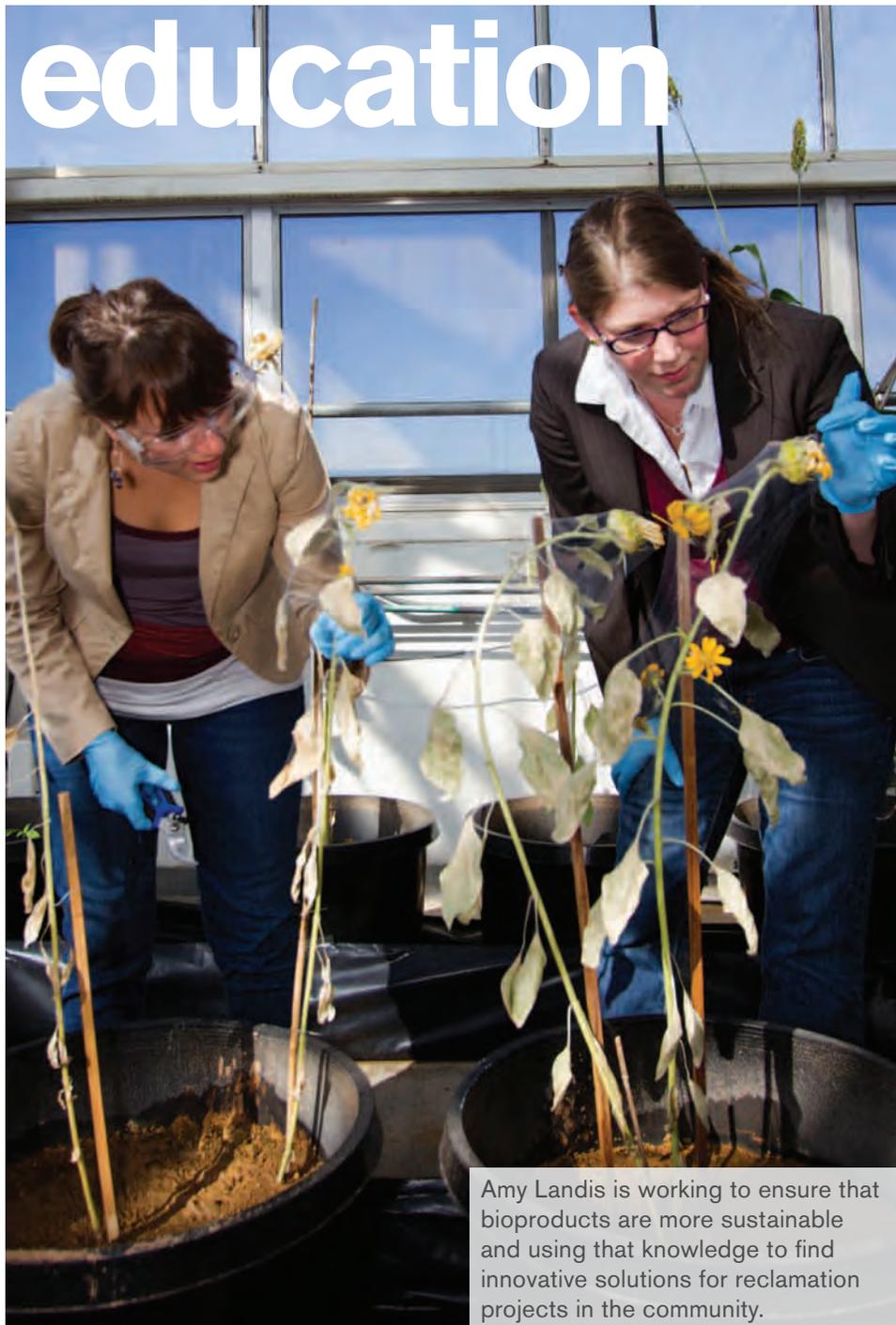


Graduate student Mac Gifford at work in Paul Westerhoff's lab.

Photocatalysis involves the acceleration of chemical reactions using the power of light. In this case, the researchers are seeking to produce reactions at the nanometer scale that will convert nitrate to a nonthreatening form.

"This will bring some of the most recent and significant advances in light-based technology and materials nanotechnology into engineering better water treatment systems," Westerhoff says.

# education



Amy Landis is working to ensure that bioproducts are more sustainable and using that knowledge to find innovative solutions for reclamation projects in the community.

## **Creativity in sustainable engineering education earns award**

Innovative work in advancing sustainability engineering education has earned Associate Professor Amy E. Landis a Carnegie Science Award.

The awards are given by the Carnegie Science Center in Pittsburgh “to recognize and promote innovation in science and technology.” Landis shares the award with Melissa Bilec, an assistant professor in the Swanson School of Engineering at the University of Pittsburgh.

Landis was a faculty member at the University of Pittsburgh from 2007 until 2012, when she joined the School of Sustainable Engineering and the Built Environment.

In the past several years Landis has developed research and community outreach programs in sustainable engineering, as well as four new sustainability courses. She has won four educational excellence awards and drawn more than \$750,000 to support her work in creating education programs designed to promote engineering innovation.

Landis’ success led her to be selected to participate in the 2011 National Academy of Engineering Frontiers in Engineering Education Symposium.

Landis focuses on devising hands-on, interactive methods for teaching sustainability principles.

For instance, she has students deconstruct a chair as a way of exploring the sustainable aspects of the materials used to make the chair, the energy expended in the manufacturing process that produces it and the finished product’s recyclability and re-use potential. She also has students compare the sustainability of older products compared to newer ones.

## **Li receives CAREER Award for transfer learning research**

Jing Li, assistant professor in industrial engineering in the School of Computing, Informatics, and Decision Systems Engineering, has received a CAREER Award for her work developing transfer learning methodologies to help improve manufacturing systems and healthcare.

The notion of transfer learning was originally introduced in psychology and education. It refers to the study of how humans apply prior experience to learn new tasks.

Li is the first to introduce transfer learning into the area of quality control and process improvement. In this new context, transfer learning refers to gaining knowledge from one quality control process then applying that knowledge to a different but related problem.

In statistical quality control, statistical models are built from production data to characterize the relationships between many process and product quality variables for process monitoring, fault



Jing Li

root cause identification and quality control decision makings. Finding ways to build these models is more complex today, with many industries—in particular semiconductor and renewable energy—facing challenges of high product variety and short life cycles. A development path that used to be several years is now just several months.

“In this scenario, the traditional quality control paradigm falls short,” Li says. “Now we need to use a very limited amount of data and knowledge, and a short time period of learning. Because the data is so limited, we cannot get a reliable statistical model that can be used for the new generation of products.”

Li’s approach is to leverage information that is embedded in old processes—for example, processes that share the same



Mary Anderson-Rowland

production environment, same machines or same product family. The objective is to use prior information as a baseline, then focus on quickly learning the new product.

One of the challenges is that existing data cannot be used directly—simply pooling the old data with the new data will not work as the production processes are not identical. Her work will develop novel transfer-learning-based methods with statistical rigor and computational efficiency, to address various quality control objectives including process monitoring and anomaly detection, fault root-cause analysis and quality control with sensor data uncertainty.

By enabling real-time, robust quality control decision-making across a large variety of products and along progressing

product generations, the results of this research could significantly improve the quality, productivity and cost-effectiveness of manufacturing systems. The potential for Li’s research is not limited to industrial processes. She is also exploring applications in healthcare. Using neuroimaging data for patients with similar neurological disorders, transfer learning can help identify differences in advanced phases of diseases such as Alzheimer’s disease, and provide better diagnosis and treatment options throughout the progression of the disease.

### **METS recognized for fulfilling New American University vision**

The Motivated Engineering Transfer Students (METS) program, administered by Mary Anderson-Rowland, associate professor in the School of Computing, Informatics, and Decision Systems Engineering, received a \$100,000 grant from the Women & Philanthropy fund in the ASU Foundation. The fund supports initiatives and programs that help fulfill the New American University vision of excellence, access and impact.

The METS program provides engineering and computer science community college transfer students a solid platform of workshops, mentoring, a study center with computer and printing access, and a variety of student resources and events to enhance students’ transition to ASU.

The METS Center and its resources offer transfer students a successful transition into university life and to obtaining a four-year engineering/computer science degree in the Ira A. Fulton Schools of Engineering.

### **Landis and Ramakrishna named inaugural Tooker Professors**

Amy Landis, associate professor, School of Sustainable Engineering and the Built Environment, and B.L. Ramakrishna, associate professor, School for Engineering of Matter, Transport and Energy, have been appointed Tooker Professors, effective June 2012.

Tooker Professors are selected annually via a competitive proposal process and appointed for one- to two-year terms. During this time, they will implement proposed innovations designed to lead to increased student retention and persistence, more rewarding learning experiences, greater student diversity and experiences that aid student competitiveness in the job market.

The Tooker Professor program was established in 2011 through an endowment established by Diane and Gary Tooker and co-investment from the Dean’s Office. Diane is a former elementary school teacher, and Gary is one of our engineering alumni and the former CEO of Motorola; both are passionate about creating exciting learning environments that attract students to and retain them in STEM fields.

## Using technology to advance learning

Brian Nelson says that learning in a typical classroom is nothing like learning in the real world. Nelson, an associate professor in the School of Computing, Informatics, and Decision Systems Engineering, is developing computer-based learning environments designed to immerse students in contextualized simulations of real-world activities to introduce them to scientific inquiry and content.

In a current NSF-funded study, *SAVE Science* (Situating Assessment in Virtual Environments for Science Content and Inquiry), Nelson is exploring ways to design and embed assessments into virtual worlds and find new ways to analyze the data.

Nelson's first game in the project, *Sheep Trouble*, tests students on their understanding of how organisms adapt over time to a specific physical environment. In *Sheep Trouble*, students go to a farm where the farmer has recently brought new sheep from a remote island and added them to his herd. The new sheep have physical characteristics that cause them problems in their new environment. The local villagers think the sheep are afflicted with black magic and must be killed. Students must find out what the problems are.

As part of the study, Nelson and his colleagues at the University of Maryland and Temple University look for links between student results on standardized

testing and the embedded assessments in *SAVE Science*.

"If there is little overlap, we want to know what that means," Nelson says. "Can we get more interesting data about learning from these kinds of embedded assessments? What patterns of interactions could serve as a substitute for regular testing?"

Now on year four of the project, Nelson has added virtual world-based tests aimed at weather and climate, physics and air pressure.

He has expanded his work on assessments, teaming with researchers at the University of Maryland in data mining and analysis. In the *Sheep Trouble* module, they found that some students who demonstrated an understanding that different physical attributes were impacting the health of the new sheep, did not understand why this occurs. They also found that most students began the assessment by exploring the virtual farm randomly, but those that came into the test with an understanding of the concepts being tested narrowed down their investigation to relevant information sources much more quickly.

Nelson has published and presented extensively on the viability of educational virtual environments for situated inquiry learning and assessment. He hopes that by better understanding how students learn we can design more effective teaching methods and immersive learning environments in the future.



Brian Nelson is advancing work on computer-based learning and assessment techniques.

# facilities



Opened in 2012, ISTB4 is the single-largest research building at ASU.

## New science building designed to advance research, engage community

ASU's newest science building—the Interdisciplinary Science and Technology Building 4 (ISTB4), on the Tempe campus—is designed to advance research and discovery, and to encourage children to explore their futures as scientists and engineers. The building does this through a mixture of high-tech labs, interactive environments and open spaces that will allow the public to witness research and technology advancement as it happens.

The seven-story, 293,000-square-foot building provides flexible laboratories for Fulton Engineering and the School

of Earth and Space Exploration and is home to the Office of Global Outreach and Extended Education.

Research at ISTB4 is reflective of our core research themes of energy, health, security, sustainability and education, with five main research centers and programs housed in the building.

**Synthetic Biology:** The synthetic biology group uses synthetic, systems, and quantitative biology to engineer, via modular design, useful gene and protein-based biological devices, and to deepen our understanding of molecular cell biology. We create biological devices primarily in human/mammalian cells, aimed at accelerating the pace of therapeutic technologies such as tissue

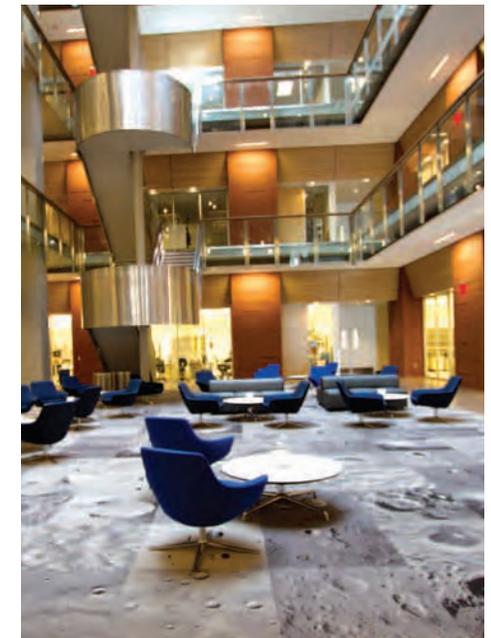
regeneration and customizable protein-based drugs.

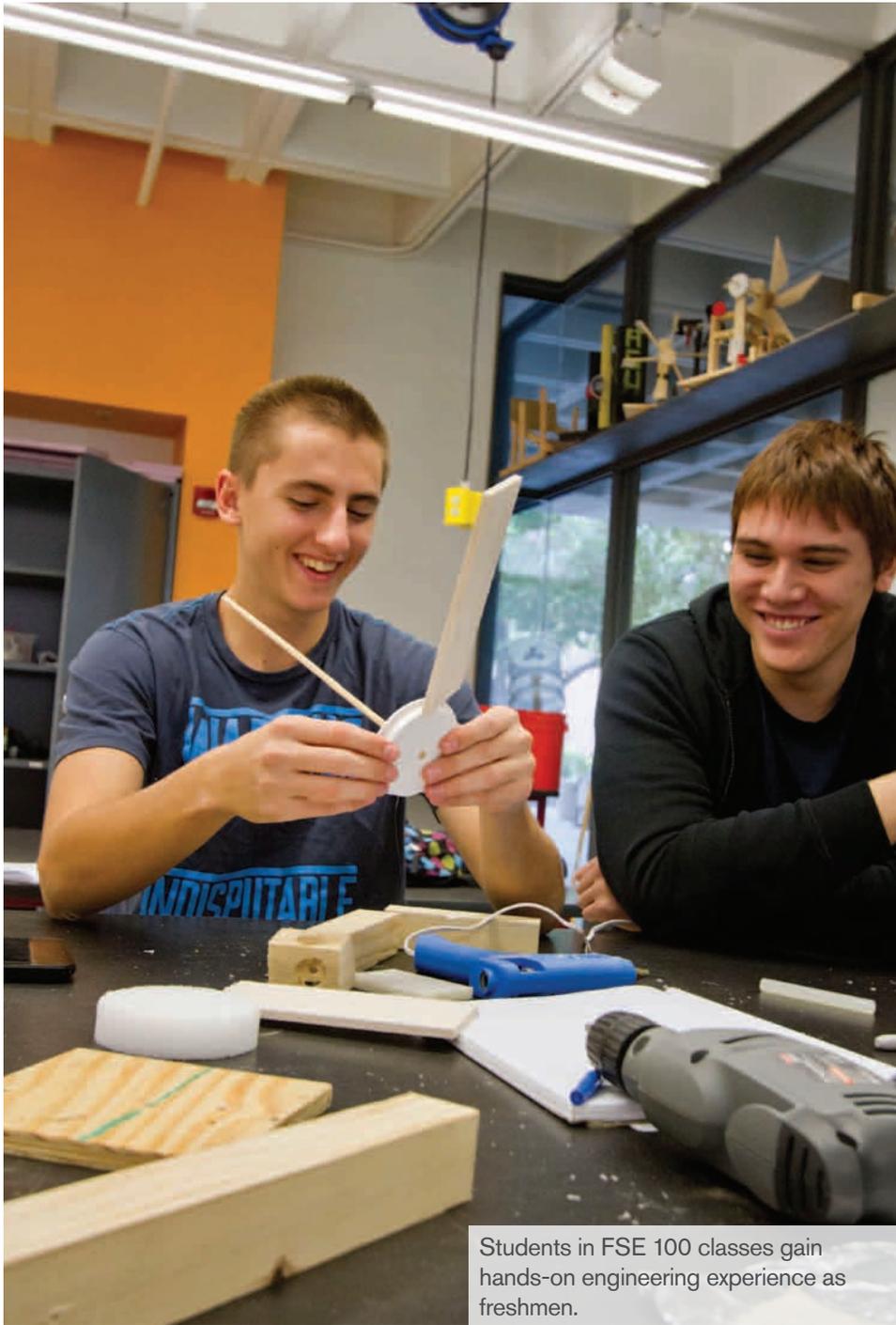
**The Security and Defense Systems Initiative (SDSI)** is addressing national and global security and defense challenges through an integrative, transdisciplinary, “whole system” approach that involves three key areas: technology solutions, law and policy issues, and root social causes. Fulton Engineering faculty are leading several thrust areas: biosecurity technology, advanced materials and material processing, and advanced RF, sensing and signal processing.

**Center for Electrochemistry:** Faculty in the Center for Electrochemistry bring expertise in surface/interface

physics and thermodynamics, physical electrochemistry, thin-film growth and new paradigms in electrochemical energy devices to advance research and commercialization of renewable electrochemically-based energy storage and conversion devices.

**Sustainable Water Initiative:** The Sustainable Water Initiative aims to understand problems and develop sustainable technologies that improve water quality and availability for people, industry and ecosystems. Our faculty and students conduct research on a range of projects including potable and industrial water treatment, wastewater treatment and reuse, desalination, groundwater remediation, water for biofuels applications and solutions to legacy pollution.





Students in FSE 100 classes gain hands-on engineering experience as freshmen.



Construction site for the Block 12/ College Avenue Commons building project.

### Continued expansion of eSpace initiative—open, engaging educational space for students

In fall 2011, we opened our first eSpace design, integration and prototyping studio. Since that time, we have expanded our eSpace initiative to four eSpaces that serve over 1,000 freshmen in our Introduction to Engineering classes (FSE 100) as well as our students in the Engineering Projects in Community Service (EPICS) classes.

eSpaces are innovative, hands-on learning spaces that inspire creativity, build problem-solving skills and prepare our students to excel in whichever field they choose.

Freshmen participate in multiple team-based projects culminating in a final project during the last half of the semester. These projects include hydroelectric power generators, solar cars, robotics and solar power

generation systems. Teams participating in EPICS also use the studio to plan their entrepreneurial service projects and test proposed engineering solutions.

Rooms are equipped with high-end computers to power engineering applications. Interactive design areas, projection screens, whiteboards and writeable glass wall panels that line the exterior encourage collaboration. The majority of the room is modular—moveable tables, rolling cabinets with tools and power cables that can be pulled from above—allowing flexibility to accommodate a wide spectrum of learning experiences from classroom lectures to large-scale design and demonstration.

Finished projects are showcased in display cases and in front of the glass panes for public viewing—allowing everyone to see the innovative and inspiring projects that our students create.



### Construction starts on new home for Del E. Webb School of Construction program

A groundbreaking ceremony in early 2012 launched the Block 12/College Avenue Commons building project, the largest infrastructure investment in the Del E. Webb School of Construction program's 54-year history. The building will create additional permanent space and state-of-the-art facilities needed to accommodate student growth and further DEWSC as a leader in construction management programs.

The multi-use building will exemplify cutting-edge construction and best practices in sustainable design. Specialty mechanical and electrical teaching spaces will allow students to see how the building operates. Collaborative workspaces, teaching studios and social areas will enable students to work together on in-classroom and out-of-classroom projects. The building will also be home to retail and auditorium space, fostering a connection to our community.

The estimated completion date is 2014.

### More Fulton Engineering facilities

The Ira A. Fulton Schools of Engineering have more than one million square feet of space in 11 existing facilities, providing room for our growing faculty to advance use-inspired research.

The **Biodesign Institute**, home to 10 research centers, is a conduit for Fulton Engineering faculty in environmental engineering, materials science and engineering, electrical engineering and biomedical engineering to merge their expertise with other ASU researchers. Research includes disease prevention and cures, reduction of injury-induced pain and physical limitations, and renewable and sustainable resources.

Biodesign includes 350,000 square feet of space designed to promote interaction among nearly 600 faculty, staff and students. It was the first facility in Arizona to earn platinum-level LEED Certification from the U.S. Green Building Council.

The **Brickyard on Mill Avenue** is a reflection of ASU's strategic initiative to embed itself in the communities it serves. The complex is located in downtown Tempe and houses both ASU and commercial entities. The Brickyard is home to the Engineering Dean's Office, the Engineering Career Center and instructional labs and offices for faculty of the School of Computing, Informatics, and Decision Systems Engineering.

The **Engineering Center** is an interconnected research and instruction complex. It houses labs, classrooms, our eSpace design studios and administrative offices, as well as student support services including the Engineering Tutoring Center and Engineering Student Center.

The **Engineering Research Center** houses research on advanced semiconductor and material technologies, power systems and electronics, and computational sciences. Several engineering centers are housed in the building, including NanoFab, a flexible foundry that offers state-of-the-art device processing and characterization tools for individuals and companies.

The 7,500 square-foot **Engineering Student Center** features study pods, a wireless access facility, a conference room, loaner laptop computers and meeting areas that can accommodate small groups for lectures and video presentations.

The **Barry M. Goldwater Center** for Science and Engineering houses several important research centers along with school offices and research and instructional labs.

### Interdisciplinary Science and Technology Building 1 (ISTB1)

provides flexible laboratories and adjoining workspace for biomedical engineering, including neural, molecular, tissue and cell research to develop artificial organs, biomaterials, and diagnostic and therapeutic devices.

### Interdisciplinary Science and Technology Building 2 (ISTB2)

is a high-bay research facility supporting research in advanced materials, transportation planning, geotechnical engineering, fluid dynamics and sustainable materials.

### MacroTechnology Works (MTW)

a world-class research facility at ASU's Research Park, brings market input and business process into the academic laboratory. MTW houses research programs in flexible electronics and systems, solar energy and photovoltaics and related collaborative research between government, industry and ASU. The facility boasts a 40,000 square-foot cleanroom.

### Urban Systems Engineering

houses administrative and faculty offices, as well as classroom labs for construction management, construction engineering, aerospace engineering and mechanical engineering.

# global outreach and extended education

The office of Global Outreach and Extended Education takes ASU's engineering expertise off campus through innovative online programs, short courses and global partnerships. Students in the programs have access to the same high-quality programs, top faculty and vast support services—in a flexible format that enables them to achieve their academic and professional development goals.

GOEE's programs also bring ASU engineering into the community. Partnering with industry, academia and government, we share knowledge and inspire collaboration that benefits our society and strengthens our global community.

## Secretary of State lauds ASU-Intel partnership for fostering international economic growth

U.S. Secretary of State Hillary Clinton pointed to an educational outreach partnership of ASU and Intel Corp. as a prime example of innovative efforts to expand global economic opportunities.

In remarks in July 2012 at an American Chamber of Commerce reception in Hanoi, Vietnam, Clinton spoke of the program that aims to help Vietnam's universities and technical schools

modernize its engineering education, and to lay the groundwork for future education, research and business collaborations between U.S. interests and Vietnam.

Clinton hailed the Higher Engineering Education Alliance Program (HEEAP) as the kind of public-private enterprise needed to produce an educated workforce prepared to compete for jobs in a 21st-century economy.

HEEAP was established in 2010 with a \$5 million grant from the United States Agency of International Development (USAID) and Intel, the leading multinational semiconductor chip and microprocessor maker. GOEE administers the program.

To date, the program has enabled more than 100 faculty members at Vietnam engineering schools to be trained in new instruction methods, both at ASU and in Vietnam.

In 2012, ASU and Intel renewed a joint commitment to help to expand the program. The new agreement provides resources to increase the number of faculty members receiving training in the HEEAP education model, supports development of a distance-education network and provides training to



Vietnamese education leaders in modern administrative, revenue-enhancement and policy development models.

Since its inception, the HEEAP alliance has been joined by Portland State University's Maseeh College of Engineering and Computer Science, and industry partners Siemens, Danaher and Cadence.

## U.S. News gives online engineering education program high marks

In recent national rankings by U.S. News & World Report, ASU's engineering schools place number two for student services and technology provided in an online graduate engineering program. For that ranking category the publication assesses such services as online access to academic advisement and technical support for students, as well as the

quality of technological resources used in online teaching.

The program is ranked number 16 in the country in student engagement and accreditation and 17 in faculty credentials and training.

U.S. News & World Report sought data for the rankings from more than 250 institutions with graduate engineering programs accredited by ABET, the leading engineering and technology education accreditation board. The rankings place ASU's online program at the level of those offered at many of the most prominent engineering schools and colleges.

Eighty-five full-time engineering faculty members teach in the program, which currently has more than 350 students from the United States and several other countries.

## Online electrical engineering degree program offers advanced education, ease of access

Beginning in fall 2013, the Ira A. Fulton Schools of Engineering will offer its renowned Bachelor of Science in Engineering (B.S.E.) degree program in electrical engineering in an online format.

Fulton Engineering's current online degree programs include one additional bachelor's program—engineering management—10 master's degree programs and three graduate-level academic certificate programs.

The 120-credit hour electrical engineering degree program includes core-engineering courses and a minimum of 45 upper division credit hours in specialty courses—including topics such as analog and digital circuits, electromagnetic fields, microprocessors, communications networks, solid-state electronics and electric power and energy systems.

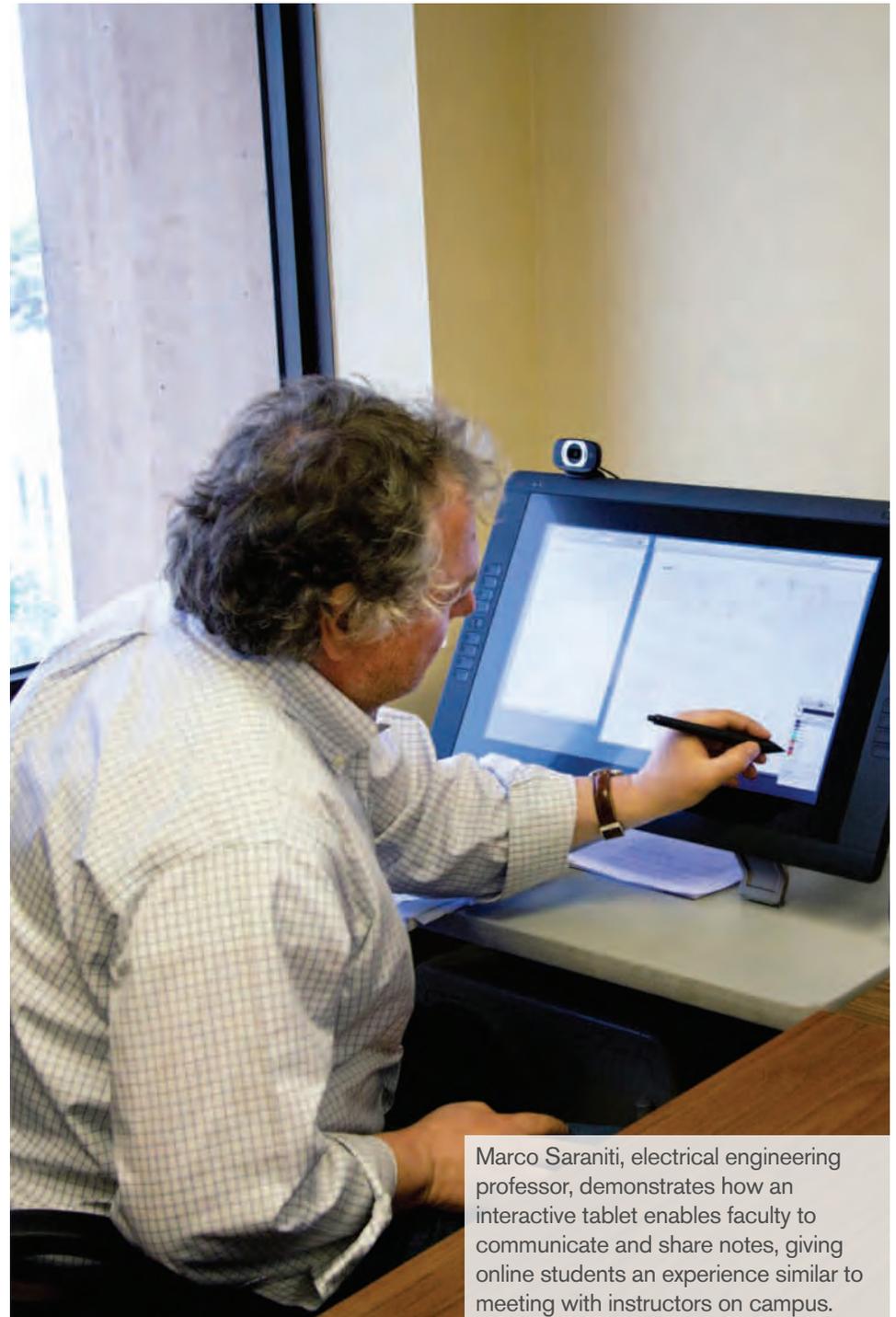
The program's labs incorporate practical hardware with industry-standard computer-aided design and simulation tools to give students applied, hands-on experience.

Sessions are offered in a seven-and-a-half week format and the degree program can be completed in as few as three calendar years, depending on the student's desired course load.

The online format enables corporate partners to provide workforce development opportunities, and gives their employees the opportunity to bring back insights gained from interaction with faculty who are leaders in their fields.

Professor Marco Saraniti notes that the class is not a remote class and that students will have significant real-time exposure to the instructor through innovative learning technologies.

ASU has a long history in distance-learning programs. Thirty years ago, it offered programs to corporate sites through interactive TV networks and satellites. In 2002, it first offered an online engineering graduate degree program. The programs have since expanded to include 60 undergraduate and graduate degree programs entirely online.



Marco Saraniti, electrical engineering professor, demonstrates how an interactive tablet enables faculty to communicate and share notes, giving online students an experience similar to meeting with instructors on campus.

# entrepreneurship



Engineering student team SafeSIPP, with a prototype of their portable water purification system.

## Encouraging entrepreneurship

Entrepreneurship is one of the major tenets of the New American University at ASU, and the university prides itself on the breadth and depth of resources available. Engineering students gain valuable leadership, business planning and marketing skills while they put their technological expertise to work.

Students often work in multidisciplinary teams to find solutions to local and global problems. Some of the resources that enable students to not just think about solutions, but implement them, include:

**Changemaker Central** was created as a way to facilitate participation by making direct service, service learning, entrepreneurship and high-impact careers more accessible and inviting to students.

The **Venture Catalyst at ASU** provides a suite of venture acceleration services that are designed to help ventures, in all stages of development, grow and succeed.

Now in its eighth year, the **Edson Student Entrepreneur Initiative** is one of the largest privately funded business plan competitions at a U.S. university. In addition to funding, students selected for the year-long program receive office space and training, enabling them to develop their ideas and launch viable businesses.

The **Engineering Projects in Community Service (EPICS)** program is a national, award-winning social entrepreneurship program. Teams design, build and deploy systems to solve engineering-based problems for charities, schools and other not-for-profit organizations.

**Innovation Challenge** seeks undergraduate and graduate students from across the university who are dedicated to making a difference in our local and global communities through innovation. Students can win up to \$10,000 to make their innovative project, prototype, venture or community partnership ideas happen.

These programs help students build a foundation and compete on a national and international stage for even greater support and recognition.

**G3Box** (Generating Global Good), which emerged from the EPICS program, is working to solve the problem of inadequate medical facilities in rural areas by converting freight shipping containers into medical clinics. G3Box was named Entrepreneur magazine's College Entrepreneur of 2011, Inc. Magazine's Coolest College Startups of 2012 and a finalist in the international James Dyson Awards for student innovators. The team has also been awarded funding through the Edson Student Entrepreneur Initiative for two years. Founders include Susanna Young and Clay Tyler, both of whom earned master's degrees in



mechanical engineering, Billy Walters, who holds a bachelor's in mechanical engineering and biomedical engineering undergraduate Gabrielle Palermo.

**FlashFood** is a food recovery network that uses text notifications to connect food-service vendors with those in need in an effort to combat hunger and reduce food waste. The team, which also got its start through EPICS, won the Microsoft Imagine Cup U.S. Finals going on to compete in the world finals in Australia, and was one of six finalists in the YUM! Global Sustainability Challenge. The team is part of the 2012-2013 Edson cohort. Team members include biomedical engineering graduate Eric Lehnhardt, computer science graduates Steven Hernandez and Ramya Baratam, marketing and sustainability graduate Jake Irvin, sustainability graduate Loni Amundson and materials science and engineering major Katelyn Keberle.

Another EPICS team, **SafeSIPP**, (Sustainable Innovative Portable Purification) is simultaneously solving two problems for rural communities in Africa: transportation and purification of clean drinking water. The team has designed a three-phase water purification and filtration system that works when a barrel—made from 80 percent recycled materials—is rolled across the ground from the water source to the community for consumption. SafeSIPP was the grand prize winner at the 10,000 Solutions one-year anniversary celebration, receiving \$10,000 to further their venture. The team, which has also received funding and support through Edson, includes Lindsay Fleming, Taylor Barker and Jared Schoepf, chemical engineering majors, and Jacob Arredondo, marketing and finance major.

Team **33 Buckets** is developing a project designed to provide clean water in communities in rural Bangladesh, where contaminated water is a leading cause of disease and other health problems. 33 Buckets was one of only five teams that made it to the Dell Challenge world finals from among some 1,700 teams that initially entered the competition. The team members are mechanical engineering senior Paul Strong and four biomedical engineering students—senior Pankti Shah, senior Varendra Silva, senior Mark Huerta and junior Connor Wiegand.

Led by mechanical engineering graduate student, Eli Chmouni, **AlphaStripe** is a global, online networking platform for military service members, military families, civilians, and humanitarian organizations to share war-time and conflict zone stories in video, photo, audio and journal formats. The entrepreneurial group started independently from organized venture programs at ASU, and was recently one of 20 companies to receive funding and mentoring through the Edson program.

**Vantage Realized**, an eight-member team developing a customized wheelchair designed to prevent injuries and physical ailments that often afflict long-term manual wheelchair users, has received support through Edson and last year finished second in the ASU Innovation Challenge. The team was also one of a handful of finalists

in the Entrepreneur magazine College Entrepreneur of the Year Award for 2012.

**Heart In Your Hand** is creating precise physical models designed to provide a guide for the diagnosis and treatment of congenital heart defects, coronary artery disease, heart failure, valvular heart disease and other cardiovascular malformations. The project began as a senior-year capstone design project undertaken by ASU student Fariha Ejaz, who is now pursuing a doctorate in

industrial engineering. The project was propelled forward after Ejaz, biomedical engineering master's student Megan Henriksen and David Frakes, assistant professor, gave presentations about the heart models at medical conferences. Soon after, the heart models were being used at the UCLA Medical Center, Children's Hospital of Pittsburgh, Phoenix Children's Hospital, and St. Joseph's Hospital and Medical Center in Phoenix.

Another senior capstone project that turned into a fledgling business is **Boogüd**. Founded by Derrick Loud, a biomedical engineering graduate, Boogüd was a finalist in the Innovation Challenge and semifinalist in the Dell Social Innovation Challenge. This year, Boogüd was one of 16 companies accepted into SEED SPOT's inaugural venture program, a resource for early stage social entrepreneurs.



Members of 33 Buckets in Bangladesh

## Fulton Entrepreneurial Professors

The Fulton Entrepreneurial Professors Program supports the translational efforts of faculty, particularly as it relates to technology and product commercialization and the formation of new companies. The first class of Fulton Entrepreneurial Professors, each with a two year appointment, was announced in 2012.

### **Gail-Joon Ahn** School of Computing, Informatics, and Decision Systems Engineering

The exponential market growth and the urgency of mobile security desperately demand the proactive technology transfer and broader collaboration with business partners including the Phoenix community. This professorship enables Ahn to collaborate with GFS Technology, Inc., an ASU spinout company, and tackle timely issues in mobile platforms in an effort to make a significant impact on local and state economic development as well as digital society. The entrepreneurial experience is also disseminated to students via regular lectures. With the FY13 support, Ahn will secure office space at ASU Skysong and support a postdoctoral research scientist who will oversee doctoral and graduate students under Ahn's supervision and pursue entrepreneurial



Gail-Joon Ahn

activities including drafting a business plan and developing prototypes.

### **Lawrence Clark** School of Electrical, Computer and Energy Engineering

Clark is on leave from ASU working as chief architect at SuVolta, Inc., a Silicon Valley startup that develops and licenses CMOS-based semiconductor technologies that significantly reduce the power consumption of integrated circuits (ICs). SuVolta has developed a proprietary platform (PowerShrink™ technology) that addresses the primary cause of excess power consumption by minimizing the electrical variation of the millions of transistors on a chip. At SuVolta, Clark's efforts focus on ensuring that the device performance and specifications are in line with customer needs, and on

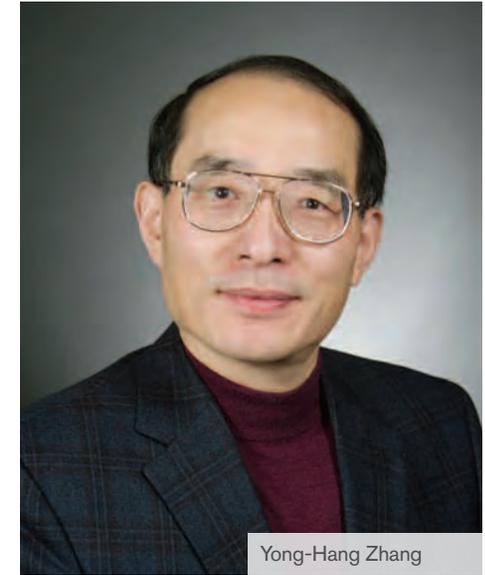


Lawrence Clark

the development of circuit design methodologies and design ICs that best leverage the DDC device improvements. Clark brings professional expertise through his extensive research in low-power design at ASU.

### **Yong-Hang Zhang** School of Electrical, Computer and Energy Engineering

Over the past five years, Zhang and his research group have developed approximately 25 inventions in the areas of solar cells, photodetectors, and light-emitting devices and systems. The underlying breakthroughs have application toward several market segments including terrestrial defense, space, law enforcement and aviation safety, and commercial digital cameras. This professorship will enable Zhang to establish Zipton



Yong-Hang Zhang

Labs, a research and development platform to bridge university research and technology commercialization of these inventions. Funding will partially support a postdoctoral researcher to further research under Zhang's guidance. Zhang already incorporates entrepreneurial lessons in his teaching and will continue his efforts to help show how engineers can start a company and bring an idea to the marketplace. Ultimately, Zipton Labs could have an economic benefit through royalties to ASU and Fulton Engineering, job creation and additional federal funding.



**outreach**

## Inspiring future engineers

Many young students with an aptitude for math and science may not realize that engineering exists, much less the breadth of career opportunities available.

Through a variety of on-campus activities, after-school programs, summer camps and collaborations with faculty and engineering student organizations, Fulton Engineering engages Arizona's K-12 students in creative, hands-on activities in an effort to inspire them to become technically savvy, prepare for studies in science, technology, engineering and math (STEM)-related fields and pursue careers in engineering.

Many are particularly geared toward young women and minorities—groups typically underrepresented in engineering—by providing appropriate role models and rich educational experiences that help them envision, create and fulfill career aspirations.

From managing the Arizona *FIRST* LEGO League program, which attracted more than 300 middle school teams from around the state in 2012, to student-led activities like the Society of Women Engineers' GEAR Day which hosted 120 Girl Scouts, our efforts have reached thousands of young students in Arizona.

We continue to expand programs, both on campus and in our community, in an effort to share the excitement of engineering.

## Engineering Open House helps spark interest in engineering

The Ira A. Fulton Schools of Engineering hosted nearly 2,000 visitors at the first-ever Engineering Open House held in March 2012. The student-led event was aimed at highlighting student and faculty work, and sharing the excitement of engineering.

Visitors saw displays of solar energy, robotics, and the technological advances behind all the ever-more-versatile mobile communications devices and high-performance computers.

They toured laboratories where engineers are at work developing better biomedical devices, expanding the applications of nanotechnology, and boosting the capabilities of automobiles, airplanes, rockets and satellites.

More than 200 volunteers—faculty, staff, students and industry representatives—helped organize activities. The first day, activities were geared toward field trips for elementary and middle school student groups. For teachers, the event helped bolster lessons K-12 teachers are providing on science and engineering.

"This helped them relate the technology projects we're doing in the classroom to real science and engineering. It's wonderful," said Myrna Galaz, a fourth-grade teacher at Zito Elementary School in Phoenix.

The second day was open to families and the community. Among those who attended were Zeke, 11, and his sister Ava, 8, from Goodyear, who worked intensely trying to improve their designs and construction of miniature carts for test-runs on an up-and-down track.

"They would have kept at it for hours. I had to drag them away to see other things," said their father, Shawn Vandernaalt, an ASU graduate who is now a counselor at La Joya Community High School in Avondale.

"I'm trying to feed their curiosity about all of this stuff. Any chance to expose them to [engineering and science] is good," Vandernaalt said. "It's not too early to get them thinking about higher education. We'll be back here again next year."

## SHPE and the Legacy Initiative host STEM outreach event

The Society of Hispanic Professional Engineers (SHPE) at ASU teamed up with nonprofit, the Legacy Initiative, to host the STEMS Success Youth Conference at ASU.

Over 200 middle and high school students participated in activities designed to get female and minority students interested and excited about STEM related fields of study. Students also had the opportunity to see demonstrations from local robotics teams and speak with engineers from the Palo Verde Nuclear Station, Medtronics, Boeing, U.S. Navy and the Tuskegee Airmen.

## Nearly 300 students attend MESA Regional Event at ASU

Thirteen schools and 296 students registered for the MESA Regional event at ASU's Tempe campus.

AZ MESA is a free after-school educational program coordinated by the Fulton Schools of Engineering. The program is designed to encourage underserved ethnic minorities, girls, low income, and first-generation, college-bound students to pursue coursework, advanced study and possible careers in math, engineering and science.

With the help of a volunteer advisor, the MESA Program promotes a strong academic foundation in math and science as the key to college admission and success.

MESA competitions, curriculum and workshops are sponsored by ASU and AZ MESA. Individual teams pay only a minimal registration fee. Competitions are held twice a year at ASU and the University of Arizona. They include physics-related challenges including bottle rockets, egg launches, solar ovens and catapults. All are designed to capture student imagination and encourage interest in STEM-related concepts.



Jeff La Belle (center) with Nehal Jolly (left) and Aldin Malkoc (right), graduates of Bioscience High School in Phoenix.

## Young students learn their way around research lab in summer internship

Thirty-four high school students and college undergraduates got an immersive experience in the world of research through an internship program developed by a group of faculty members in the School of Biological and Health Systems Engineering.

Over two months during the summer, students worked on such things as applications of synthetic biology, medical-device design, bioelectronic sensors—including those that test for cardiovascular disease and hearing loss—and systems that transport medicinal drugs within the body.

“We want students to understand why they are in school and why they are taking all those hard classes. We want to show them that even though they are only in high school or in their first years of college, they can learn enough to do things that really help people,” says assistant research professor Jeffrey La Belle, who created the program and now organizes and manages it.

Now in its second year, the program offers young students the opportunity to learn in La Belle’s lab as well as those of biomedical engineering colleagues Michael Caplan, Jeff Kleim, Vince Pizziconi, Sarah Stabenfeldt, Brent Vernon and Xiao Wang.

With students and faculty involved in last year’s summer research internship program spreading the word about the value of the experience, there was no problem filling all the spots for this year’s intern group.

The program emphasizes teaching the students about teamwork, lab safety and how to apply classroom lessons in the lab.

“They like what we’re doing here,” La Belle says, explaining that the program is even drawing participants from among students attending out-of-state universities who have returned home to Arizona for the summer break.

## Summer robotics camps immerse young students in engineering challenges

Hundreds of Arizona middle school and high school students have gained experience in putting science, engineering and math into practice in the summer robotics camps presented since 2006 by the Fulton Schools of Engineering.

Led by Yinong Chen, a lecturer in the School of Computing, Informatics, and Decisions Systems Engineering, the camps teach students to design, build and program rudimentary robots.

Youngsters get a taste of the rigors of experimentation, the engineering process and technology development.

In addition, more than 50 Arizona middle school and high school teachers have received training at the camps on how to introduce robotics instruction in their schools.

Through those teachers, Chen says, thousands of young students across the state are benefitting from lessons offered by ASU summer robotics camps.

## Engineering outreach programs

### Grade school/middle school

**FIRST LEGO League:** Teams of students discover, build and compete in the exciting field of robotics.

### Middle school

**Best Engineering Science and Technology (BEST) program:** One action-packed week of engineering projects and hands-on activities at the ASU campus.

**STEM College for Kids:** These camps offer a variety of programs, from algebra explorers to water and energy engineering.

### Middle school/high school

**Math, Engineering and Science Achievement (MESA) program:** A fun, collaborative program for 7th to 12th grade students in Title I schools.

**Game Camp:** Students are engaged in intensive video game creation, visualization and production.

**Robotics Camp:** Through robot construction and programming, students learn the latest engineering design concepts and computing technologies.

### High school

**High School Engineering Research Program:** A free program that enables students to learn about engineering by working directly with faculty and students in the lab.

**Summer Transportation Institute:** Through applied projects and industry-related field trips, this three-week residential program helps students understand how engineering impacts the transportation industry.

**Summer Engineering Experience, SEE@ASU:** Students get a taste of the university experience by spending one week living on campus, touring labs, engaging in engineering activities and meeting with faculty and students.

**Test of Engineering Aptitude, Math and Science, TEAMS:** An annual theme-based competition, TEAMS gives students the chance to discover engineering through practical applications of math and science.

**App Camp:** Students learn iPhone app development in a two-week campus program.



Students at MESA Day assembled small model cars equipped with solar panels to learn about alternative energy sources.

# investing in engineering





## Celebrating 10 years as the Ira A. Fulton Schools of Engineering

At Arizona State University, we've been educating engineers for Arizona and the world for nearly 60 years. With almost 9,000 students, we are building the engineers of the future and pursuing the discoveries and solutions to the challenges facing society. E2 Camp, our innovative orientation for all incoming freshmen, is just the beginning of our "engineering from day one" culture, that emphasizes problem-solving, entrepreneurship, multidisciplinary

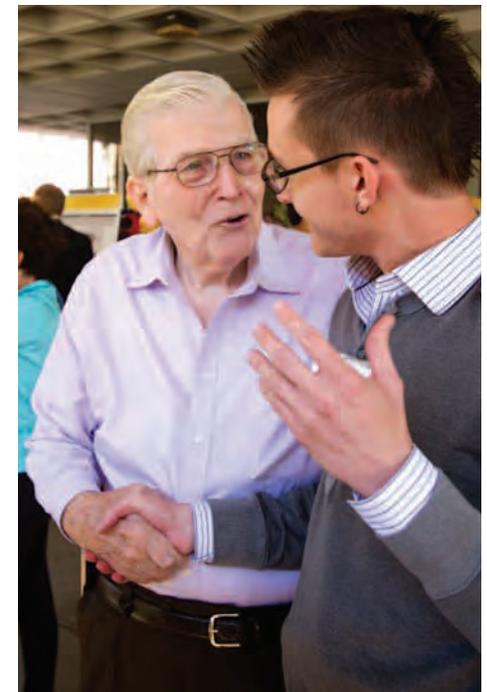
interactions, societal context and connections.

In 2003, Ira A. Fulton, founder and CEO of Arizona-based Fulton Homes, established an endowment of \$50 million in support of ASU's College of Engineering and Applied Sciences.

Since receiving his transformational gift, the Ira A. Fulton Schools of Engineering have seen tremendous growth—both in scale and quality—of people and programs. Fulton's investment has served as a catalyst for this advancement, enabling the development of a dynamic portfolio of strategic initiatives that benefit our students and faculty and the communities where they live and work.

Throughout, Ira A. Fulton has remained an active supporter of the school that bears his name. He is a familiar face to students and a regular presence at events such as the semi-annual Fulton Undergraduate Research Initiative Symposium and engineering convocation ceremonies.

We are grateful for the ongoing support provided by Ira A. Fulton.





Del E. Webb Foundation board members (left to right) Jean Canoose, John B. Lees, Larry Johnson, Shielia Johnson, Nicole Aubin and John W. Smith.

## Building a legacy

“We go for results,” says Larry Johnson, president of the Del E. Webb Foundation.

The foundation has long been a part of the success of the Del E. Webb School of Construction program, establishing a \$4 million endowment over twenty years ago. Today the program is one of the top in the nation.

“At the time, there was a lot of construction going on in the Valley,” Johnson says. “We saw really phenomenal people coming out of the school—serious people who had not just gone to school for an education, but came to ASU for the education the construction school offers.”

The endowment has provided support for research, scholarships and equipment.

He notes that the endowment is a flagship grant for the foundation. “We look at the money we gave years ago, and are still seeing results. The school is producing leaders, builders that will be building the infrastructure required for a civilized society.”

This year, the foundation furthered its investment in the future of construction by committing \$2 million in funding for new, state-of-the-art facilities needed to accommodate student growth and continue to advance the program’s leadership in the field.

The new building will exemplify the innovative, sustainable design principles championed by the Del E. Webb Construction Company. Plastic walls will enable students to see the wiring and infrastructure that goes into building, and high-tech labs and teaching spaces

will allow students to see how the building operates.

“We are quite proud of the legacy we are building with ASU,” says Johnson. “And we are honored to give such recognition to Del Webb.”

Webb built his construction company during difficult economic times into one of the largest in Arizona. His notable projects include the Flamingo Hotel in Las Vegas, Madison Square Garden in New York City and the Sun City development in Arizona. Perhaps less known is that he was an owner of the New York Yankees for 20 years—during which the team won the World Series ten times.

Johnson says that DEWSC’s programs mirror Webb’s commitment to innovation and team-building.

“I have gone to E2 Camp and the team-building that is instilled early on is something that I have not seen anywhere else. Industry participation in the program is giving students teaching out of real life,” he says. “People come from all over the world for this education.”

“There are many places that have the Del Webb name, but nothing quite like the school. He was a good man, a good builder. Throughout his life, he instilled a sense of loyalty and commitment to people who sincerely want to work. We continue that legacy through the foundation,” says Johnson.

## Fostering a great place to learn and work

What began as a chance meeting between the general manager of Cirrus Logic's Tucson facility and an ASU professor just two years ago has precipitated quickly into a robust relationship that is providing significant opportunities for engineering students and graduates.

"It only takes one or two phenomenal instructors to build a strong program in our areas of interest," says Roy Kaller, senior technical advisor, Cirrus Logic. "At ASU, we have found a great critical mass of expertise."

Based in Austin, Texas with international locations in Europe, China and Japan, Cirrus Logic is a leading supplier of high-precision analog and digital signal processing components for the audio and energy markets.

"We solve profoundly difficult problems for our customers—problems that no one in the industry is taking on," Kaller explains. "We need a workforce ready to meet that challenge."

Kaller says that beyond the pure academic preparation, ASU graduates are well-prepared with industry perspective gained from business-savvy faculty and hands-on experiential opportunities. "There are only a handful of schools with the professors and



curricula that enable students to hit the ground running."

Cirrus Logic has made a significant financial and institutional commitment to furthering these efforts.

One faculty member that Kaller meets with regularly is Bertan Bakkaloglu, an associate professor in the School of Electrical, Computer and Energy Engineering. They discuss research curricula and Cirrus Logic has provided funding for Bakkaloglu's research in RF and mixed-signal IC design.

Through its fellowship program with Fulton Engineering, the company takes what it sees as a long term bet—funding and mentoring graduate students in the electrical engineering program.

To date, two students have been awarded the full-ride Cirrus Logic Michael L. Hackworth Fellowship, supporting their master's-level studies. The company notes that up to three fellowships are available each year. Last summer 40 ASU students had the opportunity to participate in Cirrus Logic's internship program.

"ASU is one of our top sources for interns and for new graduates," Kaller notes. "It is stunning how productive our interns are—we pair them with strong mentors and give them meaningful, real-world work."

In the last couple of years, Cirrus Logic has hired 10 ASU graduates—three of whom participated in the internship program.

"We look for the cream of the crop. We want awesome engineers, but also great students and teachers that embrace our dynamic, open-communication culture. We believe that a culture of teamwork drives our business," he says.

The company was recently named to Fortune magazine's 100 fastest growing companies, and was listed among the top seven in the tech sector. It was also among Forbes list of America's Best Small Companies for 2012.

For Cirrus Logic, the bottom line is creating a great place to work "not because it sounds good, because we work here, too."

# thanks for your support

## **\$2,000,000 and above**

Del E. Webb Foundation  
William Zink

## **\$250,000 to \$500,000**

Gary & Diane Tooker Family Foundation  
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## **\$100,000 to \$249,999**

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## **\$5,000 to \$24,999**

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Every effort has been made to ensure the accuracy of this list. If an error or omission has occurred, please contact the Ira A. Fulton Schools of Engineering Development Office at 480-965-9646 so that we may acknowledge your support.

## Sandra and Joseph Palais **Investing in the future**

"I don't think of the fund as 'giving,' I'm 'investing'—investing in the future," explains Joseph Palais.

It is this mindful, forward-thinking approach that makes Emeritus Professor Joseph Palais a strong asset to the School of Electrical, Computer and Energy Engineering at ASU.

Through the united generosity of both Joseph Palais and his wife, Sandra Palais, the Joseph and Sandra Palais Awards fund was established to provide continuing support and resources for gifted students in electrical engineering. The concept of "investing in the future" drives the Palais family to support ASU because they have witnessed first-hand the accomplishments that

students are capable of achieving. They each made their long-term careers at ASU, cultivating strong personal and professional connections to the students, employees and programs.

"It has been amazing to see the transformation of the University over the decades of our affiliation with ASU," says Joseph Palais.

Joseph Palais has been a professor at ECEE since 1964 and continues to dedicate his time and efforts towards advancing the school. He also serves as the ECEE graduate program chair, responsible for all graduate program activities.

Sandra Palais graduated from ASU's Fulton Schools of Engineering with a degree in computer science in 1984. She worked in the W.P. Carey School of Business as a senior support analyst, where she provided computer support from 1984 until her retirement in 2008. She now volunteers her time to help out the City of Tempe and other organizations.

The fund supports two semi-annual awards that are presented to both undergraduate and graduate students. The Palais Outstanding Doctoral Student Award recognizes one graduating doctoral student in ECEE who has excelled in academics, research, publications and awards during their graduate career.

The Senior Design Award is divided and allocated to the EEE 489 senior design groups that win their respective senior design competitions that semester. The senior design project is designed, implemented and evaluated over the course of two semesters. Students work together in teams to gain experience engineering a new solution from the idea to the final product.

"We are pleased to have been a part of the tremendous growth and success of the Ira A. Fulton Schools of Engineering," Joseph Palais says on behalf of himself and Sandra Palais.



check out what's  
going on in our house



[engineering.asu.edu/openhouse](http://engineering.asu.edu/openhouse)

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[fullcircle.asu.edu](http://fullcircle.asu.edu)

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Tom Story



S. Harry Robertson, '56 B.S., was honored with the Alumni Service Award for his landmark achievements in the field of flight safety. Robertson is a pilot, registered professional engineer and founder of Robertson Fuel Systems, LLC.

## ARIZONA STATE UNIVERSITY: THE NEW AMERICAN UNIVERSITY

**Arizona State University** is one of the nation's largest and most comprehensive urban-serving research universities. Located in the beautiful Southwest in the Phoenix metropolitan area, ASU is boldly pursuing its vision of a New American University, striving for student access and success, research and discovery that benefit the public good, and assuming responsibility for the economic, social and cultural vitality and health and well-being of the community. We are an institution committed to excellence, access and impact—a new gold standard for the American research university.  
<http://newamericanuniversity.asu.edu>

## Remembering a scholar, teacher and friend

Dieter Schroder, Regents' Professor, noted semiconductor technology expert and revered mentor to many in the Ira A. Fulton Schools of Engineering, passed away on December 24, 2012.

The longtime electrical engineering professor served at ASU for over 30 years. He is remembered by colleagues and students as a skilled teacher and communicator, and a kind and patient man.

Schroder joined the faculty in 1981 after 13 years at Westinghouse Research Labs. His industry experience at Westinghouse, along with close working relationships at Motorola, Intel, Sperry Flight Systems, Texas Instruments and Litton Industries, gave him a unique perspective as a teacher and mentor.

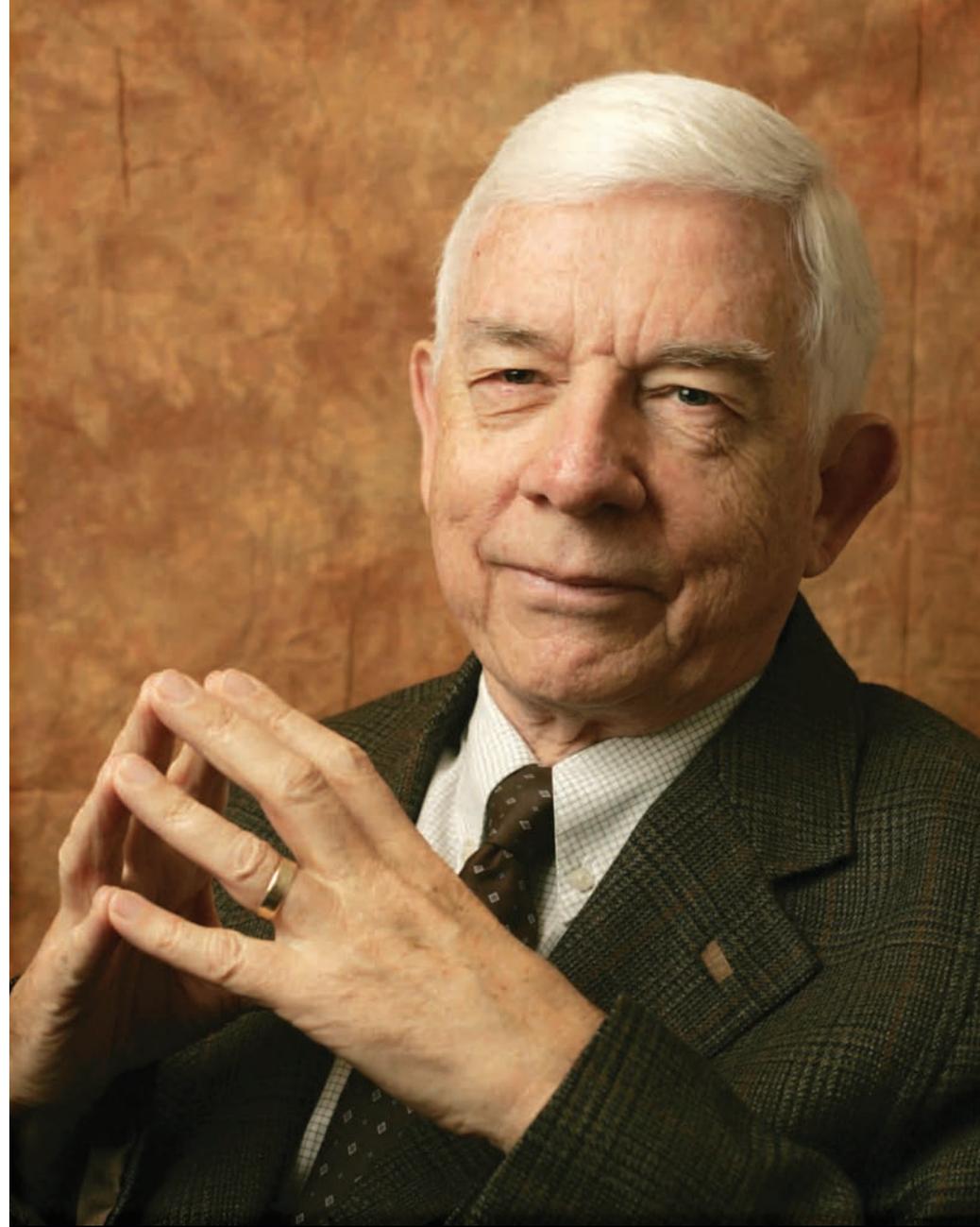
Schroder graduated more than 64 master's students and 42 doctoral students during his time at ASU. Among his many teaching accolades, he was named Outstanding Doctoral Mentor by the ASU Graduate College and earned six engineering teaching excellence awards.

Schroder helped make ASU a leader in solid-state electronics research. Under his direction, researchers at the Center for Low-Power Electronics helped solve the problem of how to make integrated circuits operate more speedily while also controlling the excessive heat the circuits generated in the process. The solutions are widely applied in the computer microprocessor industry.

His books and courses have become models for teaching. His textbook "Semiconductor Material and Device Characterization" is used worldwide. Closer to home, Schroder was a central figure in the development of engineering education at ASU.

During his career, Schroder published two books, 10 book chapters, 178 journal articles and 167 conference presentations. He edited 11 books and was awarded five patents.

Most recently, he served as deputy director of Quantum Energy and Sustainable Solar Technologies (QESST), an NSF-DOE Engineering Research Center established at ASU in 2011.



Dieter Schroder was named Regents' Professor in 2009. The title "Regents' Professor" is the highest faculty honor awarded at Arizona State University. It is conferred on ASU faculty who have made pioneering contributions in their areas of expertise, who have achieved a sustained level of distinction, and who enjoy national and international recognition for these accomplishments.

