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Dear friends and colleagues,

The start of a new year is always an exciting time, and this promises to be a particularly memorable year for the Ira A. Fulton School of Engineering at Arizona State University.

During 2007-08, the school will celebrate its golden anniversary, commemorating 50 years of excellence in engineering education and discovery. An added treat for me personally is that fall 2007 marked the beginning of my second semester as dean of the school of engineering.

The occasion of a 50th anniversary is an opportunity for reflection and a celebration, and we will gladly seize this moment in our history. As we honor the achievement and success of the past five decades, our engineering community will look collectively to what lays ahead. The school’s growth and progress since the mid-20th century demonstrate great potential, and we are building on the past as we shape the future of engineering.

The school of engineering at ASU was founded as the college of applied arts and sciences, which initially included divisions of agriculture, architecture, engineering and industrial education. Today the school is home to nine departments that encompass a full range of engineering disciplines: aerospace, bio, chemical, civil, computer science, construction, electrical, environmental, industrial, materials science and mechanical.

The school maintains a significant presence at ASU, itself one of the largest universities in the nation. We currently enroll nearly 6,000 undergraduate and graduate students, and to date more than 29,000 ASU alumni have earned engineering degrees from the school. In fall 2007, we welcomed nearly 20 new members to our faculty of more than 200 teacher-scholars. As we lay the foundation for the next 50 years, we are growing our capacity to deliver leading research and education that will impact global quality of life.

An example of this growth is in our Fulton Undergraduate Research Initiative (FURI), which offers students funded opportunities to perform applied research, providing enhanced learning and competitive advantage for undergraduates. Now in its third year, the number of FURI students has grown by more than 60 percent since the program’s launch.

Additionally, last fall we launched a new master’s degree program in biomedical informatics. This emerging discipline combines computer science and engineering with biology, mathematics and social sciences with the goal to revolutionize modern health care. It is just one demonstration of the transdisciplinary approach we are taking to training engineers of the future who will benefit their local and global communities.

Our transdisciplinary approach to engineering education and research is further demonstrated in faculty members’ collaboration with several other ASU programs, including the school of engineering’s new Department of Biomedical Informatics, co-located at ASU’s main campus in Tempe and the Arizona Biomedical Collaborative I building on the downtown Phoenix Biomedical Campus. The department operates in partnership with the University of Arizona College of Medicine-Phoenix. The School of Materials is jointly administered by ASU’s College of Liberal Arts and Sciences and the Ira A. Fulton School of Engineering.

Our continuing progress is built on the lessons and accomplishments of our past. I hope you share my excitement about the future we are creating today, and the results we will deliver during our next 50 years – and beyond.

Sincerely,

Deirdre R. Meldrum
Dean
Year in Review Engineering Momentum

Commemorating 50 years of engineering education and research and providing cutting-edge teaching and research on local and global levels.

Leading engineering discovery and innovative education. Our vision for the future is happening now.

The school is commemorating 50 years of engineering education and discovery during the 2007-2008 academic year. It is eagerly looking toward the future and providing cutting-edge teaching and research on local and global levels.

Ira A. Fulton School of Engineering programs and research are guided by a deep desire to advance knowledge, create new solutions to societal problems and improve global stewardship. Serving a wide spectrum, from the individual scholar to the greater community and industry, the school creates accessible pathways to engineering education and technology innovation.

The school began 2007 with the arrival of Dean Deirdre Meldrum, who took on a role as a prime catalyst in the realization of ASU President Michael Crow’s vision for a New American University – a single, unified institution comprising four differentiated campuses that positively impact the

The school continues to strengthen ASU’s ties with the local community and raise engineering’s profile regionally, nationally and internationally.

Online Education

In January 2007, the school expanded its historic collaboration with Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM). Initially launched by engineering’s Global Outreach and Extended Education in 2005 to offer online delivery of ASU’s International Six Sigma Black Belt certification, the program now includes the Six Sigma Green Belt certification. To date 76 students have enrolled in the Black Belt program, and 15 have graduated. The Green Belt program had 85 students enrolled for its January 2007 launch, and 150 total students were expected to enroll in the programs in January 2008. ASU courses are delivered by engineering faculty through...
online technology, supported by Global Outreach and Extended Education. Future plans for the partnership with ITESM include the development of a dual degree focused on enterprise systems innovation and management.

FACULTY ACHIEVEMENT
The success of the school of engineering is driven by its distinguished faculty. In April, four faculty members – James Adams, Ronald Adrian, Michael Kozicki and Joseph Wang – were among 19 winners of the inaugural ASU Faculty Achievement Award for outstanding intellectual contributions to their field of expertise and engineering education as a whole.

Two months earlier, Professor Subhash Mahajan, director of the School of Materials, was named a Regents’ Professor. This honor is awarded each year for outstanding accomplishments in teaching, scholarship, research, creative activities, and national and international recognition in their fields.

Three other faculty members – Hasan Davulcu of the School of Computing and Informatics, Panagiotis Mitropoulos of the Del E. Webb School of Construction and Peter Wonka of the School of Computing and Informatics – earned National Science Foundation CAREER Awards in the past year.

In addition to highly coveted faculty honors, the school is breaking ground in new academic territory.

BIOMEDICAL INFORMATICS
Last fall, Robert Greenes brought experience gained during almost four decades at Harvard University to help lead the new Department of Biomedical Informatics. He is the Ira A. Fulton Chair of the new department in the School of Computing and Informatics. He also is a professor of biomedical informatics.

Greenes left posts as professor of radiology at Harvard Medical School and distinguished chair in biomedical informatics at Harvard-affiliated Brigham and Women’s Hospital, where he also was a professor of health policy and management at the Harvard School of Public Health.

The Biomedical Informatics program, supported by the Mayo Clinic, Barrow Neurological Institute and Banner Health, is designed to bring together clinicians and researchers in teams, applying new developments in informatics theory to clinical practice. This collaborative approach makes the Master of Science program in Biomedical Informatics at ASU distinctive, if not unique, among biomedical informatics programs in the United States.

RESEARCH CENTERS
A new research arm, the Center for Health Information and Research (CHIR), is home of the Arizona HealthQuery (AZHQ), a community-university partnership created by the voluntary participation of health care providers, insurers and employers in Arizona. AZHQ is a community health warehouse containing health information on millions of Arizona residents.

In March 2007, it was announced that engineering faculty members would direct four nanotechnology research centers (more are on the way) – Applied Nanoionics, Biomolecular Integrated Circuits, Computational Nanoscience and Nanophotonics – established by the Arizona Board of Regents. The centers operate with the oversight of the also newly established Arizona Institute for Nano-Electronics (AINE) at ASU. AINE, jointly administered by the school of engineering and the College of Liberal Arts and Sciences, is charged with conducting long-range interdisciplinary research in nanoscale materials, devices, circuits and computer architecture with the aim of achieving revolutionary advances in electronics.

Delivering an innovative educational experience is a top priority for the school of engineering.
May 2007 marked one year of operation for the school of engineering’s Fulton High-Performance Computing Initiative (HPCI), whose computing facilities provide advanced capabilities for faculty research investigations. In its first year, the program’s center was used by more than 300 researchers, including about 75 ASU faculty members across 15 academic departments. HPCI is a decided advantage for engineering faculty as they vie for highly competitive national research awards. More than $22 million in research was performed at HPCI facilities in 2006.

STUDENT CENTER
Delivering an innovative educational experience is a top priority for the school of engineering, and the past academic year marked the opening of a new Engineering Student Center. The 7,500-square-foot facility features several study pods, a wireless access facility, loaner laptop computers, a conference room and meeting areas that can accommodate small groups. Such facilities are put to good use by students, as evidenced by the engineering team that in November 2006 won ASU’s inaugural Academic Bowl. Amy Teegarden, Karl Sturm, Andrew Holle and Marko Manojlovic were awarded the President’s Cup for their win, each receiving $4,500 in scholarships. Sponsored by the offices of Public Affairs and Student Affairs, ASU’s first Academic Bowl was modeled after the national College Bowl. The intellectual competition features four-member teams demonstrating knowledge of a wide array of subjects, including history, science, sports, current events and culture.

CAREER CENTER
This fall, the new Engineering Career Center was introduced. The center, run by Robin Hammond, is devoted to helping students within the school develop career-readiness skills and connect with exciting internship and career opportunities. It fills a need by helping ASU’s young engineering talent connect with the school’s industry partners.

Also, an assistant dean of student services, Stephen Rippon, was hired. Rippon is responsible for the leadership of schoolwide student services programs and initiatives, including recruitment, retention, diversity, internships, undergraduate research and collaboration with academic departments.

As it commemorates 50 years of engineering education and research, the Ira A. Fulton School of Engineering is learning from its past, reveling in its present and eagerly awaiting its future. A growing momentum is on its side.
The Ira A. Fulton School of Engineering honors the achievements and intellect of its faculty, students and alumni. The school encourages the discovery of new knowledge and skills through its collaborative research agenda, its dynamic core engineering curriculum and its value-added transdisciplinary opportunities for students.

**By the Numbers**

The Ira A. Fulton School of Engineering honors the achievements and intellect of its faculty, students and alumni. The school encourages the discovery of new knowledge and skills through its collaborative research agenda, its dynamic core engineering curriculum and its value-added transdisciplinary opportunities for students.

### Degrees Awarded

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<tbody>
<tr>
<td>Undergraduate degrees awarded</td>
<td>672</td>
<td>737</td>
<td>733</td>
<td>764</td>
<td>711</td>
</tr>
<tr>
<td>Graduate degrees awarded</td>
<td>480</td>
<td>579</td>
<td>407</td>
<td>408</td>
<td>388</td>
</tr>
<tr>
<td>Master’s</td>
<td>421</td>
<td>505</td>
<td>344</td>
<td>308</td>
<td>279</td>
</tr>
<tr>
<td>Doctoral</td>
<td>59</td>
<td>74</td>
<td>63</td>
<td>100</td>
<td>109</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,152</strong></td>
<td><strong>1,316</strong></td>
<td><strong>1,140</strong></td>
<td><strong>1,172</strong></td>
<td><strong>1,099</strong></td>
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### Enrollment

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<tr>
<td>Undergraduate enrollment</td>
<td>4,790</td>
<td>4,716</td>
<td>4,524</td>
<td>4,541</td>
<td>4,261</td>
</tr>
<tr>
<td>Graduate enrollment</td>
<td>1,926</td>
<td>1,814</td>
<td>1,667</td>
<td>1,741</td>
<td>1,833</td>
</tr>
<tr>
<td>Master’s</td>
<td>1,229</td>
<td>1,048</td>
<td>849</td>
<td>829</td>
<td>930</td>
</tr>
<tr>
<td>Doctoral</td>
<td>497</td>
<td>569</td>
<td>641</td>
<td>718</td>
<td>712</td>
</tr>
<tr>
<td>Non-Degree</td>
<td>200</td>
<td>197</td>
<td>177</td>
<td>194</td>
<td>191</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>6,716</strong></td>
<td><strong>6,530</strong></td>
<td><strong>6,191</strong></td>
<td><strong>6,282</strong></td>
<td><strong>6,094</strong></td>
</tr>
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### Scholarship Awards

464 students received a total of $1,004,343 in scholarship awards.

### Honors Students

Nearly 400 engineering students are enrolled in Barrett, The Honors College at ASU.

### Alumni

More than 29,000 Ira A. Fulton School of Engineering alumni are advancing the fields of engineering and technology nationally and around the world.

### Merit Scholars

As of fall 2007, engineering students include:

- 32 National Merit Scholars
- 18 National Hispanic Scholars
- 2 National Achievement Scholars
Subhash Mahajan will have to come up with something really special in 2008 to keep his career hot streak going.

In 2004, the professor in ASU’s Ira A. Fulton School of Engineering received the Minerals, Metals and Materials Society national Educator Award. In 2005, Mahajan was elected to the prestigious National Academy of Engineering.

In 2006, he was named director of the university’s new School of Materials, which is jointly administered by the school of engineering and the College of Liberal Arts and Sciences. He also was elected last year to the board of trustees of ASM International, a leading worldwide metals and materials industry organization.

He followed up those distinctive achievements in 2007 by being named an ASU Regents’ Professor, one of several chosen for the honor each year for outstanding accomplishments in teaching, scholarship, research, creative activities, and national and international recognition in their fields.

Regents’ Professors serve as advisers to the ASU president and as consultants throughout the university.

After more than 40 years earning professional distinction in industry and academia, “I think now I can say I made a good career decision,” Mahajan says.
More than 20 Ira A. Fulton School of Engineering faculty members have won highly sought-after National Science Foundation CAREER Awards since 1995, including three in 2006-2007.

Hasan Davulcu and Peter Wonka, assistant professors in the School of Computing and Informatics, and Panagiotis “Takis” Mitropoulos, an assistant professor in the Del E. Webb School of Construction, earned the awards this past year. The awards recognize scientists and engineers who demonstrate the potential to be leaders in advancing knowledge in their fields. Those awarded to engineering faculty members have included grants of $400,000 to $500,000 over five years to fund research.

Davulcu will use his grant to create a formal policy specification language and methodology for computer software that helps people schedule and automate consumer tasks. In the context of Web services, a policy language provides the means for “programming the terms of services” online and aligning the capabilities of service providers to requirements of the consumer.

Wonka is developing three-dimensional computer modeling techniques for use in such areas as urban planning, simulation and training programs, movie production techniques and computer games.

Mitropoulos’ research is aimed at reducing the more than 1,200 fatalities and 400,000 serious injuries that occur each year in the United States while doing construction work.

Davulcu, Mitropoulos and Wonka Receive National Science Foundation CAREER Awards

National Science Foundation CAREER Awardees 1995–2007

Terry Alford
Jean M. Andino
Rida Bazzi
Stephen Beaudouin
Yu Cao
Jeffrey Capone
Karamvir Chattha
Nik Chawla
Hasan Davulcu
Tolga M. Duman
Cody Friesen
Gerald Gannod
Joseph Hui
Lina J. Karam
Ying-Cheng Lai
Jerry Y.S. Lin
Panagiotis Mitropoulos
Alyssa Panitch
Antonia Papandreou-Suppappola
Jordan Peccia
Pedro D. Peralta
Patrick Phelan
Martin Reisslein
Andrea W. Richa
Michael Sierks
Cihan Tepedelenlioglu
Dragica Vasileska
J. René Villalobos
Peter Wonka
Teresa (Tong) Wu
Junshan Zhang
NEW FACULTY

The Ira A. Fulton School of Engineering welcomed the following new faculty members to the school in 2006 and 2007. An integral component of the school’s strategic plan is the growth of its faculty to 250 scholars, and these additions bring the school’s teaching and research ranks to well over 200. The many thought leaders who have recently joined the school’s faculty exemplify its commitment to exceptional teaching and discovery. They also join their accomplished colleagues in advancing the school’s progress toward global recognition for excellence in engineering education.

Soyoung Ahn, Assistant Professor, Department of Civil and Environmental Engineering
Ph.D. in civil and environmental engineering, University of California, Berkeley
Research interests: traffic operations and control, intelligent transportation systems
Prior institution: Portland State University

Jean M. Andino, P.E.; Associate Professor, joint appointment: Department of Civil and Environmental Engineering and Department of Chemical Engineering
Ph.D. in chemical engineering, California Institute of Technology
Research interests: atmospheric chemistry, air pollution control
Prior institution: University of Florida

Kevin Bennett, P.E.; Assistant Professor, Harrington Department of Bioengineering
PhD in biophysics, Medical College of Wisconsin
Research Interests: molecular imaging, magnetic resonance imaging, cancer detection and therapy
Prior institution: National Institute of Neurological Disorders and Stroke

Winslow Burleson, Assistant Professor, Arts, Media & Engineering
Ph.D in media arts and sciences, Massachusetts Institute of Technology
Research interests: human-computer interaction-applied to creativity, innovation, well-being, design engineering and educational technology
Prior Institution: Massachusetts Institute of Technology

Trevor Cohen, Assistant Professor, School of Computing and Informatics
Ph.D in biomedical informatics, Columbia University
Research interests: comprehension and expertise, latent semantic analysis, cognition and medical error
Prior institution: Columbia University

Valentin Dinu, Assistant Professor, School of Computing and Informatics
Ph.D in computational biology and bioinformatics, Yale University
Research interests: biomedical informatics, translational research, integrative disease association analysis, genome-wide association studies, entity-attribute-value database modeling
Prior Institution: Yale University

Bob Greenes, Ira A. Fulton Chair and Professor, Department of Biomedical Informatics,
School of Computing and Informatics
Ph.D in computer science, M.D., Harvard University
Research interests: clinical decision support, models of decision making, collaborative knowledge management, collaborative learning, personal health status monitoring, human-computer interaction
Prior Institution: Harvard University, Brigham Women’s Hospital

Gennady Gildenblat, Motorola Professor of Electrical Engineering, Department of Electrical Engineering
Ph.D. in physics, Rensselaer Polytechnic Institute
Research interests: integrated circuit electronics, transport physics
Prior institution: Rensselaer Polytechnic Institute

Rolf Halden, Associate Professor, Department of Civil and Environmental Engineering
Ph.D in environmental engineering, University of Minnesota
Prior Institution: Johns Hopkins University

Marcus Herrmann, Assistant Professor, Department of Mechanical and Aerospace Engineering
Ph.D in mechanical engineering, University of Technology, Aachen, Germany
Research interests: two-phase flows, turbulence, combustion, numerical methods for computational fluid dynamics
Prior Institution: Stanford University

Hanqing Jiang, Assistant Professor, Department of Mechanical and Aerospace Engineering
Ph.D. in solid mechanics, Tsinghua University, Beijing, China
Research interests: multiscale materials modeling and simulations, mechanics of flexible/stretchable electronics
Prior institute: University of Illinois at Urbana-Champaign

Jing Li, Assistant Professor, Department of Industrial Engineering
Ph.D in industrial and operations engineering, University of Michigan, Ann Arbor
Research interests: quality engineering, applied statistics, data mining, causal modeling and inference for process control
Prior Institution: University of Michigan
Prior institution: Arizona State University, W. P. Carey School of Business

William G. Johnson, Professor and Director, Center for Health Information and Research, School of Computing and Informatics
Ph.D. in economics, Rutgers University
Research interests: health economics, health informatics
Prior Affiliation: Arizona State University

Kanav Kahol, Assistant Professor, School of Computing and Informatics
Ph.D. in computer science
Research interests: Haptic user interfaces, multimedia, human-computer interaction, surgical simulation, assistive and rehabilitation systems
Prior Institution: Arizona State University

Rosa Krajmalnik-Brown, Assistant Professor, Department of Civil and Environmental Engineering
Ph.D. in environmental engineering, Georgia Institute of Technology
Research interests: biotransformations and the fate of environmental contaminants with an emphasis on environmental applications of molecular microbial ecology
Prior Institution: Arizona State University, Center for Environmental Biotechnology

Pat Langley, Professor, School of Computing and Informatics
Ph.D. in psychology, Carnegie Mellon University
Research interests: cognitive systems, scientific informatics, knowledge discovery, computational modeling in psychology, biology and ecology
Prior institution: Stanford University

Deirdre Meldrum, Dean, Ira A. Fulton School of Engineering / Director, Center for Ecogenomics, Biodesign Institute / Professor, Electrical Engineering
Ph.D. in electrical engineering, Stanford University
Research interests: genome automation, single cell technologies, microscale systems, ecogenomics, robotics controls
Prior institution: University of Washington

Michele Milano, Assistant Professor, Department of Mechanical and Aerospace Engineering
Ph.D. in technical sciences, Swiss Federal Institute of Technology, Switzerland
Research interests: flow control, modeling, optimization
Prior Institution: California Institute of Technology

Cun-Zheng Ning, Professor, Department of Electrical Engineering
Ph.D. in physics, University of Stuttgart
Research interests: semiconductor optoelectronics, nanowires and nanophotonics, optoelectronics theory and modeling
Prior Institution: NASA Ames Research Center and University of California, Santa Cruz

Vimla Patel, Vice Chair of Education and Training, School of Computing and Informatics
Ph.D., D.Sc., McGill University, Montreal, Canada
Research interests: medical cognition, medical decision-making and reasoning, patient safety and medical errors, socio-cognitive studies of human-computer interaction, cognitive assessment of learning and instruction
Prior Institution: Columbia University

Ram M. Pendyala, Professor, Department of Civil and Environmental Engineering
Ph.D. in civil and environmental engineering, University of California, Davis
Research interests: multimodal transportation planning, travel demand forecasting, activity-travel behavior modeling, transportation policy analysis
Prior institution: University of South Florida, Tampa

Kaushal Rege, Assistant Professor, Department of Chemical Engineering
Ph.D in chemical engineering, Rensselaer Polytechnic Institute
Research interests: molecular and nanoscale cancer therapeutics, combination treatments for cancer, targeted therapeutics, non-viral nucleic acid delivery, cellular interactions in cancer metastasis, bioseparations
Prior Institution: Massachusetts General Hospital and Harvard Medical School

Marco Saraniti, Professor, Department of Electrical Engineering
Ph.D in computational physics, Technische Universitaet Muenchen, Germany
Research interests: computational electronics and biophysics, modeling and simulation of semiconductor devices, biomimetic nanoconductors
Prior Institution: Illinois Institute of Technology

Henry Sodano, Assistant Professor, Department of Mechanical and Aerospace Engineering
Ph.D in mechanical and aerospace engineering, Virginia Polytechnic Institute and State University
Research interests: power harvesting, multifunctional materials, autonomous structures and active nanocomposites
Prior Institution: Michigan Technological University

Aviral Shrivastava, Assistant Professor, School of Computing and Informatics
Ph.D. in information and computer sciences, University of California, Irvine
Research interests: embedded systems, embedded processor architectures and their compilers, low-power high-performance, robust computing systems
Prior institution: University of California, Irvine

Muhong Zhang, Assistant Professor, Department of Industrial Engineering
Ph.D in industrial engineering and operations research, University of California, Berkeley
Research interests: robust optimization, transportation and distribution in logistics, integer programming, network optimization
Prior Institution: University of California, Berkeley

Bryan D. Vogt, Assistant Professor, Department of Chemical Engineering
Ph.D. in chemical engineering, University of Massachusetts
Research interests: nanostructured materials, polymers, supercritical fluids
Prior institution: National Institute of Standards and Technology

Eric Williams, Assistant Professor, Department of Civil and Environmental Engineering
Ph.D. in physics, State University of New York, Stony Brook
Research interests: industrial ecology, life cycle assessment, technology, environment
Prior institution: Carnegie Mellon University

Claudia E. Zapata, Assistant professor, Department of Civil and Environmental Engineering
Ph.D. in geotechnical engineering, Arizona State University
Research interests: unsaturated soils, pavement performance due to environmental factors, pavement and foundations design
Prior institution: Arizona State University
The Arizona Biomedical Collaborative (ABC) building, located in downtown Phoenix, houses engineering’s Department of Biomedical Informatics and lab space for University of Arizona College of Medicine research in diabetes, cancer and neurology.

The Biodesign Institute at ASU is focused on preventing and curing disease, overcoming the pain and limitations of injury, renewing and sustaining our environment, and securing a safer world. Ira A. Fulton School of Engineering research experts lead select centers at this university-wide institute.

Brickyard complex on Mill Avenue houses engineering classrooms and the School of Computing and Informatics. ASU’s Decision Theater and the Engineering Dean’s Office also are located here.

Goldwater Center for Science and Engineering houses wireless communications, industrial engineering, the Fulton High Performance Computing Initiative, and materials growth and analysis research areas for the School of Materials.

The Engineering Center (A-G wings) is a group of buildings connected by shared courtyards and hallways. The B through G wings are home to research and instructional labs, classrooms and offices for several engineering departments. The G wing also is home to the Engineering Student Center.

The Engineering Research Center houses research on advanced semiconductor and material technologies, power electronics and computational sciences.

The Interdisciplinary Science and Technology Building 1 comprises laboratories and collaborative spaces in bioengineering, neural engineering and molecular, tissue and cell engineering.

The Interdisciplinary Science and Technology Building 2 is a high-bay research facility supporting research in advanced pavement materials, transportation planning, geotechnical engineering, fluid dynamics and sustainable materials.

The Engineering Student Center, covering 7,500 square feet in the Engineering Center G wing, features several study pods, a wireless access facility, a conference room, loaner laptop computers, and meeting areas that can accommodate small groups for lectures and movie presentations.

MacroTechnology Works is an advanced flexible display research and fabrication facility for federal government, university and industry collaborative research in the development of low-power, rugged, lightweight military devices for the U.S. Army.
Breaking Down Barriers
Flexible Display Center develops commercially-ready display technology

“Something good happens here every week.”

That cannot always be said about the “two-steps-forward, one-step-back” world of research and development, but for Greg Raupp, director of the Flexible Display Center (FDC) at Arizona State University, it’s often one exciting breakthrough after another.

The FDC is accelerating flexible display technology—which allows for displays that are lightweight, require little power and are intrinsically rugged—in a collaboration established by the U.S. Army in February 2004, and which also includes 15 industry partners. The goal is to develop commercially-ready display technology that the Army can integrate for its purposes. “Our mission is to broadly advance the technology and break down the barriers to commercialization,” says Raupp, professor in the Department of Chemical Engineering in the Ira A. Fulton School of Engineering.

Commercial possibilities include sturdier displays for cell phones and other handheld devices, “electronic paper” and wearable displays on sleeves for everything from first responder situational awareness to personal fitness, Raupp says. But for the Army, flexible displays are not only about convenience, they also are about safety and facilitating strategy.

As early as summer 2007, the FDC was delivering prototypes of hand-held devices with rugged flexible-display technology to the Army. “They will incorporate wireless communications and link to Global Positioning Systems. The software will center an individual on the map and include other icons to indicate positioning of their objective, as well as friendlies and foes,” Raupp explains.

That sort of real-time situational awareness in the field is one application. Other possibilities include somewhat larger displays for Army vehicle applications and even very large displays that could be rolled up and used as portable command posts. In fall 2006, the FDC leap from producing one-inch diagonal displays to those of four inches. Recent advances in the display pilot line scale will allow for even bigger displays in the coming years. Through “dozens of breakthroughs,” the center has accomplished the fabrication of high-quality thin-film transistors at low temperature conditions that are compatible with flexible substrates. Raupp anticipates exploring color displays in 2008.

“It’s amazing how quickly we move,” Raupp says. “We get through a cycle of learning in well under a month in process development. Relative to the speed of typical R&D, we’re more like a start-up company in the speed at which we work.”

That’s one reason Raupp suspects the Army selected ASU: rapid technology development in a pilot line manufacturing environment. “We’re not just pushing along flexible-display technology, we’re also pushing along manufacturing technology. Not only can we fabricate the device, we can tell you how to manufacture it,” he says.

This environment of many technologies brought together makes for a unique educational experience. “Students get exposed to a very dynamic, fast-paced, high-tech development effort that isn’t found in a typical university setting. They get immersed in it,” Raupp says.
Ira A. Fulton is founder and CEO of Arizona-based Fulton Homes, one of the largest residential builders in the nation.

Born in Tempe, Ariz., Fulton started working at age 6, and by age 11 became a newspaper carrier for The Arizona Republic, eventually serving a route that included ASU's Tempe campus. After attending ASU on a football scholarship, he went to work for National Cash Register, where he rose to the position of National Salesman of the Year. Subsequently, he formed his own companies, serving the computer needs of other businesses.

In 1974, Fulton began consulting for Eagleson's Big and Tall men's clothiers, a company that was on the edge of bankruptcy. Within two years, he purchased the company, turned it around, and expanded it from two retail outlets to 33. He used the cash flow from his clothing business to start Fulton Homes, which he grew from building several homes a year to its present annual volume of around 1,500 residential units. Along the way, he built an organizational culture of quality, customer satisfaction and service, both to the company's customers and to the communities in which they operate.

Fulton established an endowment of $50 million in support of ASU's College of Engineering and Applied Sciences in 2003, and the college was renamed the Ira A. Fulton School of Engineering in his honor. The gift has enabled the Ira A. Fulton School of Engineering to provide funding for scholarships, fellowships, research programs and investments in faculty, all integral to the school's goal to move from its position as a highly ranked U.S. program into the ranks of world-class institutions.
“With this endowment, we are building an engine of educational and economic growth that will endure for generations. It is a gift of opportunity, prosperity, social equality and hope.”

– Ira A. Fulton

INITIATIVES SUPPORTED BY THE FULTON INVESTMENT INCLUDE:

SMECA
The Science, Math and Engineering Competition Award (SMECA) honors incoming undergraduate students who participated in high school science, math and engineering competitions and demonstrated the capacity to become community, industry and business leaders.

A total of 17 recipients have been awarded a minimum of $3,000 in annual scholarships, renewable up to five years.

These awardees are diversely represented and earned a collective grade-point average of 3.4.

FURI
The Fulton Undergraduate Research Initiative (FURI) offers student-driven, financially supported opportunities for undergraduates outside the classroom. FURI encourages students to design a research project and, with the guidance of a faculty mentor, complete their research and present it at a public symposium. FURI students are introduced to applied research, and learn how it fits into the professional life of an engineer and why they need to share their research findings with the public.

More than 75 FURI and other faculty-supported student projects were presented, and more than 400 guests attended the FURI symposiums. Three students were funded to present their research at international conferences.

Twenty-eight percent of FURI students are female and 40 percent are members of Barrett, The Honors College at ASU.

INNOVATIONS PAC E
InnovationSpace is an entrepreneurial joint venture among the College of Design, Ira A. Fulton School of Engineering and W. P. Carey School of Business. In 2006-2007, nine students from mechanical, aerospace and industrial engineering participated in this transdisciplinary education and research lab that teaches students how to develop products that create market value while serving real societal needs and minimizing impacts on the environment.

The following industry and ASU partners contributed a total of $90,000 in support of student teams:

• ASU’s Center for Nanotechnology in Society: to develop nano-based product concepts that enhance the freedom, privacy and security of citizens and communities.
• Intel Corporation: to develop product concepts that support the independence of elders in their home environments.
• Herman Miller: to develop product concepts that improve acute-care and ambulatory-care environments for patients and health care providers.

Students presenting at the spring 2007 Fulton Undergraduate Research Initiative (FURI) symposium.
FULTON FELLOWS
This program provides funds for academic units and research clusters to recruit high quality doctoral students. It also offers educational enhancement opportunities with academic and industry leaders, and regional technology events. Its focus is on increasing women and minority participation, as well as domestic participation, transdisciplinary research and professional-development events.

In its second-year offerings, 23 new fellowships were awarded primarily to domestic students, with strong representation of women and national minorities.

Fulton Fellows enrichment activities in 2006-2007 included workshops on career planning, writing a curriculum vitae and locating external funding through grants; an industry tour of Northrop-Grumman’s facilities; a luncheon discussion with Dr. Michael Reischman, deputy assistant director for engineering, National Science Foundation; and a presentation by Dr. Tom Duening, director, Entrepreneurial Programs Office, Ira A. Fulton School of Engineering.

REAS SYMPOSIUM
The annual Research in Engineering and Applied Science Symposium (REAS) is a platform for graduate students in the Ira A. Fulton School of Engineering to showcase the innovation and high-level research occurring at the university. Totally designed and managed by the Fulton Graduate Student Association, this symposium promotes leadership and professional development.

The 2006 symposium drew more than 200 graduate students, 17 of whom served on the REAS 2006 committee, 20 of whom gave oral presentations, 10 of whom delivered poster presentations and 11 of whom submitted technical papers.

For the first time, FURI students were invited to present their research and eight participated.

A total of 50 faculty participated in the symposium. Dr. Sayfe Kiaei, ASU electrical engineering professor and director of WinTech and ConnectionOne, gave the keynote address titled “New Frontiers: Emergence of Chem, Geo, Physics, Medical, Bio, Materials, Space, Engineering, Social Sciences” in support of transdisciplinary collaborations.

HIGH PERFORMANCE COMPUTING
The Fulton High Performance Computing Initiative (HPCI) offers world-class computing resources to the researchers and students in the Ira A. Fulton School of Engineering and across ASU. The initiative is a hub for research in computing and collaborative research in the application of parallel computing systems, and a center for education in high performance computing systems.

HPCI is proving to be a center for research in new ideas in the architectures, operating systems and applications of high-performance computer systems with funding from a variety of sources and collaborators.

Daily utilization is in excess of 80 percent, funded primarily by faculty research projects, and growing. Currently, more than 90 faculty members from 22 departments are using HPCI systems.

In January 2007, the size of the main cluster more than doubled from 400 to 1,060 processors. And this past summer, using a $900,000 contribution from the School of Earth and Space Exploration and other faculty research funding, it doubled in size again to more than 2,000 processors.

Wes Emeneker’s “Dynamic Virtual Clustering,” a system that deploys virtual machines in a multi-cluster environment to improve job workload performance, was awarded best paper at the International Symposium on Parallel Architecture.

HPCI is transitioning to a sustainable funding model. Supplemental support from the Biodesign Institute, College of Liberal Arts and Sciences, vice president for research and University Technology Office will be allocated annually.
CAREER CENTER
The Ira A. Fulton School of Engineering Career Center is devoted to helping engineering students develop career-readiness skills and connect with exciting internship and career opportunities. Career Center programs and services are designed to support students’ career aspirations and prepare them for success in a dynamic, global workforce. Inside the classroom, students learn innovative approaches to engineering disciplines. Beyond the classroom, they gain real-world experience through internships and other opportunities to ‘test-drive’ occupations, make industry contacts and sharpen career skills.

CENTER FOR ENGINEERING DIVERSITY AND RETENTION
The Center for Engineering Diversity and Retention (CEDAR) is a one-stop shop created to support diverse students within the school of engineering. CEDAR offers academic support, professional development and leadership training to women and minorities.

INTERNSHIPS
Internships allow students to learn new skills, make industry contacts, identify industries that interest them, and develop ideas for projects and papers in their courses. Undergraduates have the opportunity to participate in summer and academic-year internships through several programs.

RESIDENTIAL COMMUNITY
First-year students enrolled in engineering programs have the opportunity to enrich their academic experience outside the classroom by living on one of the several floors of San Pablo Hall which make up the Ira A. Fulton School of Engineering Residential Community. Participating students have access to tutoring and engineering workshops, and activities designed to build relationships with peers, mentors and faculty.

HONORS COLLEGE
Barrett, The Honors College at Arizona State University is a selective, small undergraduate college responsible for recruiting academically outstanding undergraduates to ASU and organizing the resources of a major university for their benefit. All students who enter ASU through Barrett also enroll in a disciplinary college, and pursue one or more of the 255 available disciplinary majors and concentrations. Engineering students enrolled in Barrett benefit from being challenged in a rigorous intellectual community of fellow students. The Barrett program culminates in an innovative research thesis. School of engineering students are eligible to compete for funding through Fulton Undergraduate Research Initiatives or honors college sources.

STUDENT ORGANIZATIONS
There are more than 30 engineering student organizations, ranging from honors and professional associations to groups creating underwater robots and concrete canoes and launching rockets. These academic, professional and social opportunities build on the academic experience at ASU, creating lasting memories and connections. Student organizations are excellent opportunities to learn about career possibilities. Many of the student groups operate in conjunction with industry professional societies.

STUDENT OPPORTUNITIES
Students can personalize their education in the Ira A. Fulton School of Engineering in many ways: coaching, counseling, career fairs, job-search training, leadership development, professional development, academic support workshops, social activities, academic advising, research opportunities, internship opportunities, access to distinguished lectures and other special events.
Bridging the Gap
Arizona Technology Investors Forum brings technology start-ups and venture capitalists together

Did Silicon Valley start with technology first, followed by the money? Or was it the money that propelled the technology forward? As far as Thomas Duening is concerned, there is no chicken-and-egg question. Instead, when it comes to such perfect storms, “It forms together, because people realize there are real opportunities. It’s not just technology first, or money first. It churns together,” says Duening, director of the Entrepreneurial Programs Office (EPO) in the Ira A. Fulton School of Engineering.

Duening is churning away, hoping for a tech-meets-capital state of affairs in Arizona and at Arizona State University, with the Arizona Technology Investor Forum (ATIF), which launched on Sept. 29, 2006. The forum, a joint initiative between the EPO and Arizona Technology Enterprises (AzTE), is a vehicle wherein like-minded individuals have early opportunities to invest in technology-based ventures growing out of the university.

The strong emphasis on funded research at ASU, conducted by “tremendously gifted researchers,” can only result in commercially viable output, Duening says. But brilliant ideas typically require an infusion of capital to get beyond the lab and into the marketplace. “The faculty realizes that we’re encouraging them to be entrepreneurs. But it’s hard to be an entrepreneur when you don’t know how to raise funds. It can be extraordinarily difficult to do. So we’re closing that final loop of what it takes to be successful in entrepreneurship by providing seed capital,” he says.

Forum member Brian Currie agrees. “If there is no money stream, there’s no capability and ideas just languish,” says Currie, an ASU electrical engineering graduate. “ATIF acts as the financial arm to make ideas reality. People see they can make a business and make money, as opposed to saying ‘Here’s this great invention,’ and that’s it.”

While cash is essential to advancing technology, so is mentorship—hence the forum, rather than a fund, says forum member and ASU engineering alum Bart Katz. “We wanted to provide a forum by which we can mentor potential technology start-ups coming out of ASU, and if the mentoring went well, provide the opportunity for financing,” he says.

Membership in the investing and networking forum is made up of accredited private equity investors, venture capitalists and corporate/institutional investors. The investment possibilities
EnrPrEnEUrSHiP are as varied as an engineering education, Duening says, covering everything from nano- and biotechnology, to software and solar technology.

At three or four events a year, members get a close-up of “the best deals coming up through the pipeline from the Fulton School labs,” says Duening, who estimates that around 80 percent of ATIF’s members are ASU alumni. “We have alums who have been out of engineering school for quite some time, have been successful and now may be quasi retired and want to stay connected with the action. The forum is the perfect setting to do so. We socialize and sometimes play golf. It gives them a chance to come into the Valley for a weekend and get caught up on the latest technologies,” Duening says.

Of course, the opportunity to let money make money is another potential privilege of membership, but “the majority of people involved are doing it for a higher level,” Katz says. “You feel strongly about what ASU has done for you and what you can do for ASU, and by extension, ASU is Arizona. There’s a strong allegiance.”

Duening is counting on that loyalty to the region. “We’re trying to aggregate and increase the velocity of capital in one localized region of the United States”—Arizona—much like what goes on in other high-tech meccas, such as the Boston Corridor and the Research Triangle in North Carolina.

“I think it will happen in Arizona,” Currie says. “It’s a pent-up opportunity. There hasn’t been a vehicle to do this, but now ASU has arrived. I think it’s going to go crazy.”

GROUNDWORK BEING LAID FOR ‘INNOVATION PIPELINE’ IN NANOTECHNOLOGY

Work has started at Arizona State University (ASU) on building an “innovation pipeline” for turning discoveries in nanotechnology into business ventures.

Groundwork for the endeavor kicked off with support from a $39,500 grant awarded in early 2006 by the National Collegiate Inventors and Innovators Alliance to a group of professors in ASU’s Ira A. Fulton School of Engineering and College of Liberal Arts and Sciences. The funding helped launch an undergraduate honors course in fall 2006 on the emerging field of nanotechnology and its commercial potential. In the course, students are taught how to construct and use that pipeline.

“It’s another step in expanding engineering education to include an entrepreneurship component,” says Thomas Duening, director of the Entrepreneurial Programs Office in the school of engineering.

B.L. Ramakrishna, an associate professor in ASU’s School of Life Sciences, developed the course based on the proposal “From Discovery to Commercialization: The Greater Phoenix Nanotechnology Innovation Pathway and Pipeline.”

Its aim is to spark students’ enthusiasm for the “enormous societal and economic impact” offered by nanotechnology science and engineering, and guide students in exploring ways of bringing technological advances to the marketplace, Ramakrishna says.

Ramakrishna and Duening work with Vincent Pizziconi, an associate professor in the Ira A. Fulton School of Engineering’s Harrington Department of Bioengineering. Pizziconi’s extensive experience in teaching biomedical engineering product design and development brings a valuable perspective to this hybrid nanotechnology and entrepreneurship course, Duening says.

Titled “Nanotechnology: Perspectives and Entrepreneurial Opportunities,” the course is designed to provide a model for a “real-world” educational experience by bringing together students, faculty, industry and the regional entrepreneurial community.

Leaders of industry and small businesses share their knowledge with students on commercialization prospects, global competition, regulatory issues and intellectual property rights.

Students focus on two of the most promising areas in the field, nanobiotechnology and environmental nanotechnology. They explore the business potential of these emerging technologies, as well as the broad impacts on society.
ARTS, MEDIA AND ENGINEERING (AME)

At Arizona State University, engineering, arts and science disciplines invested in media research and training have come together to create the Arts, Media and Engineering program (AME). The program's mission is research and education in the integrated development of media systems.

AME’s specialized focus is the study and development of experiential media systems. These are systems that integrate computation and digital media in the physical human experience for the production of enhanced physical-digital experiences. The program’s goals are achieved through a large, transdisciplinary network of faculty and students working under a common, use-inspired research and education agenda.

The development of experiential media systems requires highly integrated research across five areas:

- Sensing: Multiple types of electronic sensors are used for recording human activity and the physical world.
- Perception and Modeling: The computational modeling of human activity and sensing allows AME to optimize the ecological coupling between users and systems.
- Feedback: Dynamic, multimodal systems are developed for optimally connecting users into the experiential media environment.
- Experiential Construction: Sensing, perception, modeling and feedback are integrally combined with the physical world to produce an enhanced, user-oriented, physical-digital experience.
- Learning and Knowledge: The knowledge produced by the resulting physical-digital experience is evaluated while avenues for further evolution of the system are identified and tested.

The work at AME results in hybrid physical-digital environments that address significant challenges in four key areas of the human condition: health, education, culture and arts, and societal communication and everyday living.

THE BIODESIGN INSTITUTE

The Biodesign Institute challenges the rigid structures of conventional science. It has infused its programs with a focus on project teams and deliverables – an approach rarely found on university campuses. Led by George Poste, a world-renowned scientist and policy maker, it plays a critical role in preparing the next generation of innovators.

The Ira A. Fulton School of Engineering and Katherine K. Herberger College of the Arts are AME’s main participating entities. Faculty and students from these areas provide specialized knowledge in the five key areas of experiential media development.

The Ira A. Fulton School of Engineering works in partnership with several other ASU units and programs, leveraging shared expertise to create a framework for transdisciplinary education and discovery.
Microscale Life Sciences Center (MLSC) directed by Deirdre Meldrum, dean of the Ira A. Fulton School of Engineering. MLSC is a National Institutes of Health Center of Excellence in Genomic Science. In her role as director, Dr. Meldrum leads research to study the fundamental mechanisms governing the birth, growth and decline of human cells with the aim of better understanding and finding ways to combat the most widespread diseases and other threats to human health. As a result of achievements in its first five years, the MLSC has been awarded a second five-year, $18 million federal grant to continue its work. MLSC research partners include the University of Washington, the Fred Hutchinson Cancer Research Center and Brandeis University.

The Biodesign Institute also is home to Meldrum’s part in an oceanography project called NEPTUNE. The institute benefits substantially from a voter-approved tax supporting K-12 education and university research in Arizona. It is the largest single investment in research infrastructure in Arizona and one of the nation’s most diverse assemblages of scientific disciplines within a single institute.

In addition to its contributions to human health and quality of life across the globe, the Biodesign Institute plays a vital role in education and has a significant impact in Arizona. It is the Valley’s single largest generator of federal biomedical research funding and experienced a 110 percent increase in grant funding awards in the 2006 fiscal year.

The institute serves as a magnet for scientific talent from around the world, having recruited more than 50 new faculty members since January 2003. It has a team of more than 600 people who work together to tackle big problems, and is the training ground for 250 students per semester. Its 350,000 square-foot facility was named 2006 Lab of the Year by R & D Magazine in an international competition.

SCHOOL OF EARTH AND SPACE EXPLORATION (SESE)

Launched in July 2006, ASU’s School of Earth and Space Exploration (SESE) is a bold initiative to combine science and engineering research and education to achieve a better understanding of the universe and, especially, the world. At present, the school, a part of the College of Liberal Arts and Sciences, unites earth and planetary scientists with astronomers. It has strong collaborative ties with several other academic units at ASU, especially the Ira A. Fulton School of Engineering, whose researchers contribute to SESE projects in the areas of systems engineering, geological remote sensing, lunar orbiting technology and mapping.

Through an aggressive program of expansion, SESE’s faculty will grow by roughly one-third over the next few years. While maintaining core strengths and developing new transdisciplinary linkages among the sciences, it will broaden its scope to include engineering faculty with research interests in the development and deployment of scientific instrumentation on Earth and in space.

THE GLOBAL INSTITUTE OF SUSTAINABILITY (GIOS)/SCHOOL OF SUSTAINABILITY

The Global Institute of Sustainability (GIOS) evolved from more than 30 years of environmental research conducted by the Center for Environmental Studies at ASU. In 1997, Charles Redman became the center’s new director. In 2004, Julie A. Wrigley contributed $15 million to ASU to establish GIOS and from the institute grew the School of Sustainability, which opened in fall 2007 with another $10 million donation from Ms. Wrigley. Redman now is the director of the school, and Jonathan Fink is the Julie A. Wrigley director of the institute as well as the university’s chief sustainability officer.

GIOS conducts research, education and problem-solving related to sustainability, with a special focus on urban environments. It serves as the hub of all of ASU’s sustainability initiatives in research, education and business practices. GIOS initiates and nurtures work on issues of sustainability across many departments on ASU’s four campuses, and collaborates with other academic institutions, governments, businesses, industries and community groups locally, nationally and globally.

The first group of students at the new School of Sustainability has embarked on a unique educational odyssey. These students are future leaders in the struggle to achieve sustainability in the face of challenging environmental, economic and societal needs.

The School of Sustainability and GIOS engage students in new academic and research programs that embody collaborative learning, transdisciplinary approaches and problem-oriented training.
The Ira A. School of Engineering continues to define new areas of scholarship and opportunity that extend the boundaries of achievement.
The Harrington Department of Bioengineering educates students in the application of engineering principles and technology to careers in the biomedical device and biotechnology industries. Through the generosity of the Whitaker Foundation, the department has strengthened its neural engineering and rehabilitation research thrusts and developed a new thrust in molecular, cell and tissue engineering research. This work is in partnership with Banner Health, the Mayo Clinic in Scottsdale, the Barrow Neurological Institute, the Carl T. Hayden VA Medical Center and the Translational Genomics Research Institute. Other partners include the Biodesign Institute, ASU’s molecular and cell biology program and other colleges within the university. Additional research areas presently targeted for programmatic growth include biosensors and bioinstrumentation. The department has an active industrial internship program and continues to secure research funding from the National Institutes of Health, the National Science Foundation, the Defense Advanced Research Projects Agency and other national, regional and local funding agencies.

**Research Groups**
- Neural Engineering and Informatics Laboratory
- Neuro-Mechanical Control and Rehabilitation Research Lab
- Sensorimotor Research Group
- Glycosciences and Technology Lab
- Center For Adaptive Neural Systems
- Laboratory of Cell-Biomaterial Interactions
- Neural Microsystems Laboratory
- Brain Modeling Laboratory
- Applied Bioelectricity Laboratory
- Bioengineering Instrumentation Laboratory
- Laboratory for Bioengineering Materials

**Faculty**

James Abbas  
Metin Akay  
Yasemin M. Akay  
Christopher A. Buneo  
Michael R. Caplan  
Jerry Coursen  
Antonio A. García  
Eric J. Guilbeau  
Jiping He  
Stephen I. Helms Tillery  
Leon Iasemidis  
Lokesh Joshi  
Ranu Jung  
Bae Hoon Lee  
Stephen P. Massia  
Jit Muthuswamy  
Christine Pauken  
William Phillips  
Vincent B. Pizziconi  
Peter N. Steinmetz  
Bruce Towe  
Brent L. Vernon

**2006-2007**

**Student Enrollment:**
- 456 undergraduate
- 42 master’s
- 64 doctoral

**Degrees Awarded:**
- 71 undergraduate
- 21 master’s
- 8 doctoral

**Total Research Expenditures:**
- $4.66 million

**Chair (interim):**
Metin Akay
The Department of Chemical Engineering is devoted to educating chemical engineers and conducting cutting-edge research in electrochemistry, inorganic membranes, sensors, thin films, reaction kinetics, molecular biochemical engineering, aerosol chemistry, process control and engineering education. Faculty members are committed to fully developing students’ potential by providing a unique and stimulating learning and research environment, exposing them to a diversity of viewpoints and teaching/learning styles, and preparing them to work in teams to solve real-world, transdisciplinary problems. Chemical Engineering professor Gregory Raupp also is the director of the Flexible Display Center, a university/industry/government collaborative venture designed to advance full-color flexible display technology and flexible display manufacturing to the brink of commercialization.

Research Groups

- Atmospheric Aerosol Research Group
- Atmospheric Chemistry and Air Pollution Control
- Bioelectronics and Biosensors
- Computational Biofluids Group
- Control Systems Engineering Laboratory
- Materials for Separation Laboratories
- Polymers for Advanced Applications
- Biodesign Institute
- Center for Solid State Science
- Flexible Display Center
- International Institute for Sustainability

Faculty

Jonathan O. Allen  Jeffrey J. Heys  Michael R. Sierks
Jean M. Andino      Jerry Lin           Bryan D. Vogt
James R. Beckman    Gregory B. Raupp    Joseph Wang
Veronica A. Burrows  Kaushal Rege       Daniel Rivera
Gholamreza Ehteshami  

The Department of Civil and Environmental Engineering offers undergraduate degrees in general civil engineering or civil engineering with an emphasis in environmental engineering or construction engineering. Graduate programs include studies in structures, geotechniques, water resources, transportation materials and pavements, transportation systems, environmental engineering for water and air quality, and construction engineering. Faculty members are actively engaged in many local, national and international research efforts that have a great impact on economic development and environmental quality. These research efforts are concentrated in the area of sustainable urban engineering, with a particular emphasis on arid regions. In the past four years, the department has added two National Academy of Engineering members who specialize in sustainability-related issues, two nationally recognized transportation systems engineers, and six additional faculty members who focus on sustainable engineering issues.

Research Groups
- Construction Engineering
- Environmental Engineering
- Geotechnical/Geoenvironmental Engineering
- Structures/Materials Engineering
- Transportation/Materials Engineering
- Water Resources Engineering

Faculty

Morteza Abbaszadegan
Soyoung Ahn
Jonathan O. Allen
Braden Allenby
Jean M. Andino
John C. Crittenden (NAE member)
Apostolos Fafitis
Peter Fox
Jim M. Holway
Sandra L. Houston
Paul C. Johnson
Kamil Kaloush
Edward Kavazanjian
Rosa Kraimalkin-Brown
Christopher Lawrence
Michael S. Mamlouk
Larry Mays
Barzin Mobasher
Julia Muccino Cornuelle
Ram M. Pendyala
Subramaniam D. Rajan
Bruce E. Rittmann (NAE member)
Simon P. Washington
Paul Westerhoff
Eric D. Williams
Matthew Witczak
Claudia E. Zapata

2006-2007

Student Enrollment:
596 undergraduate
50 master’s
61 doctoral

Degrees Awarded:
85 undergraduate
16 master’s
11 doctoral

Total Research Expenditures:
$ 3.92 million

Chair (interim):
Edward Kavazanjian
The School of Computing and Informatics is home to the Department of Computer Science and Engineering and the Department of Biomedical Informatics. The school supports the evolution of the computing and informatics disciplines, and responds to the need for partnership and collaboration between computer and information sciences and a broad range of disciplinary areas at ASU. It boasts an impressive research agenda supported by an equally impressive infrastructure. Launched in fall 2007, the new Biomedical Informatics department is headed by Robert Greenes, formerly professor of radiology at Harvard Medical School and distinguished chair in biomedical informatics at Brigham and Women’s Hospital.

### Research Groups
- Arts, Media and Engineering
- Center for Cognitive Ubiquitous Computing
- Center for Decision Making and Cognition
- Center for Health Information and Research
- Decision Theater
- Enabling Technologies for Intelligent Information Integration
- Enterprise Computing
- High Performance Computing Initiative
- Information Assurance Center
- Institute for Computing Information Sciences and Engineering
- Partnership for Research in Spatial Modeling

### Faculty
- Ashish Amresh
- Janaka L. Balasooriya
- Chitta Baral
- Rida Bazzi
- Kevin Burger
- Winslow Burleson
- Debra Calliss
- Kasim Candan
- Karamvir Chatha
- Yi Chen
- Yinong Chen
- Shu-Chuan “Grace” Chen
- Trevor Cohen
- Charles Colbourn
- James Collofello
- Partha Dasgupta
- Hasan Davulcu
- Valentin Dinu
- Gerald Farin
- Toni Farley
- Douglas Fridsma
- Robert A. Greenes*
- Sandeep K.S. Gupta
- Dijiang Huang
- Marcus A. Janssen
- William Johnson
- Kanav Kahol
- Subbarao Kambhampati
- Seungchan Kim
- Goran Konjevod
- Pat Langley
- Joohyung Lee
- Yann-Hang Lee
- William E. Lewis
- Baoxin Li
- Huan Liu
- Donald S. Miller
- Mutsumi Nakamura
- Faye Navabi
- Gregory M. Nielson
- Sethuraman Panchanathan
- Vimla L. Patel
- Andrea W. Richa
- Hessam S. Sarjoughian
- Arunabha Sen
- Edward H. Shortliffe*
- Aviral Shrivastava
- Hari Sundaram
- Violet R. Syrotiuk
- Wei-Tek Tsai
- Joseph E. Urban
- Susan D. Urban
- Sarma Vrudhula
- Peter Wonka
- Guoliang Xue
- Stephen S. Yau
- Jieping Ye

* Institute of Medicine of the National Academy of Sciences member

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**2006-2007**

**Student Enrollment:**
- 788 undergraduate
- 208 master’s
- 151 doctoral

**Degrees Awarded:**
- 75 undergraduate
- 43 master’s
- 15 doctoral

**Total Research Expenditures:**
- $4.86 million

**Director:**
- Sethuraman Panchanathan
The Del E. Webb School of Construction is one of only four named schools of construction in the country. The school seeks to become a national center for construction education, research and technology transfer, to study innovative technologies for implementation in the construction industry, and to promote international relationships. The school is now offering a Ph.D. program in construction management and an online master’s degree program. The doctoral program is designed to enroll up to 25 students within the first four years. The first students began studies in the fall 2007 semester. The online master’s degree program has begun offering studies in construction management and facility management. Through scholarships, construction research, exceptional teaching standards and industry partnerships, the school is leading the way in delivering the industry’s future leaders. Twenty percent of the school’s more than 2,500 graduates are owners, chief executive officers and executives of their companies, and 30 percent of its female alumni hold those titles. Students in the school participate in annual competitions against schools from all parts of the world. Assistant Professor Panagiotis “Takis” Mitropoulos recently received a CAREER Award from the National Science Foundation. He is one of three engineering faculty members to win CAREER Awards during 2006–2007.

Research Groups

- Construction Research Education Advanced Technology Environments
- Housing Research Institute
- Performance-Based Studies Research Group

Faculty

Samuel T. Ariaratnam
William W. Badger
(Nonnial Academy of Construction member)
Howard H. Bashford
Allan D. Chasey
James J. Ernzen
Dean T. Kashiwagi

Kraig Knutson
Panagiotis “Takis” Mitropoulos
Anil Sawhney
Kenneth T. Sullivan
Edwin Weaver
Avi Wiezel

2006–2007

Student Enrollment:
418 undergraduate
39 master's

Degrees Awarded:
77 undergraduate
14 master's

Total Research Expenditures:
$ 2.15 million

Director:
James J. Ernzen
The **Department of Electrical Engineering** is committed to the integration of use-inspired research with locally and globally relevant academic programs. It has gained national recognition in electrical engineering scholarship by defining new areas of study and pursuing the highest quality research, training and entrepreneurship. The department’s research programs reflect the diversity of the profession and range from the very small (nanoscale electronic devices) to the very large (the U.S. electric power grid). Some programs offer students theoretic approaches for the design of communication systems, while others include the implementation of wireless communications devices such as circuits in cell phones. Graduate students are involved in a variety of research activities and have access to state-of-the-art facilities such as the electromagnetic anechoic chamber, the wireless communications lab and the integrated circuit fabrication clean room.

**Research Groups**
- Control Systems
- Electromagnetics, Antennas and Microwave Circuits
- Electronic and Mixed-Signal Circuit Design
- Electric Power and Energy Systems
- Signal Processing and Communications
- Solid-State Electronics
- Arts, Media and Engineering

**Faculty**

- Abbas Abbaspour-Tamijani
- James T. Aberle
- Terry Alford**
- David R. Allee
- Raja Ayyanar
- Berton Bakkaloglu
- Constantine A. Balanis
- Hugh Barnaby
- Yu “Kevin” Cao
- Junseok Chae
- Chaitali Chakrabarti
- Lawrence T. Clark
- Douglas Cochran
- Sandwip Dey**
- Rodolfo E. Diaz
- Tolga M. Duman
- Richard G. Farmer
  (*NAE member*)
- David K. Ferry
- Gennady Gildenblat
- Stephen Goodnick
- Ravi Gorur
- Michael Goryll
- Gerald T. Heydt
  (*NAE member*)
- Keith Holbert
- Joseph Hui
- Bahar Jalali-Farahani
- Youngjoong Joo
- George G. Karady
- Lina J. Karam
- Sayfe Kiaei
- Michael N. Kozicki
- Ying-Cheng Lai
- Deirdre R. Meldrum
- Nathan Newman**
- Cun-Zheng Ning
- Joseph Palais
- George Pan
- Antonia Papandreou-Suppappola
- Stephen M. Phillips
- Gang Qian
- Martin Reisslein
- Armando A. Rodriguez
- Ronald Roedel
- Marco Saraniti
- Dieter K. Schroder
- Michael N. Kozicki
- Ying-Cheng Lai
- Deirdre R. Meldrum
- Nathan Newman**
- Cun-Zheng Ning
- Joseph Palais
- George Pan
- Antonia Papandreou-Suppappola
- Stephen M. Phillips
- Gang Qian
- Martin Reisslein
- Armando A. Rodriguez
- Ronald Roedel
- Marco Saraniti
- Dieter K. Schroder
- Jennie Si
- Brian J. Skromme
- Andreas Spanias
- NJ Tao
- Cihan Tepedelenlioglu
- Harvey Thornburg
- Trevor Thornton
- Konstantinos S. Tsakalis
- Daniel J. Tylavsky
- Dragica Vasileska
- Vijay Vittal
  (*NAE member*)
- Hongbin Yu
- Frederic Zenhausern
- Junshan Zhang
- Yong-Hang Zhang

**2006-2007**

**Student Enrollment:**
- 561 undergraduate
- 354 master’s
- 225 doctoral

**Degrees Awarded:**
- 118 undergraduate
- 112 master’s
- 40 doctoral

**Total Research Expenditures:**
- $15.55 million
The Department of Industrial Engineering concentrates on the design, operation and improvement of the systems required to meet societal needs for products and services. Faculty members specialize in the tools of industrial statistics, mathematical modeling and enterprise information systems. The department is ranked among the top 20 in the nation. The undergraduate curriculum provides the strong foundation necessary for successful careers in industry or preparation for graduate study, and more than 65 Ph.D. graduates currently hold faculty positions at universities and colleges around the world. Faculty and staff are dedicated to offering programs that prepare the next generation of industrial engineering leaders.

Research Groups

- Electronics Assembly Laboratory
- Information and Systems Assurance Laboratory
- Integrated Manufacturing Engineering Laboratory
- Logistics, Optimization, and Control Laboratory
- Modeling and Analysis for Semiconductor Manufacturing
- Quality and Reliability Engineering
- Virtual Computer Integrated Enterprise
- Intelligent Decision Systems Laboratory

Faculty

Mary Ruth Anderson-Rowland
Ronald Askin
Linda Chattin
John W. Fowler
Esma S. Gel
Gary L. Hogg
Ahmet B. Keha
Jing Li
Gerald T. Mackulak
Douglas C. Montgomery
Rong Pan
George C. Runger
Dan L. Shunk
William Thompson
J. René Villalobos
Teresa (Tong) Wu
Nong Ye
Muhong Zhang
The School of Materials leverages the synergy of engineering and science. Drawing faculty, courses, research and programs from the Ira A. Fulton School of Engineering and ASU’s College of Liberal Arts and Sciences, the School of Materials offers students a state-of-the-art education with a transdisciplinary approach to the study of materials. The school provides students with the knowledge and training necessary to optimally use existing materials and develop and produce new ones. The school’s graduate program is one of the nation’s largest. It features a flexible structure that encourages students to explore topics at the boundaries between traditional disciplines. Research thrusts span a wide range of cutting-edge topics, from nanoelectronics to energy and the environment.

Research Groups
- Computational Modeling
- Microscopy (TEM and scanning probes)
- Electronic Materials
- Applied NanoBioscience
- Nanoelectronics
- Flexible Display
- Photonics

Faculty

- James B. Adams
- Terry Alford
- Peter Bennett
- Ray W. Carpenter
- Nik Chawla
- Sandwip Dey
- R. Bruce Doak
- Jeff Drucker
- Cody Friesen
- Ghassan Jabbour
- Takao Kotani
- Stephen J. Krause
- Jian Li
- Subhash Mahajan
- Bob Marzke
- James W. Mayer
- Nathan Newman
- Bill Petuskey
- S. Thomas Picraux
- B.L. Ramakrishna
- Peter Rez
- John M. Rowell
- Della Roy
- Rustum Roy
- Karl Sieradzki
- Rakesh K. Singh
- Amaneh Tasooji
- Mark van Schilfgaarde
- Frederic Zenhausern

Director:
Subhash Mahajan

Total Research Expenditures:
$6.83 million
The Department of Mechanical and Aerospace Engineering houses distinct undergraduate programs in both mechanical and aerospace engineering. The programs prepare students for immediate entry into professional engineering fields or graduate study. The curricula in mechanical and aerospace engineering emphasize fundamental principles of mechanical and thermal sciences as well as contemporary tools of engineering practice. Faculty and students are generating new knowledge and creating innovative solutions to society’s most pressing problems in energy, human health, and transportation on Earth and in outer space. The department conducts research in four primary areas: aerodynamics and fluid dynamics; design, manufacturing and control; heat transfer and thermodynamics; and solid mechanics and dynamics.

Research Groups
• Aerodynamics & Fluid Dynamics
• Design, Manufacturing & Control
• Heat Transfer & Thermodynamics
• Solid Mechanics & Dynamics

Faculty
Ronald J. Adrian  
(NAE member)  
Ronald L. Bengelink  
Don L. Boyer  
Ronald Calhoun  
Aditi Chattopadhyay  
Kangping Chen  
Joseph K. Davidson  
Harindra J.S. Fernando  
Mario Gomes  
Marcus Herrmann  
Kenneth H. Huebner  
Hanqing Jiang  
Taewoo Lee  
Yabin Liao  
Marc P. Mignolet  
Pavlos Mikellides  
Michele Milano  
Pedro D. Peralta  
Patrick Phelan  
Jonathan D. Posner  
Ramendra P. Roy  
John W. Rutherford  
Jami Shah  
Praveen Shankar  
Henry Sodano  
Kyle Squires  
Steven Trimble  
Ampere Tseng  
Marion Vance  
Valana Wells  
Lun-Shin Yao
**Signature Research**

Engineering faculty and students merge their expertise across multiple disciplines to address seven distinct research themes that characterize the school’s commitment to developing technological solutions with real-world impact.

fulton.asu.edu/signatureresearch

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**FY 2007 Expenditures**

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditures</th>
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<tbody>
<tr>
<td>FY07</td>
<td>$54,793,017</td>
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<tr>
<td>FY06</td>
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<td>$16,671,808</td>
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</tbody>
</table>

**FY 2007 Expenditures by Source of Funds**

- **Industry**: 18%
- **DoD/DOE**: 37%
- **NSF**: 20%
- **Private**: 7%
- **Foreign**: 2%
- **State & Local**: 3%
- **Other Federal**: 6%
- **NIH**: 7%

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**Signature Research Themes**

- **Nano-technologies & Nano-electronics**
- **Human Health**
- **Technology-Enhanced Lifestyles**
- **Computing and Informatics**
- **Communication Systems**
- **Sustainable Urban Engineering**
- **Exploration and Discovery**

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**Departments and Themes**

- **Harrington Department of Bioengineering**
- **Department of Chemical Engineering**
- **Department of Civil and Environmental Engineering**
- **School of Computing and Informatics**
- **Del E. Webb School of Construction**
- **Department of Electrical Engineering**
- **Department of Industrial Engineering**
- **School of Materials**
- **Department of Mechanical and Aerospace Engineering**
It is getting hotter in the Valley of the Sun. Just ask Joe Fernando.

Fernando, a professor in the Department of Mechanical and Aerospace Engineering in ASU’s Ira A. Fulton School of Engineering, and graduate assistant Kyungsun Park have created a graphic computer modeling system that shows more clearly what the term “heat island” means to the Valley.

According to the graphic model, Valley temperatures have climbed in recent years from 3 to 8 degrees in various areas, and as much as 10 degrees in some areas during the summer. Urban temperatures in Phoenix are about 7.5 degrees hotter than rural temperatures because of the urban heat island effect. In the 1960s, that difference was only about 2.5 degrees.

The presence of a heat island increases ozone production. A recent panel of United Nations scientists indicated that global warming could raise average summer temperatures in the Southwest 9 degrees by 2070.

Lighter winds also can be a bane, as they hamper removing heat from dense urban areas.

While Fernando researched the tsunami that hit Southeast Asia in 2004, he also studied waves of air that move across the country and through the cities. He and Park created a computer model that shows how the “urban heat island” effect has operated in the Valley.

Fernando says his new urban modeling system uses the Fulton High Performance Computing Initiative platform to perform complex calculations regarding the effects of human-created surfaces, emissions from autos and other polluters, and the movement of air in the Valley have on retained heat.

He says this is the first time all these factors have been so completely combined and analyzed.

Serious actions are necessary to reduce the increasing heat island effect due to the rapid urbanization of the Phoenix area. ASU’s National Center of Excellence: Smart Innovations for Urban Climate and Energy, led by Jay Golden and Kamil Kaloush, and other laboratories such as the Lawrence Berkeley Laboratory are looking into the new materials such as pervious – or porous – pavements to mitigate the urban heat island effect. Fernando’s group is looking at how urban planning such as deeper street canyons and building densities can affect the urban development.

The hope is that with this type of research, the best science can be used to design and manage cities in a sustainable manner.
Intelligent or “smart” materials have the capability to change their physical properties in response to external changes such as increase in temperature or introduction of an electric or magnetic field.

Smart structures make use of sensors to gather data about the external environment and the internal workings of the structure itself. At the highest level of sophistication, smart structures will be able to actuate physical responses to perceived needs.

Current scientific research in the areas of smart materials and smart structures is revealing what the world’s engineered environment will look like in years to come.

“The next generation of material is going to be smart, autonomous material,” says Aditi Chattopadhyay, director of the Adaptive, Intelligent Materials and Systems (AIMS) Center in the Ira A. Fulton School of Engineering.

The five-year (2006-2011) project was awarded $6 million by the Multidisciplinary Research Program of the University Research Initiative (MURI) and is being supervised by the Air Force Office of Scientific Research.

The center’s work on structural health monitoring and damage detection has had ongoing support from NASA and the Army Research Office.

In a project funded by NASA’s Intelligent Design Branch, Chattopadhyay and her colleagues are attempting to use damage-detection techniques to optimize data received from sensors on NASA’s space station and space shuttle.

“We are developing a technique to find damage hidden within a structure. Using algorithms to sort through and make sense of high volumes of data, we can localize, pinpoint and quantify damage,” Chattopadhyay says.

The technique can be applied to other critical areas such as human health and computer science, she says.

“We are bringing together fields of engineering and science in an effort that will have a very broad impact for society in general.”
Clean-Up
Construction professor oversees decontamination, decommissioning of semiconductor facility

Allan Chasey, an associate professor in the Del E. Webb School of Construction, has been involved in a project to provide direction and oversight for the decontamination and decommissioning of a manufacturing line and support facilities for a clean room. It entails all of the air conditioning systems, waste water systems, and process materials such as gases and chemicals that were used in the production of semiconductor chips.

A couple of years before, Chasey and others had done an asset decommissioning and investment recovery seminar at a Semiconductor Environmental Health and Safety Association (SESHA) conference. Based on that workshop, Chasey was asked if he would be able to put together a team that could give some direction on how it should decommission the facility and then oversee the actual decommissioning and decontamination work.

Chasey’s team first had to determine what the potential hazards were for this facility and what could be done with the various process equipment, as well as the facility infrastructure. Then, based upon the process, the chemistries involved and the various pieces of equipment, put together a recommendation on how to decontaminate the equipment and safely remove all of the utilities that were connected. A decision had to be made between cleaning them up or removing them as hazardous waste.

The team made its final presentation in January 2007, but someone has been returning to the project once or twice a month since then because additional work has been requested, including energy conservation studies and environmental assessments.
What’s in the Water
Environmental engineering professor does pioneering research in nanomaterials

Using his and other quantification tools, Westerhoff will seek to quantify the capability of wastewater treatment plants to remove commercial nanomaterials before water is discharged to local surface waters.

Nanomaterials. They are structures no larger than a billionth of a meter wide, are becoming increasingly common in manufactured goods, and are frequently found in products ranging from cosmetics to sunscreen lotions, air fresheners to stain-resistant paints.

They also are increasingly being found at wastewater treatments plants and will be found in our rivers, lakes and streams in five or 10 years.

That is, unless Paul Westerhoff and his team are able to provide the fundamental knowledge needed to manage them.

Westerhoff, a professor in the Department of Civil and Environmental Engineering at Arizona State University, is one of the world’s leading researchers on the environmental implications of the nanotechnology revolution. He won the prestigious Paul L. Busch Award from the Water Environment Research Foundation Endowment for Innovation in Applied Water Quality Research in 2006 for his investigations into the fate of commercial nanomaterials in drinking water and wastewater treatment plants, and their potential human toxicity. The Paul L. Busch Award carried with it a $100,000 grant that Westerhoff and his team will use to work to improve operations of existing wastewater treatment plant processes, such as membranes, filters, sedimentation basins and ultraviolet radiation, and catalyze research opportunities on the beneficial use of nanotechnology in diagnostic tools or treatment processes.

He also has received numerous other awards, including the Quentin Mees Research Award from the Arizona Water and Wastewater Association and the Walter L. Huber Civil Engineering Research Prize from the American Society for Civil Engineers.

Westerhoff’s large group of graduate students and post-doctoral researchers focuses its attention on emerging inorganic and organic chemicals, and environmental nanotechnology processes. He defines emerging contaminants as “things that maybe have been in the water for a long time (and) people haven’t measured them, or they’re newly produced chemicals that are just now starting to get into the water.”

Although nanotechnology creates advanced products and scientific advances that benefit humanity, little scientific information is available on nanomaterials’ fate in water and wastewater treatment plants, whether they are found in biosolids or effluent, or how they might impact treatment processes.
Using his and other quantification tools, Westerhoff will seek to quantify the capability of wastewater treatment plants to remove commercial nanomaterials before water is discharged to local surface waters. He also will characterize more naturally occurring biogenic nanomaterials that are produced by bacteria within biological wastewater treatment plants.

Westerhoff, who has been actively conducting research and teaching since he arrived at ASU in the fall of 1995, was chosen by the Provost’s Office as a university-wide “exemplar” when he was promoted from associate to full professor last year.

In August 2007, he was recognized as one of the country’s most promising young engineers through his selection to participate in the National Academy of Engineering’s U.S. Frontiers of Engineering Symposium Sept 24-26 at Microsoft Research in Redmond, Wash. Participants, who must be 30 to 45 years old, are selected based on the academy’s assessment that nominees “have demonstrated accomplishment in engineering research and technical work with recognizable contributions to advancing the frontiers of engineering…and have potential to be future leaders in the U.S. engineering endeavor.” He was one of 83 engineers chosen from among 260 nominees for last year’s event.

Westerhoff’s team aids in the development of analytical methodologies, and helps him lead a group of ASU faculty members and outside organizations such as the Arizona Department of Health Services on a large number of transdisciplinary, collaborative projects.

Research teams from ASU and Motorola Labs, the applied research arm of Motorola Inc., have developed a method to functionalize Single-Walled Carbon Nanotubes (SWNTs) with peptides to produce low-power SWNT-Field Effect Transistors (FETs) that are highly sensitive and can selectively detect heavy metal ions down to the parts-per-trillion level.

Researchers have successfully tuned SWNTs-FETs to sense specific agents by applying a peptide-functionalized polymer coating that does not affect their ability to transmit electrical signals. This developing sensor technology could be used to monitor a host of environmental and health issues including air and water quality, industrial chemicals and biological agents.

“Our sensor is based on the unique properties of peptides and carbon nanotubes. Peptides can be used to recognize and detect various chemical species with astonishing sensitivity and selectivity while carbon nanotubes are known for their unique electronic properties,” says Nongjian Tao, a professor in the Department of Electrical Engineering in ASU’s Ira A. Fulton School of Engineering. “The combination of the two allows us to quickly convert the recognition events of the peptides into an electronic signal.”

This work is reported in a paper co-authored by ASU and Motorola titled “Tuning the Chemical Selectivity of SWNTs-FETs for Detection of Heavy-Metal Ions” that will be published in the journal Small. Researchers will now investigate the sensing of other analytes and the feasibility of multi-analyte detection with selective sensing libraries.
Inside Dr. Bruce Towe’s lab, bioengineering graduate student Patrick Larson assembles microstimulators by piecing together small diodes, tiny balls of platinum and thin slices of polyvinylidene fluoride plastic underneath the lens of a microscope.

Similar to larger devices in use today to treat human conditions such as chronic muscle pain and nerve damage, these super small, electricity-generating devices are being tested to one day treat neural disorders such as Parkinson’s disease and chronic depression, or aid paraplegics in operating robotic devices by facilitating a two-way communication between brain signals and the electrical signals sent out by the external device.

As they are used today, electrical biostimulators are surgically implanted in the body. If they were made small enough, however, they could be more easily introduced to the body or the brain.

Towe, a professor of bioengineering in the Ira A. Fulton School of Engineering, is working toward this goal in several ongoing research projects and through collaborations with medical institutions. He has fabricated a wireless microstimulator small enough to fit through the opening of a 14-gauge syringe needle.

In a current research project sponsored by the National Institutes of Health, the device is being designed to manage chronic pain. Used for this function, the microstimulator would be injected into the spine, where it would block pain signals that originate below its placement along the spine.

Bioelectrical stimulation technology is not new, Towe explains.

His device performs a similar function to existing technologies, but it is smaller. It can be introduced with less trauma, activated remotely, and it is wireless.

“Overall, it is comparatively non-invasive,” Towe says. “We’re not trying to reinvent the wheel. We’re just trying to make a big improvement in the way these medical devices work so far.”

Towe is examining the device’s potential use in neural therapeutics in collaboration with the Barrow Neurological Institute in Phoenix.

“There is a lot of enthusiasm in the medical neuroscience community for the prospect of using this much smaller, wireless device,” he says.

“Success in this area would allow for a less invasive implantation of the device and for a more comfortable daily experience for the patient.”
Rummaging Through the ‘Gunk’ Pile

ASU researcher’s work could lead to a brighter horizon for Parkinson’s patients

Individuals afflicted with Parkinson’s, Alzheimer’s and Huntington’s disease – and even diabetes – might soon be looking forward to a brighter future.

With his atomic microscope, chemical engineer Dr. Michael Sierks is looking deep into the causes of such diseases. In Parkinson’s patients, many dopamine-producing neurons in the brain that control motor function die off, and the remaining neurons are left with intracellular aggregates – “gunked-up proteins” known as lewy bodies.

When the proteins aggregate, they can form highly toxic ‘oligomeric’ structures – assemblies containing from two to 15 or more molecules.

Sierks is focusing his research on targeting the toxic oligomeric form of proteins. Unlike the monomeric form – the single, functioning protein – the oligomeric structure of many different proteins can cause cell death.

The ultimate goal, Sierks says, is to develop novel therapeutics for the treatment of Parkinson’s disease.

This work can be applied to other diseases as well, since each involves a misfolding of proteins that affect the brain, he says.

Under the microscope, Sierks can distinguish between monomer, oligomer and fibril proteins, gaining a better understanding of protein morphology. He also can see the impact of antibodies he is testing, assessing whether they block toxicity.

Sierks’ research is supported through a grant from the Arizona Biomedical Research Commission and through the Michael J. Fox Foundation.

A detailed explanation of the process was presented in an article published in the July 17, 2006 edition of Applied Physics Letters, a leading international journal reporting on significant new findings in physics applied to engineering, technology and other sciences.

Digital magnetofluidics enables tiny drops of fluids to be manipulated on a silicon chip in ways that produce clearer pictures of the proteins, DNA, bacteria, viruses and chemicals present in liquids, explains Antonio Garcia, a professor in the Harrington Department of Bioengineering.

Sierks is among the scientists and engineers developing microfluidic and test-surface techniques. The team includes Mark Hayes and Devens Gust, both professors of chemistry and biochemistry, and Tom Picraux, who spent the past four years on the ASU chemical and materials engineering faculty before becoming chief scientist for the Center for Integrated Nanotechnologies at the Los Alamos National Lab in New Mexico.

Beta-amyloid oligomers (white dots), protofibrils (thin filaments) and fibrils (thick filaments), a protein that’s responsible for causing Alzheimer’s Disease.

Tiny Drops, Huge Advances

Magnetofluidics research points the way to better medical testing

Critical advances in medicine and environmental protection promise to emerge from a new method for biochemical analysis of fluids developed by an international science team led in part by Ira A. Fulton School of Engineering researchers.

Called “digital magnetofluidics,” it promises more rapid, more accurate and less costly analyses of water and biological fluids – blood, urine and saliva – that require only miniscule amounts of fluids.

The new method holds hope for significant improvements in such areas as prognosis and diagnosis of medical conditions, and in testing of water sources for environmental hazards, Garcia says.

At ASU, Garcia is among the scientists and engineers developing microfluidic and test-surface techniques. The team includes Mark Hayes and Devens Gust, both professors of chemistry and biochemistry, and Tom Picraux, who spent the past four years on the ASU chemical and materials engineering faculty before becoming chief scientist for the Center for Integrated Nanotechnologies at the Los Alamos National Lab in New Mexico.
The Microscale Life Sciences Center (MLSC) led by Deirdre Meldrum, dean of ASU’s Ira A. Fulton School of Engineering, was awarded a five-year, $18 million grant – one of the highest individual grant amounts in the university’s history – in 2006 to continue its role as one of the national Centers for Excellence in Genomic Science (CEGS).

The grant is from the National Human Genome Research Institute (NHGRI), a part of the National Institutes of Health (NIH).

The Microscale Life Sciences Center’s focus is on the use of microscale technology innovation to solve mysteries about cell growth and death, answers that will reveal crucial knowledge about cancer, heart disease and strokes – the leading fatal diseases in the United States.

It is developing miniature automated systems designed to rapidly detect and analyze the differences between healthy and diseased body cells to better understand the nature of disease processes.

The MLSC was established in 2001 as one of the first members of the CEGS and funded with an initial five-year, $18 million grant.

Meldrum brought the research program from the University of Washington to ASU when she stepped into the dean’s post in January 2007. She oversees the program as director of the new Center for Ecogenomics at ASU’s Biodesign Institute.

The program is continuing its collaboration with researchers at the University of Washington, Brandeis University in Massachusetts and the Fred Hutchinson Cancer Research Center in Seattle.

The new funding came from one of three grants totaling $54 million awarded by the NHGRI. In addition to the grant to the Microscale Life Sciences Center, $18 million each went to the Yale University Center of Excellence in Genomic Science, which coordinates the efforts of several research laboratories at Yale with the goal of discovering and analyzing the vast amount of information encoded within the human genome, and to the California Institute of Technology to establish the Center for In Toto Genomic Analysis of Vertebrate Development.

“Deirdre Meldrum is both a visionary and a scientific and technological leader,” says ASU President Michael Crow. “The participation of Dean Meldrum’s team in this collaboration of leading research institutions gives ASU the opportunity to make significant contributions to some of the most promising advances in modern medicine. This research is a prime example of her ability to move science and scientists to the cutting edge of discovery.”
The act of drinking from a glass of water is completed almost subconsciously: reach, grab and drink. Unnoticed are the mind’s calculations such as of how, when and where to touch.

We are not aware of the signals sent to the body from the brain to perform the act or the sensory information sent back to the brain from nerve endings under the skin.

Clearly, dissecting the art of human movement is a complex endeavor. But it can lead to enormous advances in human health.

As more becomes understood about the brain’s role in movement, researchers are getting closer to developing prosthetic devices that can be operated solely by a person’s brain signals. Stated differently, by volition.

Steve Helms Tillery, assistant professor of bioengineering and head of the SensoriMotor Research Group at ASU, has worked for years to advance the technology of brain-controlled prosthetics.

Five years ago, he teamed with Dr. Andy Schwartz, professor of neurobiology at the University of Pittsburgh, and Dawn Taylor, professor of bioengineering at Case Western Reserve University, to demonstrate that monkeys could operate a robotic arm to feed themselves using only their brain signals.

Today, he is a part of a team of researchers attempting to build a prosthetic human hand to be controlled entirely by brain signals.

In re-directing the focus of research from the arm to the hand, Helms Tillery encountered a new set of challenges.

The hand’s reliance on sensory information for its effective use and its comparatively complex configuration requires extensive knowledge of the hand and the way the mind controls it.

For this, Helms Tillery turned to Marco Santello, associate professor of kinesiology and director of the Neural Control of Movement Laboratory at ASU.

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In 2006, the pair’s research proposal was selected for funding by the National Institutes of Health as part of its Bioengineering Partnership Project entitled “Cortical Control of a Dexterous Prosthetic Hand.” The transdisciplinary project brings together researchers from the University of Pittsburgh, the University of Washington, Carnegie Mellon University, the University of Minnesota and Columbia University.

“This research is exciting because we are working to build something that can be of use to disabled individuals. And, at the same time, we are pushing the frontiers of knowledge regarding how the brain controls a complex system like the hand,” Helms Tillery says.

In their lab, Helms Tillery and Santello monitor the neuronal activity that takes place when the hand grabs objects, allowing them to identify the various sets of muscle and joint combinations employed by the brain to carry out the task.

They also are devising a system for sending information back to the brain, replacing the sensory information that would be produced by a natural hand.
SIGNATURE RESEARCH

The Really Big One
ASU researchers to help build one of the world’s most powerful computing systems

ASU researchers are partners in an unprecedented supercomputing project that has been awarded a five-year, $59 million grant from the National Science Foundation (NSF).

The Texas Advanced Computing Center (TACC) at the University of Texas at Austin is the lead institution for the project, which will provide a high-performance computing system for the nation’s research scientists and engineers.

TACC and the Institute for Computational Engineering & Sciences at UT-Austin will be assisted in the effort by the Fulton High-Performance Computing Initiative (HPCI) in ASU’s Ira A. Fulton School of Engineering, as well as by the Cornell Theory Center at Cornell University and the computer technology company Sun Microsystems.

The project’s goal is to deploy and support world-class high-performance systems with tremendous computing capacity and capability to enhance leading U.S. research programs.

The supercomputer system is to achieve a peak performance in excess of 400 trillion floating point operations per second, providing more than 100 trillion bytes of memory and 1.7 quadrillion bytes of disk storage.

May 2007 marked one year of operation for HPCI, which is directed by computer engineer Dan Stanzione.

The program’s center has been used by more than 300 researchers, including about 75 ASU faculty members from more than 15 academic departments. More than $22 million in research has been performed at its facilities in the past year, accounting for more than 10 percent of ASU’s total research expenditures.

The facility started with support entirely from endowment funds, but now more than half of its operations are supported through almost $3 million in external grant funding from a variety of government and industry sources, including the National Science Foundation, the U.S. Department of Defense and NASA.

“Advanced computational capability is increasingly critical to research at ASU and around the world,” Stanzione says.
In the United States alone, approximately 200,000 individuals live with spinal cord injuries that have left them immobile, unemployed and with a host of additional health complications.

According to bioengineering and electrical engineering professor Ranu Jung, their fate – and the futures of others afflicted with additional neurological disabilities – is improving. At the heart of such advancement is research being carried out in the Ira A. Fulton School of Engineering’s Center for Adaptive Neural Systems that Jung co-directs with James Abbas, a professor who conducts research in rehabilitation engineering.

Jung and a team of about 20 researchers who work within the Harrington Department of Bioengineering are looking at ways to coax damaged nervous systems into repairing themselves.

“We are analyzing signals from the nervous system and developing computational algorithms,” explains Jung of the numerical formulas that mimic brain patterns responsible for controlling limb movement. “We’re trying to understand how the brain and spinal cord originally did the control, and use that knowledge in the design of our computational algorithm.”

The algorithms then are programmed into rehabilitative devices for individuals with spinal cord injury, Parkinson’s disease, cerebral palsy and other orthopedic injuries.

Clinical trials are underway for a hand-held, take-home unit, as well as a unit designed for rehabilitation facilities – both designed to electrically stimulate paralyzed muscle, thus imitating the movement that occurs during exercise.

Through ongoing studies in animals and humans, the team has recorded functional improvement of muscle function using such therapies. The next step, Jung says, is understanding why the electrical stimulation is working.

Repairing Damaged Nervous Systems
The Center for Adaptive Neural Systems searches for ways to help nervous systems repair themselves
Advancing Alternative Energies
Engineers are working to make wind power reliable and solar energy pervasive

“Our efforts have the potential to significantly benefit the state of Arizona in meeting its goal of meeting 15 percent of its energy needs with renewable forms of energy by 2025.”

As the global community strengthens its commitment to develop and utilize more sustainable sources of energy, the United States government and existing energy companies are turning to university researchers to test and improve alternative energy systems.

At ASU, transdisciplinary research collaborations are underway to advance the technologies that support clean and renewable power systems.

Vijay Vittal, Ira A. Fulton chair of electrical engineering and director of the Power Systems Engineering Research Center (PSERC), and Raja Ayyanar, associate professor of electrical engineering, are a part of a transdisciplinary team of researchers selected for funding under the U.S. Department of Energy’s Solar America Initiative to advance solar power capabilities in the United States.

The team is comprised of faculty from ASU’s College of Design, PSERC, the Department of Electrical Engineering, the Photovoltaic Testing Laboratory and the Electronic Systems program, and has partnered with energy company BP Solar.

Ayyanar and Vittal are using dynamic modeling techniques to gauge the effect of large-scale solar power use on the electrical components of power management systems. They will specifically look at the interaction between the power converters that convert DC (solar generated) current into usable AC current and other power inverters connected to the utility grid, and then develop advanced control methods and algorithms to manage the influx of solar power.

Other partners of the BP project include Dow Corning, Ceradyne, Bekaert, Ferro, Specialized Technology Resources, Komax, the Palo Alto Research Center, AFG Industries, Automation Tooling Systems Ohio, Xantrex, Fat Spaniel, the Sacramento Municipal Utility District, Recticel, the Georgia Institute of Technology and the University of Central Florida.

The projected impact of the BP project will occur on a national and international scale, yet it also has important significance for the state of Arizona, Vittal says.

“Our efforts have the potential to significantly benefit the state of Arizona in meeting its goal of meeting 15 percent of its energy needs with renewable forms of energy by 2025,” Vittal says.

In another renewable energy project, funded by the National Science Foundation, Ayyanar and Vittal are looking at ways to improve the performance of large wind farms connected to the electric grid by analyzing the impact of increased wind penetration on grid reliability, measuring the effectiveness of doubly fed induction generator-based wind turbines and establishing new power electronics-based controls.
Qualcomm Joins ASU’s Connection One to Advance Wireless Communications
Students will benefit from internships, expansion of electrical engineering research

A major industry leader in next-generation wireless communications is teaming with an Ira A. Fulton School of Engineering research center to move new technology advancements from the research lab to the marketplace.

Qualcomm Inc. is helping to expand the research pursuits of Connection One, a designated National Science Foundation Industry/University Cooperative Research Center based in ASU’s school of engineering. Connection One is at the forefront of developing next-generation antennas, low-power computer chips, advanced transistor models and cutting-edge multiple-function circuitry to enhance technologies ranging from cellular to environmental and defense applications. The National Science Foundation-funded center partners with universities and corporations to bring together the academic laboratory with state-of-the-art research initiatives and real world market applications.

The partnership between Connection One and Qualcomm focuses on advances in wideband code division multiple-access cellular telephones, aimed at improving the performance of cell phones as well as increasing user privacy.

“The next generation of wireless communications is one of the most significant technologies for this millennium, and Qualcomm plays a critical role in this,” says Sayfe Kiaei, Connection One director. “Qualcomm will bring new expertise and an industry perspective to the center.”

ASU students benefit from the partnership. Qualcomm supports Connection One’s academic objective to prepare students for careers in new industries evolving from emerging wireless technologies and nanotechnologies. The company funds graduate-level projects and hires students for internships to work with Qualcomm engineers.

“Connection One is an effective platform for establishing relations between industry leaders and university researchers,” says Qualcomm Director of Engineering Seyfi Bazarjani Sr.

“Twice a year, Qualcomm learns about the latest research topics in communication-integrated circuits, interacts with faculty and meets directly with top students in the field,” Bazarjani says. “From there, we can decide on further options for interaction, such as sponsoring individual projects, setting up internships and hiring students. This flexibility and networking opportunity makes Connection One very attractive to Qualcomm.”
“Sustainability is necessarily transdisciplinary. This is something that couldn’t be taught just by engineering or just by business. But by combining efforts we can provide something fairly unique. It’s clearly something that’s at the head of the class in terms of what you can find around the country.”

Ask Brad Allenby to define sustainability, and the professor of civil and environmental engineering will give you a roundabout answer. “I don’t generally define it,” he says, logic quick on the heels of his reluctance. “I think that most efforts to define it at this point necessarily Underestimate the complexity and the difficulty inherent in the concept.”

Indeed, sustainability involves the complex and difficult task of considering the interconnectedness of the environment, society and the economy. Still, in some circles it is regarded in ‘simple life’ terms.

That sustainability defies being boxed in and neatly packaged is indicative of its status as a problem worthy of evaluation, further investigation and experiment. ASU and the Ira A. Fulton School of Engineering are making concerted efforts toward sustainable strategies — to not only further understanding, but also to innovate tools, technologies and knowledge, and of course do so in the transdisciplinary manner required by a concept that is at once broad in scale and specific. “ASU right now is a fairly unique intellectual environment. People talk about that, but they don’t realize how important that is, particularly in these cutting-edge areas that jump across disciplines,” Allenby says.

Engineering’s reach as a whole involves an enormous array of sustainability implications. “A lot of sustainability is very fuzzy, but if you’re an engineer you don’t have that luxury,” Allenby says. “You’re given a problem in the real world and you’ve got to solve it, whether it’s build a product that a company can sell in the market, or create a bridge design that works.” To do so sustainably means paying more heed than in the past to the environmental, social and cultural dimensions of product and infrastructure design, he says. “Then we develop heuristics that, while not perfect, enable us to do better than we have in the past.”

Take a new cell phone design, for example. In thinking about sustainability, two goals might prevail: reduce energy consumption over the life cycle and reduce unnecessary use of toxic materials in the manufacture of the phone itself.

The Ira A. Fulton School of Engineering is charged with integrating sustainability in ways that are fundamental to the school’s mission and goals. Civil and environmental engineering has been designated the lead department to interface with the rest of the university on sustainability, especially ASU’s prominent School of Sustainability and Global Institute of Sustainability (GIOS). It also is working in collaboration with two other universities, the University of Texas at Austin and Carnegie Mellon University, to develop coursework and otherwise spread the word in sustainable engineering education through the Center for Sustainable Engineering.

Civil and environmental engineering is offering a sustainable technology and management certificate jointly with the School of Sustainability and the W. P. Carey School of Business — a prime example of the advantages of working across disciplines without reducing the emphasis on the school of engineering’s strengths. “Sustainability is necessarily
transdisciplinary. This is something that couldn’t be taught just by engineering or just by business,” Allenby says. “But by combining efforts we can provide something fairly unique. It’s clearly something that’s at the head of the class in terms of what you can find around the country.”

ASU’s focus on sustainability is set apart from the rest of the country for another reason: its geographic location in an intensely developing major metropolitan area. The challenges that result from being the nation’s fastest growing city — from highway congestion to the urban heat island effect to dispersing the water supply — effectively create a living laboratory in which to study sustainability, Allenby says. The ability to look at Phoenix as a case study, with its complex mixture of built environment, natural, cultural and social systems, makes sustainability issues more palpable to students.

Resources at the university aim to understand and form responses to changes in these systems. The National Center of Excellence on SMART Innovations for Urban Climate and Energy, led by Jay Golden and Kamil Kaloush of the Ira A. Fulton School of Engineering, is looking at the creation of new sustainable materials and renewable technology innovations. And ASU’s Decision Theater offers methodological learning about sustainability, allowing researchers, decision makers and others to view issues at different scales, with the ability to render raw data intuitive and accessible.

Because one day such renderings won’t be that at all; they will develop into full-scale, real-world environmental, economic and social situations — no doubt still complex, but quite possibly made a great deal less difficult.

### Scheduling Surgeries

Industrial engineering professor teams with the Mayo Clinic to improve outpatient procedure center operations

Surgical services require the coordination of many activities, including patient check-in and pre-procedure preparation, the surgical procedure and recovery. Recently, Serhat Gul and Dr. John Fowler of the Ira A. Fulton School of Engineering’s Department of Industrial Engineering teamed up with Todd Huschka and Dr. Brian Denton of the Mayo Clinic in Rochester, Minn., to develop a simulation model of an outpatient procedure center (OPC).

Through the use of the model, they demonstrated that how surgeries are scheduled has an impact on the competing objectives of mean patient waiting time and the amount of overtime at the OPC. In particular, they found that arrival time schedules substantially influence expected overtime and patient waiting time, while surgery allocation and sequencing heuristics have a smaller effect.

Furthermore, they found that surgery mix on a particular day is an important factor affecting performance measures, indicating that the optimization of daily surgical mix may be a promising opportunity for improving scheduling efficiency in an OPC. In addition, the model developed for the OPC has become the starting point for a model that is being used to help design a new outpatient procedure center.

In the continuation of their National Science Foundation-funded project, Fowler and Denton will continue to use the model to study how to improve OPC operations.
Electrochemist of the Year
Chemical engineering professor wins ultra-prestigious award

“Joe Wang is one of the most creative scientists I have known in my technical life,” says Subhash Mahajan, director of the School of Materials.

Joseph Wang, director of the Center for Bioelectronics and Biosensors in ASU’s Biodesign Institute, was the 2006 recipient of the American Chemical Society (ACS) Division of Analytical Chemistry’s Cole Parmer Award in Electrochemistry.

Wang is an academic “triple threat” at ASU, having been recruited in 2004 to the Biodesign Institute to lead a new center and serve a joint appointment as professor in the Department of Chemical Engineering at the Ira A. Fulton School of Engineering and the Department of Chemistry in the School of Life Sciences.

“Joe Wang is one of the most creative scientists I have known in my technical life,” says Subhash Mahajan, professor and director of the School of Materials. “His understanding and intuition of electrochemistry is so excellent that he can apply it to a multitude of technologies. He can reduce complex problems to an aggregation of simple ones, resulting in sophisticated biosensors and nanowires with unique properties.”

Wang’s research interests include the development of microfluidic (“lab-on-chip”) devices, biosensors DNA recognition and diagnostics, and nanomaterials-based sensors that can operate at the scale of single-molecule detection limits.

ACS Award recipients are honored for advancing the field of electrochemical analysis by criteria that include developing unique instrumentation, discovering fundamental events or processes, and authoring important books and research papers that have had a profound influence on the field.

Wang has continually pushed the boundaries of his field by making new discoveries and applications that rely on a fundamental understanding of the relationship between the different electrical properties of molecules, such as current, charge or potential, and their chemical nature.

“Such use of electrical measurements for analytical purposes has found a vast range of applications, including environmental monitoring, industrial quality control and biomedical analysis,” Wang wrote in the latest edition of his advanced undergraduate and graduate textbook “Analytical Electrochemistry.”

Sensors developed from these basic electrical and chemical measurements often can speed up and automate sample handling and measurement, eliminating the need for cumbersome and tedious sample collecting or preparation methods. With wireless technologies improving, the numbers of remote sampling and monitoring applications are increasing.

During his career, Wang has written 685 papers, seven books and 24 chapters and received 14 patents to his credit, including involvement in the development of the first noninvasive biosensor for diabetes, the Food and Drug Administration-approved Gluco Watch, which monitors glucose levels through human sweat.

Wang also joins the ranks of a very select few who have been doubly honored by the ACS. In 1999, he was the recipient of the ACS Award for Chemical Instrumentation.

In addition, Wang’s prolific publication record was recognized in 2006 with the top-ranked cited researcher in the field of engineering (out of 5,537 authors) and the fifth-most cited in chemistry (out of 5,977 authors) for research papers published over the last decade.
“You can invent, but you can’t produce your invention if there is no material to do so.”

Materials World
Supplying the building blocks for innovation

The concept of the semiconductor—a feat of science and engineering no doubt taken for granted in the world at large today—was known since the early 1930s, but at the time manufacturing it was not possible. While the technology was intellectually available, the ready materials were too unrefined.

It was not until the mid-1940s that Bill Pfann at Bell Telephone Laboratories made the computer chip possible through the development of zone-refining and zone-leveling methods, which could prepare high-purity materials. Pfann’s sights were set on manufacturing transistors, but the concepts based on materials science and engineering provided the ability to refine silicon to ultra-pure levels. At last chip technology was not mere invention; its very feasibility changed the world.

Subhash Mahajan, director of the Ira A. Fulton School of Engineering’s new School of Materials (SOM), recounts that story as a classic example of the importance of the materials education. Technology will get nowhere without the proper materials, he says.

“You can invent, but you can’t produce your invention if there is no material to do so,” Mahajan says. “If you talk to those in industry, such as chip manufacturers, they’ll tell you it is mostly materials problems that are the constraints. The ideas are there, but the implementation is difficult.” Implementation also would prove difficult without the properly educated.

That is the double gist of SOM, a collaboration between the Ira A. Fulton School of Engineering and the College of Liberal Arts and Sciences: to advance materials science and educate students to apply those advances to real-world needs.

SOM began offering classes in fall 2006. Its formula will match materials science to society’s challenges. “The whole key is to do some fundamental science, but we want it to be applicable to the real world,” says School of Materials Professor Terry Alford.

Which circles back to the science of semiconductors. “We’re learning how to take semiconductor processing technology—something we as a country do well—and asking, ‘Can we apply these techniques to other things?’” Alford says.

Alford is applying semiconductor techniques to biomedical uses in his work with hydroxyapatite, the mineral content of human bone, in conjunction with the Center for Solid State Science and faculty in bioengineering.

The application possibilities are boundless. “Seeing how materials have been used throughout the history of mankind to resolve social issues, be they communication, housing, storage of food, transportation, there has always been that ability to have materials that can do specific functions,” he says. “That’s why if we really want to think about the many problems facing society right now, materials will be expanded to even broader, unfathomable venues,” such as medicine and alternative fuels.

Mahajan has in mind innumerable examples of technological advances just waiting for the requisite materials.
Invest in Engineering

Like all educational institutions, public or private, the Ira A. Fulton School of Engineering at Arizona State University (ASU) depends heavily on support from the private sector to advance its mission and achieve its objectives. The Development Office manages a variety of fundraising programs to support attainment of the school of engineering’s short- and long-range goals, including alumni programs, major gifts and endowments and planned giving. The Development Office works closely with the ASU Foundation, an independent non-profit organization that acts as the principal agent through which gifts are made to benefit the university.

Enamul Hoque, who earned a master’s degree in civil and environmental engineering from Arizona State University in 1985, recently made a $250,000 gift to the Department of Civil and Environmental Engineering (CEE) in the Ira A. Fulton School of Engineering. As a result, the department’s large-scale geotechnical testing lab will be renamed the E.M. Hoque Geotechnical Laboratory. Hoque’s gift is the first in support of a lab within ISTB2, an $18 million, two-story, 66,000-square foot research facility on ASU’s Tempe campus.

Over the past four years, CEE has added several new laboratories and renovated or relocated a number of existing ones, including the Biodesign Institute, the Environmental Protection Agency-funded National Center for Excellence on SMART (sustainable materials and renewable technology) Innovations and the Advanced Asphalt Technology Laboratory. Hoque’s gift will help sustain both research and educational programs in Civil and Environmental Engineering and will support the E.M. Hoque Geotechnical Laboratory as the preeminent lab in the United States, and one of the best in the world, for large-scale static and dynamic testing of waste materials.

The new E.M. Hoque Geotechnical Laboratory is special for a number of reasons, not the least of which is the man for whom it is named. Since his childhood, Hoque has volunteered his time to help the less fortunate in his native Bangladesh and in the United States. He is constantly trying to infuse his family’s tradition of community service into the operation of Phoenix-based Hoque & Associates, a consulting engineering firm specializing in geotechnical exploration, civil engineering, construction materials testing, environmental assessment and solid waste engineering.

“With this investment in the school of engineering, Enamul Hoque is enabling important research efforts while also providing unique opportunities for students to enhance their educational experience,” says Executive Dean Paul Johnson. “This gift is particularly meaningful as it represents the first of what we hope will be a wide range of laboratory investments by the supporters and benefactors of our school.”
Del E. Webb School of Construction Now Has an In-house Student Recruiter

Female enrollment figures for the fall 2007 semester are four times higher than any other year in school history.

Melissa Luna joined the Del E. Webb School of Construction in January 2007, after Jeff Ehret, a 1976 alumnus of the school and president of the PENTA Building Group Inc., donated $200,000 to the construction program in fall 2006.

In her first year on the job, Luna increased the enrollment figures for first-time entering freshmen in the school of construction by 52 percent. Female enrollment figures for the fall 2007 semester are four times higher than any other year in the school of construction’s history.

Industry Veteran Continues Long History of Philanthropy at ASU

William “Wink” Ames has worked in the construction industry for four decades. Twenty years ago, he co-founded Minard-Ames Insurance Group and he since has worked closely with Valley contractors and construction educators, building a reputation of professionalism, generosity and leadership.

Ames, who has taught both undergraduate and graduate-level courses in construction at ASU, is passionate about education. Over the years, he has worked with the Del E. Webb School of Construction to raise money for its growth.

Ames and his two children made a personal contribution of $330,000 to the school to fund an academic endowment for African-American students. The scholarship will assist a student throughout his or her undergraduate construction education.

In October, Ames received the ASU Alumni Appreciation Award for his commitment to ASU and the construction program.

Salt River Materials Group Reaffirms Support to Construction School, American Indian Community

This year the Del E. Webb School of Construction received a $100,000 pledge of support from the Salt River Materials Group (SRMG), an enterprise of the Salt River Pima-Maricopa Indian community, to go toward the school’s Construction in Indian Country (CIIC) program. Established in 2001 by the construction school and a group of American Indian leaders, the CIIC program addresses the need for quality management of construction among American Indian sovereignties and provides valuable educational opportunities to American Indian students.

SRMG has been the largest sponsor of CIIC, having donated $75,000 over the past three years. The recent $100,000 donation, made in January, affirms its commitment to the CIIC and the education of American Indian students.

“As a Native American-owned business engaged in supplying the construction industry, the CIIC is a natural fit for our company. Pairing up with a world-class program like the Del E. Webb School of Construction helps meet two of our primary goals: to improve the understanding of the construction process for all parties in the fast-growing Native American market, and to develop the next generation of professionals equipped to manage that dynamic process.”

Roger R. Smith Jr.  President and CEO
Del E. Webb School of Construction “Building Foundations” Campaign

In January 2005, the Del E. Webb School of Construction launched its “Building Foundations” campaign with the goal of building a new facility for the school and creating new, enhanced programs.

The ambitious effort is being led by two of the school’s alumni, Dan Withers, president of D.L. Withers Construction, and Ron Rodgers, chairman of the New Horizons Foundation. Since the official launch, the school has received more than $8.5 million in endowment support, $4.0 million toward the building campaign and more than $2 million in non-endowed support.

ACADEMIC FACILITY & LABORATORY SPACE

$10 million
This effort is part of a larger $65 million 180,000-square-foot construction and engineering facility that will support the growth of the program and will include classrooms dedicated to construction management courses. The building also will provide space for other engineering programs that have a synergistic relationship with the construction school, leading to an enhanced student experience.

ENDOWED PROGRAM SUPPORT

$10 million
The Del E. Webb School of Construction is home to eight research and teaching centers committed to partnering with the local construction industry and sharing research findings with local government, businesses, contractors and communities. Through the school’s international academic partnerships and industry collaborations, students gain real-world exposure to the rapidly evolving industry.

Alumni Profile: Jack Carney, ’60

Jack Carney graduated with the ASU school of construction’s first class in 1960. He has had a long, successful career in the industry, working for such companies as Morrison Knudsen and Nat Harrison Associates.

While working as a project manager at Morrison Knudsen, Carney oversaw the construction of NASA’s Vehicle Assembly Building (VAB) at Cape Canaveral, Florida. The VAB was originally built to allow for the vertical assembly of Apollo/Saturn space vehicles, and it remains the largest single story building in the world with a height nearly double that of the Statue of Liberty (525 feet).

Carney also started two construction companies, Carney General Contractors and ASC Construction. In 1992, Carney General Contractors starting doing outdoor media work, and, by 2003, Carney Media Inc. was formed as an independent company working in outdoor advertising and point-of-purchase ads. His latest business venture, Carney-Zeta, was formed in 2005 and leases advanced capacitor-based technology for the prevention of fouling in aqueous systems in industrial plants.

AGC, ABA Give Del E. Webb a Boost

The Associated General Contractors (AGC) and the Associated Builders’ Alliance (ABA) are helping ASU’s Del E. Webb School of Construction reach its goals for expansion. Both organizations are funding endowed lecturer positions at the school. Within the past fiscal year, funds donated by the two organizations toward the school’s building and endowment campaign totaled more than $4.7 million.

The AGC has committed nearly $2.5 million toward the establishment of an enhanced faculty position to teach the heavy construction curriculum. The organization has committed another $568,000 toward the construction school’s building campaign.

The ABA has committed more than $2.4 million to the building campaign and another $158,000 toward an endowment to support the commercial building curriculum.
Donor Honor Roll
Gifts to the Ira A. Fulton School of Engineering
July 1, 2006 through June 30, 2007

$1,000,000 and above
Anonymous
Anonymous
Diane and Gary Tooker

$500,000 to $999,999
Anonymous
Kitchell
Sunstate Equipment Company

$250,000 to $499,999
Anonymous
Fann Contracting, Inc.
Mahmuda and Enamul Hoque

$100,000 to $249,999
Achen-Gardner Engineering, LLC
Ames Construction Inc.
Avnet, Inc.
Combs Construction Company, Inc.
Construction 70, Inc.
Empire Southwest
FNF Construction, Inc.
Fisher Sand & Gravel Company
Freescale Semiconductor Inc.
Government Electronics & Information Technology Association
Harrington Arthritis Research Center
Haydon Building Corp.
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Intel Foundation
Markham Contracting Company, Inc.
Meadow Valley Contractors, Inc.
Nesbitt Contracting Company, Inc.
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Rinker Materials
Rummel Construction, Inc.
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Southwest Patrons-Concrete Industry Management
Stevens Leinweber Construction Inc.
Sundt Construction, Inc.
Sunland Inc.
Tremco

$50,000 to $99,999
American Subcontractors Association of Arizona Inc.
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Autism Research Institute
Buesing Corporation
CAADES Sinaloa, AC
C.S. & W. Contractors, Inc.
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Cemex Construction Materials, Inc.
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Klondyke, Inc.
McNeil Brothers
OVSS LECET
PCA Education Foundation
PCL Civil Constructors, Inc.
Red Mountain Machinry Company
Rhodes Homes Arizona, LLC
Tanner Companies

$25,000 to $49,999
Arizona Materials, LLC
Arizona Public Service Company
Banner Health
Cactus Transport, Inc.
Carnegie Mellon University
Chevron Energy Technology Company
D.L. Withers Construction, L.C.
Felix Construction Company
Ford Motor Company
Betty Hum
Maricopa Readymix, LLC
Ophthalmic Research Associates
Rock Solid
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Swengel-Robbins
Vulcan Materials Company
Weyerhaeuser

$5,000 to $24,999
3DInternational, Inc.
APS Energy Services
Adolson & Peterson Construction
American Council of Engineering Companies
Anonymous
Satyavath and Vasudeva Arturi
Austin Commercial LP
Axon Technologies Corporation
Bechtel Foundation
Black & Veatch Corporation
The Boeing Company
Capital Pacific Arizona, Inc.
Centennial Contractors Enterprises, Inc.
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Core Construction
DPR Construction, Inc.
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General Dynamics Decision Systems, Inc.
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Gould Evans Associates, LC
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NEC Laboratories America, Inc.
National Electrical Contractors Association Inc.
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Opus West Construction Corp.

Thank you
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 School of Engineering Development Office at 480.965.9646 so that we can correct our records.
**Vision**
Leading engineering discovery and innovative education for global Impact on quality of life.

**Mission**
Provide an environment rich in transdisciplinary research, education, entrepreneurship and leadership resulting in successful engineers and technologies that benefit society.