Pushing Medicine's Boundaries
Kon-Well Wang, Diefenderfer Chaired Professor in Mechanical Engineering, was named editor of the American Society of Mechanical Engineers’ *Journal of Vibration and Acoustics*.

**Timothy Simpson**, associate professor of mechanical and industrial engineering, received the Society of Automotive Engineers’ 2005 Ralph R. Teetor Educational Award. The award recognizes outstanding young engineering educators who have between three and ten years of full-time faculty experience. Recipients are recognized for their contributions to teaching, curriculum development, professional development, and research, as well as their leadership in student activities and participation in engineering society activities.

John M. Mason Jr., associate dean for graduate studies, research, and outreach, and professor of civil engineering, won the Institute of Transportation Engineers’ 2005 Theodore M. Matson Award. The award recognizes outstanding contributions in the field of traffic engineering, including application of traffic engineering principles, adaptation of research findings to practical situations, and the advancement of the profession through training and administration.

Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics, was one of only five University faculty members to receive the 2004–2005 Faculty Scholar Medal for Outstanding Achievement. Lakhtakia was recognized for his work in the development of sculptured thin films and research in negative-phase-velocity propagation of light in gravitationally affected vacuums.

David Riley, associate professor of architectural engineering, won the 2005 President’s Award for Engagement with Students. The award goes to a full-time Penn State faculty member who goes beyond his or her responsibilities to engage and encourage students in learning, demonstrating deep caring, and involvement.

Barbara Bogue, affiliate associate professor of engineering science and mechanics and former director of the College’s Women in Engineering Program, won the 2005 Founders Award from the Women in Engineering Programs and Advocates Network (WEPAN). The award recognizes Bogue’s service to WEPAN and her scholarship in women’s studies.
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About the Cover

Engineers continue to play a major role in medical research, from creating artificial organs to new drug delivery methods. Researchers in the College of Engineering continue to expand our medical knowledge and innovate in new technologies.

Correction: In the spring 2005 issue, Alumni Fellow winner R. William Happel was incorrectly identified as a 1969 mechanical engineering graduate on page 26. Happel is a 1969 industrial engineering graduate.
Pushing medicine’s boundaries

Engineers take an increasingly active role in medicine

They’re not seen in the operating room, nor do patients call upon them for routine checkups, but engineers have become an important—if unheralded—part of medicine.

Doctors collaborating with engineers is nothing new. Milton S. Hershey Medical Center doctors teamed with engineering faculty in the 1970s to work on what became the artificial heart. That effort, as well as other groundbreaking research, continues today.

Hearts for children

In spring 2004, an interdisciplinary team of Penn State engineers and doctors received a $5 million contract from the National Institute of Health’s National Heart, Lung, and Blood Institute to build a pediatric heart assist device.

William Weiss, the Howard E. Morgan Associate Professor of Surgery and Bioengineering and the project’s principal investigator, says, “This contract allows us to develop two sizes of blood pumps small enough to provide heart support for infants, children, and teens.”

Most heart-assist devices were developed for adults and are too large for children. Kids who need them typically suffer from congenital heart diseases such as hypoplastic left heart syndrome, in which the left part of the heart is underdeveloped, or left ventricle dysfunction, which is an infection or inflammation of the heart.

The hope is to construct a device that provides at least six months of support until the heart recovers or until a donor heart is found.

Fabricating an assist device requires developing very smooth materials and making seamless connections between parts to ensure that red blood cells and platelets don’t collect in crevices and seams. Failing to do so would allow clots to form, which can break loose, travel through the blood stream, and cause a stroke. The researchers also must ensure the device doesn’t create stress in the blood. When blood undergoes fluid stress, it may become activated and begin to clot, or red blood cells may rupture.

Weiss adds, “Making these pumps smaller is not just a matter of shrinking everything. We really have to be careful about how we design the pump. When you make blood pumps, or even grafts or tubes, the fluid dynamics change as the size changes. In the smaller pumps, dead zones, or low-rate flow zones, can form inside the blood pumps. This slow-flowing blood can create clots. Our challenge is to be sure the blood is neither too active nor too slow.”

The team includes more than a dozen doctors and engineers from the Colleges of Medicine and Engineering, Applied Research Laboratory, and Materials Research Institute.
"Smart" medicine

Some engineers’ research doesn’t involve creating a new device. Instead, they look at taking better advantage of existing treatments and technology.

Michael Pishko, professor of chemical engineering, is making medicine more effective after it’s introduced into the body.

Few understand the difficulty in delivering drugs to the proper place in the body. The body’s immune system is on constant alert for intruding bacteria and viruses, continually sweeping out things it doesn’t recognize. And though it does an excellent job of protection, the immune system doesn’t discriminate between good and bad—if it’s foreign, it gets expelled.

That’s why transplanted or artificial organs run a high rejection risk. It’s also why getting medication to the proper place in the body is so difficult.

Pishko seeks to change that by reducing medicine to tiny, nano-sized fragments.

“We’re essentially creating ‘stealth’ particles the body won’t recognize,” he says. By evading the body’s natural defenses, nano-sized medicine could remain in the body longer. The chemical engineer is taking matters a step further by adding a coating that programs the nano-sized fragments to target specific areas of the body.

One method is coating the particles with folic acid. Cancer cells have many more folic acid receptors than normal cells.

Pishko says the folic acid-coated drugs would be quickly drawn to the cancer site.

A second method is designing coatings modified with monoclonal antibodies designed to recognize diseased cells in the body. Because each type of ailment can be recognized by a specific monoclonal antibody, the medication could simply hitch a ride to where it needs to go.

These “smart” medicines offer two major benefits, Pishko says. First is the elimination of side effects. “When you give a patient a cancer drug, it goes throughout the body,” he explains. “The cancer drug not only acts on the tumor, but also on all the other cells, which is why a patient experiences side effects.”

The second major benefit is patients will need only small drug doses. In conventional treatments, a stronger dose is necessary to ensure enough medication reaches the targeted area.

“For chemotherapeutic products, you don’t need a lot,” he states. “Minute quantities are sufficient for numerous patients because the drugs are so potent.”
Toward a virtual lung

Other engineers are applying their expertise to expand medical knowledge. For the past few years, James Ultman, professor of chemical engineering, has studied how inhaled pollutants move among the lung’s different regions, where they can affect the organ’s functions.

“Air pollution has the potential for inducing significant health problems,” Ultman explains. “In fact, any foreign agent you breathe, ingest, or come in contact with can potentially induce a biological effect. The biological effect’s severity is directly related to the extent of exposure to the material.”

Working with Ali Borhan and Aziz Ben-Jebria, both professors of chemical engineering, the team is studying ozone—a pollutant linked to smog formation.

“When properly controlled in our experiments, ozone is not a dangerous gas. To create a health effect, you have to breathe it for a long time or at high concentration levels,” Ultman says.

The engineers are approaching their study from a different angle. Borhan, an expert in fluid dynamics and transport, says the work isn’t a far stretch from “traditional” engineering.

Ultman says, “To a chemical engineer, the lung is like a process vessel.”

Borhan adds, “Fluid transport in the lungs is similar to flow in pipes. The techniques we’re using are well established—we’re just applying them to a different type of complex problem.”

The work employs a two-pronged approach. The first uses human subjects in controlled environments where they breathe diluted ozone amounts. Ultman stresses the tests adhere very strictly to human subjects safety rules. “These experiments,” he says, “allow us to infer what’s going on in the lung.”
The second step is forming mathematical models to explain how inhaled air pollutants are distributed inside of the lungs. Borhan says the model’s construction is a complex process, requiring information from numerous sources.

Magnetic resonance imaging is used to give the researchers a better idea of the lung’s airway structures. Bench-top studies of the ozone reaction with naturally-occurring substances provide a better understanding of the chemistry between ozone and the tissues it encounters in an actual lung.

The mathematical model will eventually allow researchers to predict how different air pollutant levels impact people’s lungs, leading to a better understanding of who is at greatest risk. The researchers continue to refine their model’s geometry, chemistry, and other characteristics in the hope of one day devising a virtual lung.

The team’s other members include Dr. Rebecca Bascom, a Hershey Medical Center pulminologist, and Steven Arnold, professor of statistics.

Zebrafish, a popular tropical aquarium pet, offer numerous research advantages. Cheng says, “The zebrafish is a vertebrate organism, so it gets vertebrate diseases like cancer.” The animal is also quick to reproduce and develop, two other traits prized by researchers.

In the course of their work, Cheng’s group generates large volumes of digital images. For Cheng, the photos have spawned their own research problem—not only are there a lot of images, but each is enormous.

Cheng turned to computer algorithms expert James Wang, an assistant professor of information sciences and technology and computer science and engineering, and holder of the PNC Technologies Career Development Professorship.

Wang states, “These images are thousands of pixels by thousands of pixels.” On the average, Cheng’s high resolution images are 5,000 pixels by 5,000 pixels. In comparison, a standard 15-inch, flat-panel computer monitor is set at 1,024 pixels by 768 pixels.

Wang’s first problem was reducing the images to a manageable size without losing resolution. Programs such as Adobe Photoshop allow users to trim a photograph’s physical dimensions or reduce the digital image’s file size. Once that’s done, however, the extra information is lost forever.

Cheng’s group needed to shrink the images to allow for better digital file management while still being able to examine the original’s details.

“A small dot can mean a lot of things in biomedicine,” Wang says.
He developed a lossless method that compressed the digital images to a smaller size, but still allowed researchers to click anywhere on the thumbnail image to get a closer look. The algorithm has already been tested on other image types and Wang will test it with pathology images once they’re available.

With one problem solved, he turned his attention to the second problem: the sheer volume of images. It isn’t possible for researchers to examine each image, so Wang teamed with Jai Li, an assistant professor of statistics and computer science and engineering, to create another algorithm that allows the computer to learn what abnormalities to look for.

The second algorithm lets researchers ask the computer to search by characteristics such as color, texture, and shape.

“It’s just like humans—we have to show the computer samples or slides of what the cancer looks like. When it’s looking at actual images, it compares what it sees versus its own knowledge base,” he explains.

The algorithm can not only be used to seek out anomalies in photos, it can search for similar samples as well.

Although Wang’s expertise is in computers, he admits he enjoys his foray into medicine. “I’m really into applying some of these technologies to biomedicine,” he says.

—Curtis Chan

Valerie Gliem contributed to this story.
Black holes influence knowledge of the universe

Black holes have a reputation for voraciously eating everything in their immediate neighborhood, but these large gravity wells also affect electromagnetic radiation and may hinder our ability to locate the center of the universe.

“Any attempt to discover what was happening a long time ago at the beginning of our universe must take into account what gravitationally assisted negative refraction does to the radiation being viewed,” says Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics.

Electromagnetic radiation is affected by the material through which it travels. A material with a negative index of refraction transmits light or other wave energy differently than one with a positive index of refraction. Natural materials have a positive index of refraction. When an energy beam—light, radar, microwaves—passes through water or glass or some other natural material, the material displaces the beam in the same direction. The amount of displacement, due to a material with negative index of refraction, is in the opposite direction.

Previously, Lakhtakia and Tom Mackay, mathematics lecturer at the University of Edinburgh, used Albert Einstein’s Special Theory of Relativity to examine refraction by moving materials. They calculated that negative refraction can be concluded to have occurred by an observer moving at a very high relative velocity in certain directions.

Later they showed that no material is needed for negative refraction in outer space. Instead, when a beam passes through the gravitational field of a massive object, such as a rotating black hole, negative refraction theoretically is possible.

When it comes to the influence of gravity caused by rotating black holes or other massive objects, it really depends on where one stands. A local observer can see only a very small piece of the universal picture of how large gravitational forces influence electromagnetic radiation. To the local observer, gravity is uniform and does not cause negative refraction.

However, Lakhtakia and Mackay, assisted by Sandi Setiawan, a postdoctoral researcher at the University of Edinburgh, decided to look at a global observer—one who stands in space-time as described by Einstein in his General Theory of Relativity. A global observer sees a region around rotating black holes, called the ergosphere, as possibly bending electromagnetic radiation according to a negative refractive index.

These new derivations indicate that not only do the effects of the minute stuff of the universe have to be considered when mapping the universe, but the existence of large gravity wells also must be considered.

The three researchers have extended their theory of negative refraction to even more general scenarios. As we reach out into extrasolar space, for example via Pioneer 10, scientists are getting more interested in the actual existence of such scenarios.

When researchers hunt for the universe’s origin, multiple black holes and other massive objects can make the light beams bend in unexpected and unpredictable ways.

“We should not be disappointed if we cannot discover the origin of the universe,” says Lakhtakia. “The gravitational effect probably makes it so that we do not really know where we are looking.”

Nevertheless, Lakhtakia and his collaborators are optimistic that scientists eventually will overcome many of the obstacles put forward by negative refraction in outer space.

—Barbara Hale

Dr. Lakhtakia can be reached atakhlesh@psu.edu or at 814-863-4319.
Penn State helps develop new road signs

New easier-to-read road signs based on University research are appearing across the United States and Canada.

The Federal Highway Administration approved the interim use of a new typeface, called Clearview, for signs on all public streets, highways, and byways. New signs bearing Clearview, instead of the old familiar Highway Gothic, already appear on U.S. Route 322 and Interstate 80 in Pennsylvania and on highways throughout Texas and in Canada.

A decade in development, the Clearview Typeface System for traffic control devices was created by a design team that included Martin Pietrucha, a civil engineer and director of the University’s Science, Technology, and Society Program, and Philip Garvey, research associate at the University’s Pennsylvania Transportation Institute.

The new Clearview road sign typeface is so much more legible than the existing typeface that it gives drivers going 55 mph added seconds to respond to directions.

Clearview offers a 20 percent improvement in legibility and recognition with the same sign as currently used. Replacing signs bearing the 50-year-old Standard Highway Sign Alphabet with new Clearview signs should not cause driver confusion or increase costs, the two Penn State engineers say.

An interdisciplinary team including perceptual psychologists, traffic engineers, type designers, graphic designers, vision experts, and optics engineers developed Clearview. Their goal was to improve road sign legibility and recognition at night, especially for older drivers.

“Clearview achieves its greater legibility by using upper and lower case with initial capital letters, special spacing based on how a viewer reads a legend from an extended distance, and by eliminating nighttime overglow or halo-ing,” Pietrucha says.

He explains that overglow occurs when a car’s headlights shine directly on a sign on which letters have been

Martin Pietrucha, associate professor of civil engineering and director of the Science, Technology, and Society Program, left, and Garvey, a Pennsylvania Transportation Institute research associate, display the improved typography for road signs.
formed from highly reflective material. The letters become, momentarily, so bright that they lose their familiar shapes and look instead like blobs. Overglow is especially troublesome for those over age 65.

Clearview retains its readability, despite overglow, because the letters have been designed to have more interior space. The B, e, g, and a, for example, have more space inside the letters so that when halo-ing occurs, the overglow doesn’t entirely fill them up.

Garvey notes that Clearview’s design is based on the results of six formal studies and dozens of field reviews using younger drivers as well as older ones in both day and night driving conditions.

“Inadequate signing can be a contributing factor in roadway crashes,” he adds. “Although Clearview was intended to help older drivers, our studies show that the appreciable gain in reaction time provided by the new typeface will be achieved by drivers regardless of age.”

Support for the project came from a grant from 3M and assistance from Avery Dennison.

—Barbara Hale

Dr. Pietrucha can be reached at mtp5@psu.edu or at 814-865-9951.
A n interdisciplinary team of researchers has received a $6.7 million grant from the National Science Foundation to establish a new center for environmental kinetics.

The group is headed by Susan Brantley, director of the Earth and Environmental Systems Institute in the College of Earth and Mineral Sciences. The new center will be called the Penn State Center for Environmental Kinetics Analysis (CEKA) and administered through Brantley’s institute.

CEKA’s engineering faculty include William Burgos, associate professor of civil and environmental engineering; Brian Dempsey, professor of civil engineering; and Bruce Logan, Kappe Professor of Environmental Engineering.

CEKA brings together engineers, chemists, geochemists, biochemists, and soil scientists to measure and synthesize kinetic data for environmental systems and to promote modeling of the temporal evolution of such systems.

The group will try to comprehend how fast pollutants and natural salts react with minerals in soils and aquifers. CEKA will attempt to understand this reaction using laboratory and computer experiments and work to scale the results to natural systems.

The team’s other Penn State faculty members include Peter Heaney, geosciences; Mercedes Maroto-Valer, energy and geo-environmental engineering; Kwadwo Osseo-Asare, materials science and engineering; Ming Tien, biochemistry and molecular biology; Karl Mueller and Kenneth Merz, chemistry; and Carmen Martinez, crop and soil sciences. The University team will be joined by Department of Energy scientists as well as a Juniata College faculty member.

—Curtis Chan

More information on CEKA can be found at www.ceka.psu.edu.
David Riley, associate professor of architectural engineering, and Andrew Lau, associate professor of engineering design, have been named director and associate director, respectively, of Penn State's Center for Sustainability.

Located off Porter Road on the University Park campus, the center serves as a showcase for sustainable living concepts and ecological technologies, as well as an outdoor classroom and laboratory for students and the community.

Educational activities at the center include credit courses offered through the College's Science, Technology, and Society program, non-credit courses, special-interest workshops, and community volunteer workdays.

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### Bookshelf

#### Lakhtakia, Messier pen new text

Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics, and Russell Messier, professor of engineering science and mechanics, have authored *Sculptured Thin Films: Nanoengineered Morphology and Optics*.

The text pairs the author's knowledge of thin-film morphology with the response characteristics of optical sculptured thin film (STF) devices, enabling scientists and technologists to design STF materials and devices for optical applications.

A CD containing Mathematica™ programs designed by the two is included. Suitable for graduate students and professionals in optics, the work can be purchased online at bookstore.spie.org.

#### Cimbala coauthors new book

John Cimbala, professor of mechanical engineering, has coauthored an undergraduate textbook on fluid mechanics.

Published by McGraw-Hill, *Fluid Mechanics: Fundamentals and Applications* by Yunus Cengel and Cimbala presents the basic principles and equations of fluid mechanics through numerous and diverse real-world examples. Focus areas in the text include the visual nature of fluid dynamics, current research, computational fluid dynamics, and precise definitions of key terms. In addition, the book helps students develop an intuitive understanding of fluid dynamics by emphasizing underlying physical mechanisms.

The book can be purchased online at www.mhhe.com.

#### Wagener coauthors text

Thorsten Wagener, assistant professor of civil and environmental engineering, has coauthored a new text, *Rainfall-Runoff Modelling in Gauged and Ungauged Catchments*. The other authors are Howard Wheater and Hoshin Gupta.

The work is based on the results of a study on the identification of conceptual lumped rainfall-runoff models for gauged and ungauged catchments. The theory underlying the application of rainfall-runoff models for predictions in ungauged catchments is discussed, problems are highlighted, and ways to move forward are investigated. Modelling frameworks for gauged and ungauged cases are presented.

Suitable for graduate students, hydrological researchers, and consultants, the book is published by World Scientific Publishing and can be purchased online at www.wspc.com.
■ **College goes secure wireless**

The College’s Electronics and Computer Services unit has completed the installation of secure wireless networking systems in 17 buildings on the University Park campus: Hammond, Electrical Engineering East, Electrical Engineering West, Engineering Units A and B, Reber, Fenske, Hallowell, Leonhard, Earth and Engineering Sciences, Research East, Research West, Cato Park, Sackett, and the Transportation Institute buildings.

All engineering faculty, staff, and students have access to College resources through available secure wireless services with computers capable of wireless connectivity using 802.11a, 802.11b, or 802.11g wireless technologies. Users must install a virtual private networking client on their systems to take advantage of the network. The client can be downloaded at www.engr.psu.edu/vpn.

■ **Sniper victim memorial fund reaches $100,000**

A scholarship fund established in memory of Dean Meyers (CE ’75) has reached $100,000.

Meyers was fatally shot during a sniper attack on Oct. 9, 2002, while he was fueling his vehicle after working late. His employer, The Dewberry Companies, established the Dean Meyers Memorial Fund to pay tribute.

Meyers was a 20-year veteran of Dewberry. He joined the company in 1982 in its Land Design and Survey Division.

As a student, Meyers was an active member of the American Society of Civil Engineers and a member of the Tau Beta Pi engineering honor society. He held a life membership in the Penn State Alumni Association.

Those who wish to contribute to the fund may send a check payable to Penn State to: Richard G. Swails, Director of Development, Penn State College of Engineering, 101 Hammond Building, University Park, PA 16802. The check’s memo line should read, “Dean Meyers Memorial Fund.”

■ **Engineering joins Neuroscience Institute**

The College of Engineering is participating in the University’s new Neuroscience Institute. The institute is dedicated to teaching, research, and service across neuroscience-related disciplines from molecular and cellular research to studies on human behavior.

The Neuroscience Institute’s participants include the Colleges of Agricultural Sciences, Engineering, Health and Human Development, Liberal Arts, Medicine, and Science. The institute will be administered through the Huck Institutes of the Life Sciences.

As part of the initiative, the College’s bioengineering department has hired new faculty member Andrew Webb, who is working with the College of Medicine’s Michael Smith to establish a magnetic resonance imaging center for animal studies at the University Park campus.
**U.S. News gives engineering high marks**

The College’s graduate programs fared well in the latest U.S. News & World Report rankings.

In the 2006 edition of America’s Best Graduate Schools, the College of Engineering as a whole ranked 19th, moving up two spots from the previous year. The engineering graduate program has consistently ranked in the top 25 since 1999.

The industrial engineering program was rated third in the country, moving up from fourth. The Harold and Inge Marcus Department of Industrial Engineering is one of the oldest and largest in the country. It has consistently ranked in the top five since 1999.

The College’s nuclear engineering program was ranked seventh. Nuclear engineering was previously ranked ninth.

The intercollege program in materials was ranked eighth. The materials program is a perennial member of the top ten and has been since 1999.

Other graduate program rankings include aerospace (13th), mechanical (15th), environmental (17th), electrical (18th), chemical (19th), computer engineering (21st), and bioengineering (27th).

**Medical pioneer delivers commencement address**

Robert Langer, Kenneth J. Germeshausen Professor of Chemical Engineering and Biomedical Engineering at the Massachusetts Institute of Technology, delivered the keynote address for this spring’s engineering commencement ceremony on May 13.

Langer is considered one of the most prolific inventors in medicine. He has won numerous awards and prizes and is one of the few people to hold memberships in all three national academies—the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

In his address, “Making Life Better: The Engineer’s Dream and Challenge,” Langer encouraged graduates to dream big and to pursue those dreams.

At the end of the ceremony, Langer was conferred an honorary degree by Penn State President Graham Spanier.

**Zydney to head chemical engineering**

Andrew Zydney has been named the Walter L. Robb Chair and Head of Chemical Engineering. He replaces Henry Foley, who was tapped by the University to serve as the associate vice president for research and director of strategic initiatives.

Zydney joined the Penn State faculty in 2001 after serving as a chemical engineering faculty member at the University of Delaware. At Delaware, he was also the associate chair for undergraduate studies and previously served as director of the graduate program in chemical engineering.

Zydney holds a bachelor’s degree in chemical engineering from Yale University and a Ph.D. in chemical engineering from the Massachusetts Institute of Technology.
**EE student dies in fire**

Christopher Raspanti, a seventh-semester electrical engineering student, died in an early morning house fire on Apr. 24. Four other occupants of the East Beaver Avenue house managed to escape without injuries.

Investigators determined that the fire was caused by a spark from an electrical problem in the house’s attic.

Raspanti was from Fairless Hills, PA, and was a 2002 graduate of Pennsbury High School.

He was a member of the Penn State Snowboarding Club and worked part time as a chef at the Corner Room restaurant.

According to the Daily Collegian student newspaper, Raspanti was known for his warm, friendly demeanor. Friends also recalled Raspanti’s love of baseball and his devotion to the Philadelphia Phillies baseball team. They said the 21 year old was so loyal to the Phillies that he purchased two seats from Veterans Stadium before it was demolished. He was also well known for organizing Wiffle Ball tournaments on campus.

Raspanti is survived by his parents, William and Kimi, and siblings Greg, Lindsay, and Brett.

Memorial contributions may be sent to the College of Engineering’s development office at 101 Hammond Building, University Park, PA 16802. Envelopes and checks should contain the line, “Attn: In memory of Christopher Raspanti.”

**AE department unveils new test facility**

Architectural engineering recently celebrated the completion of a new full-scale thermal and air quality research facility.

Located in the Mechanical Building Systems Laboratory in the basement of Engineering Unit A, the Building Environment Simulation and Test (BEST) Facility consists of two chambers that share a glass wall. Each chamber is equipped with its own HVAC system, allowing researchers to simulate an indoor environment in one and an outdoor environment in the other. The facility’s state-of-the-art measuring and data acquisition systems can then be used to determine energy consumption, air quality, and thermal comfort of various building environmental systems.

Jelena Srebric, assistant professor of architectural engineering and project director, explains that the BEST facility was designed for maximum flexibility. “Both the HVAC systems and the control systems are reconfigurable such that components, subsystems, and complete systems can be easily installed, modified, and tested,” she says.

**Graduate students receive teaching, research honors**

Four engineering graduate students received University-wide awards for their teaching and research efforts.

Two students received the Alumni Association Dissertation Award. The students are Beshahwired Ayalew, a doctoral candidate in mechanical engineering, and Fei Wang, a doctoral candidate in engineering science and mechanics.

The award is considered among the most prestigious available to Penn State graduate students. Each student receives an award of $5,000. Two students received the Graduate Assistant Outstanding Teaching Award. The students are John Sustersic, a doctoral candidate in computer science and engineering, and Lesley Strawderman, a doctoral candidate in industrial engineering.

Students winning the Graduate Assistant Outstanding Teaching Award each receive a $500 award.
**Student profile: Jessica Lohwasser**

Jessica Lohwasser’s connection to Penn State began at a very early age.

“I was born on the day Penn State won its first national football championship,” she says, referring to the Nittany Lions’ victory over Georgia in the 1983 Sugar Bowl. “My dad has always been a huge Penn State fan,” she adds. “So you could say I was destined to go to school here!”

Although she comes from a small town—there were only about 100 kids in her high school class—Lohwasser wasn’t intimidated by Penn State’s size. The industrial engineering senior spent her first semester exploring opportunities.

“I wanted to see what was out there and then dive into the things I really liked,” she recalls.

One activity Lohwasser was sure she wanted to pursue was tennis, a sport she had begun playing in high school. She joined the Penn State Tennis Club during her freshman year, tried out for the club’s traveling team—and made it. “We travel all over the east and play matches against other college tennis club teams,” she says. “We even went to Florida for the 2004 nationals. It’s a lot of fun.”

Lohwasser’s other extracurricular pursuits revolve around the Women in Engineering Program (WEP). For the past three years, she has volunteered at WEPO, the orientation program for incoming first-year women engineering students. In addition, she works as an intern in the WEP office, where she coordinates activities for Girl Scout Saturdays.

“We bring in Girl Scouts of all ages so they can see what engineering is really like,” Lohwasser explains. “We want to show them that it’s a cool thing for girls to do—it’s not so nerdy!” To give an example, she describes an architectural engineering activity. “We had them design their own homes and build their own models,” she says. “Then we took them to the Immersive Environments Lab in Unit C so they could see their designs in virtual reality.”

Lohwasser, who will graduate in 2006, spent spring semester on a co-op assignment at Walt Disney World. As for the future, she’s undecided. “I have interests in a lot of areas,” she says. “I’m keeping my options open!”

—Jane Harris
At this very moment, a robot somewhere is painting a car for an automobile manufacturer, arranging chocolate candies in a box, or perhaps even locating and disposing of bombs.

A new club on campus, the Penn State Robotics Club, gives students a forum in which to learn about and build robots.

What exactly is a robot? To qualify as a robot, a machine must be able to perform two tasks: obtain information from its surroundings and do something physical such as move or manipulate objects.

The idea to have a Robotics Club stemmed mainly from two former Abington campus students, Dan McAdams, a physics major, and Evan Glinski, a chemical engineering senior. Glinski recalls, “My very good friend, Dan McAdams, and I had taken a computer science course at Penn State Abington. He became more interested in robotics after taking the course. Dan mentioned to me his surprise that University Park didn’t have a robotics club, and he expressed an interest in starting the club. I told him I’d support him the best I could. After recruiting some friends and other people interested in robotics, and after submitting the proper paperwork, the robotics club was born.”

Approved as an official Penn State club in October 2004, the organization has already participated in a few competitions. However, not all competitions are the same. Erica Rodriguez, a sophomore majoring in communication, sciences, and disorders, explains, “We build the robots, but the task of each competition is different every time.”

A Robo Hoop competition was held last fall at the Abington campus. Students were charged with programming a robot to find a ball, follow lines, locate a light, and put the ball through a hoop as often as possible in an allotted time.

In a subsequent Sumo Bot competition, students made two robots fight each other and try to push each other off a platform.

An April event, the Penn State Abington Mini Grand Challenge, required students to build robots to navigate paths of the Abington campus and avoid objects with no human interaction. Unfortunately, the contest was canceled due to inclement weather. Instead, robots were displayed on campus.

According to Glinski, who now serves as club treasurer, funding for the club comes from two engineering departments and Penn State. He says, “We have had money generously donated by the Department of Mechanical and Nuclear Engineering
and the Department of Electrical Engineering. We also get some money from Penn State for being a recognized club.

Prizes for the competitions vary. For example, winners of the Robo Hoops competition earned trophies and books, while champions of the Sumo Bot competition received ribbons and certificates.

Rodriguez remarks, “When you win, it's the prestige of going in there and doing well, especially with the different Penn State branches.”

Shivang Patel, computer engineering senior and interim president, says the biggest challenge he has faced so far is students' frustration. He states, “Sometimes stuff doesn't work the first time, and students get frustrated. My job is making sure they don't give up.”

Any student in any major is welcome to join the club.

Rodriguez smiles, “You don't need experience to be in this club. If you like working with people and want to learn something new, we are willing to teach you.”

Patel adds, “When you think of robotics, you think of engineering, but other students can have good ideas. If you can put something together, that's all that matters!”

—Stefanie Tomlinson

More information is available at www.clubs.psu.edu/up/robot/index.html.

Two students make some final adjustments to their robot before the start of a competition.
One student from each major has the honor of being named student marshal for the College of Engineering’s spring commencement ceremony. Student marshals are chosen on the basis of their academic achievement and contributions to the College. This spring, the College graduated 824 undergraduate students. The following are among our best, and we’re proud to introduce them to you.

### Aerospace Engineering
- **Bryce Durham** of Houston, TX. Employed by Cessna Aircraft Co. in Wichita, KS.

### Agricultural and Biological Engineering
- **Gregory Stricker** of Wernersville, PA. Employed by the Natural Resources Conservation Service in Lebanon, PA.

### Architectural Engineering
- **Diane Emert** of North Huntingdon, PA. Employed by James Posey Associates in Baltimore, MD.

### Bioengineering
- **Rachel Miller** of Annville, PA. Attending graduate school at MIT.

### Chemical Engineering
- **Andrew Marencic** of Mifflintown, PA. Attending graduate school at Princeton University.

### Civil Engineering
- **Daphne Matthews** of Greensburg, PA. Pursuing a career in civil engineering.

### Computer Engineering
- **Matthew Roberts** of Johnstown, PA. Employed by Raytheon in State College and attending graduate school at Penn State.

### Computer Science
- **Vlad Morariu** of Murraysville, PA. Attending graduate school at the University of Maryland.

### Electrical Engineering
- **Nicholas Pillitteri** of Allentown, PA. Attending graduate school at the University of Maryland.

### Engineering Science
- **Katherine Weaver** of Rochester, NY. Attending graduate school at Penn State.

### Industrial Engineering
- **Kyungjin Rachel Lee** of Seoul, Korea. Attending graduate school.

### Mechanical Engineering
- **Allison Beese** of Herndon, VA. Attending graduate school at Georgia Tech.

### Nuclear Engineering

### ROTC
It’s been a year since I began my term as PSES president, and as I reflect on the past year, I am reminded of the first column I wrote. The emphasis in the article was reconnecting with Penn State, specifically the College of Engineering. I pointed out opportunities that exist for Penn State engineering alumni to re-establish their connections to the College and shared some of my experiences as an active member of PSES.

As president, I have expanded my involvement by serving the College as a member of the Alumni Council and inducting new engineering graduates into the University and College of Engineering alumni societies at the spring commencement. These experiences have been extremely satisfying for me. They have also allowed me to become acquainted with students, faculty, and staff at the College, and with individuals who have reconnected with Penn State in some way.

As fall semester at Penn State approaches, I know everyone is excited about the upcoming football season and anticipating a winning season and maybe even a slot in the top echelon of the Big Ten. However, there are also ways for you to become involved in PSES activities.

The Resumania Committee, which helps engineering students with their resumes, will be holding their Fall Resume Review Day on Sep. 16 in conjunction with the annual Career Fair.

The fall PSES meeting will be held on Sep. 23, with post-meeting activities that will include tours of Old Main and the new Information Sciences and Technology Building.

On Sep. 24, PSES will hold its 13th annual PSES Golf Classic at Toftrees Resort. The Golf Classic provides scholarship support for undergraduate engineering students (see the back cover of the magazine for details).

In closing, I’d like to mention another personal experience for me as an active PSES member. Last year the Golf Classic provided an opportunity for me to establish a connection with other engineering alumni. I wanted to play, but I didn’t have a specific foursome to play with. The Golf Classic Committee organized foursomes for individuals, and I got hooked up with John Hollenbach (ChE ’78) and Jeff Jeffries (NucE MS ’70, PhD ’72), two other alumni who attended the PSES meeting on Friday. We had a great time golfing together, and we are already planning to play in the same foursome this year.

As I mentioned before, all PSES meetings and activities are open to interested alumni. For information, contact Cindy Jones at cjjdo@engr.psu.edu or 814-863-3384.

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**Alumni Calendar**

- **Sep. 16**: Resumania
- **Sep. 23**: Fall PSES meeting
- **Sep. 24**: 13th annual Golf Classic
Awards honor outstanding staff, faculty

The College celebrated achievements in teaching, research, service, and advising with its annual Penn State Engineering Society (PSES) Faculty Staff Awards in March.

The PSES Outstanding Staff Award recognizes dedicated individuals who place extra effort in and show initiative and loyalty to the College beyond their job descriptions. The award recipients are Michelle Alterio, mechanical and nuclear engineering staff assistant; Cheryl George, electrical engineering staff assistant; and Teresa Reed, Office of Graduate Studies, Research, and Outreach staff assistant.

Three faculty members won the Outstanding Advising Award for their dedication in advising students or student groups. The recipients are William Haering, assistant professor at Penn State DuBois; Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics; and Daniel Linzell, assistant professor of civil engineering.

The PSES Distinguished Service Award, which recognizes dedicated individuals who willingly donate their time, expertise, and energies to the College, was given to Lee Coraor, associate professor of computer science and engineering.

The PSES Outstanding Teaching Award recognizes individuals who show a special talent and commitment to teaching. In addition, recipients of the award are innovators and experimentalists in the classroom and laboratory who have at least three years of experience at Penn State. The winners are Ivan Esparragoza, assistant professor at Penn State Delaware, and Lawrence Hochreiter, professor of mechanical and nuclear engineering.

The PSES Premier Teaching Award is given to faculty members who have been previously recognized for outstanding teaching and have continued to excel in the classroom. The award recipient is Timothy Simpson, associate professor of mechanical engineering and industrial engineering.

The PSES Outstanding Research Award, which recognizes notable contributions to research, was given to Mary Frecker, associate professor of mechanical engineering.

The PSES Premier Research Award, which honors faculty who have previously been recognized for outstanding research and are considered preeminent in their field, was presented to Vigor Yang, distinguished professor of mechanical engineering.

PSES award recipients are nominated by their respective departments in which the individual is employed or from which the candidate earned a degree and are selected by a panel of peers and PSES representatives. All awardees are selected through secret ballot by committees composed of faculty, staff, alumni, and former award recipients.

Resumania needs you!
PSES is looking for alumni volunteers to give students pointers on their resumes. The event will be held Sep. 16. Contact Cindy Jones at cjjdo@engr.psu.edu or 814-863-3384 for information.
College celebrates Outstanding Engineering Alumni

Ten top engineers were honored in April as the 2005 Penn State Outstanding Engineering Alumni. In addition to receiving their honors, the Outstanding Engineering Alumni Award recipients met with faculty and spoke with students during their visits to campus.

The annual Outstanding Engineering Alumni Award is the highest honor conferred by the College of Engineering and recognizes graduates who have reached exceptional levels of professional achievement. Only 250 men and women—out of more than 75,000 engineering alumni worldwide—have received the award during its 39-year history.

This year’s recipients are:

**Engineering Science**

![Charles Dages](image1.png)

Charles Dages, of Brentwood, CA, and Bergen County, NJ, executive vice president of emerging technology for Warner Bros. Technical Operations, Inc. Dages is a 1977 engineering science graduate.

**Chemical Engineering**

![Raymond Houck](image2.png)

Raymond Houck, of Oakmont, PA, president and chief executive officer of Automated Cell, Inc. Houck is a 1977 chemical engineering graduate.

**Industrial Engineering**

![Edward Kasody](image3.png)

Edward Kasody, of Boalsburg, PA, retired president and CEO of American Trim, LLC. Kasody is a 1960 industrial engineering graduate.

**Computer Science**

![Michael Keebaugh](image4.png)

Michael Keebaugh, of Plano, TX, president of intelligence & information systems for Raytheon. Keebaugh is a 1971 computer science graduate.

**Architectural Engineering**

![Joseph Martignetti Jr.](image5.png)

Joseph Martignetti Jr. of Palo Alto, CA, chairman and CEO of Ventana Property Services, Inc. Martignetti is a 1978 architectural engineering graduate.

**Civil Engineering**

![David Meehan](image6.png)

David Meehan, of Philadelphia, PA, president and CEO of Kvaerner Philadelphia Shipyard. Meehan is a 1975 civil engineering graduate.

**Electrical Engineering**

![David Newman Jr.](image7.png)


**Mechanical Engineering**

![Clyde Shuman Jr.](image8.png)

Clyde Shuman Jr. of Allentown, PA, CEO of Precision Medical, Inc. Shuman is a 1967 mechanical engineering graduate.

**Aerospace Engineering**

![Glenn Spacht](image9.png)

Glenn Spacht, of Lloyd Neck, NY, vice president and chief technology officer of NanoDynamics, Inc. Spacht is a 1968 aerospace engineering graduate.

**Nuclear Engineering**

![Douglas Wood](image10.png)

Douglas Wood, of Ann Arbor, MI, vice president of Advent Engineering Services, Inc. Wood is a 1973 nuclear engineering graduate.
Blackmon receives first Alumni Achievement Award

Theodore Blackmon (ME ’92) was among the first Penn State graduates to receive the Alumni Association’s Alumni Achievement Award. The new honor celebrates the accomplishments of University alumni who are 35 years old or younger.

Blackmon is president and chief technology officer of Common Point, Inc. Common Point provides software solutions that optimize business through visual simulation of work processes using a virtual model of a building, facility, or industrial plant. Blackmon is a recognized leader in the area of robotics, virtual reality, advanced 3D modeling, and systems integration for real-time applications.

Prior to the launch of Common Point (formerly known as Reality Capture Technologies), Blackmon was employed at the NASA Ames Research Center, where he served as technology group leader for advanced human-machine interfaces within the computational sciences division. During this period, he led development efforts on several significant and highly visible system applications, including the “Virtual Reality for Mars Pathfinder” project and the “Chernobyl 3D Mapping System” project. Both of these applications required an extremely short development cycle of less than six months and involved the successful coordination and assimilation of technologies from multiple research groups in government and academia.

Before joining NASA, Blackmon successfully operated a technology consulting business focused on providing integration and visualization software solutions for large engineering and construction firms.

Blackmon received his M.S. and Ph.D. in mechanical engineering from the University of California, Berkeley, with a major in control systems and minors in robotics and human neuromotor control. He is a native of southwestern Pennsylvania and was a student marshal in the mechanical engineering department.

Heard on campus

Jerry Goldress, CEO of Grisanti, Galef & Goldress, Inc., delivered the 2005 Marvin J. Kudroff Memorial Lecture in Engineering Management on Apr. 6 at the University Park campus. Goldress is considered a national expert in managing troubled companies and is widely known for his transformation of the L.B. Foster Company from a firm on the brink of bankruptcy with $5.5 million in losses to a debt-free, profitable organization two years later. His presentation to engineering students was titled, “Industrial Engineering as a Springboard to Top Management.”
### 1960s

Carl A. Mazeleski (EEET ’61) retired in September 2004 after 43 years of service with PPL Electric Utilities. Mazeleski held a number of supervisory and management positions during his career, retiring as operations supervisor of PPL’s northeast region. He and his wife, Barbara, reside in Clarks Summit, PA.

Raymond R. Pisaneschi, Jr. (CE ’67) retired from Lehigh Cement Co. in April. During his 38 years with the firm, Pisaneschi held various positions in Maryland, Florida, Washington, and Pennsylvania. At the time of his retirement, he was manager of marketing and technical sales at Lehigh’s corporate headquarters. Pisaneschi and his wife, Maureen, live in Emmaus, PA.

Robert Sebrosky (ESM ’62, MS ’63) retired from IBM Corporation, where he was an advisory engineer.

### 1970s

David C. Carter (CE ’77), owner of David C. Carter Consulting Engineers in Winter Haven, FL, was named 2004 Builder of the Year by the Polk County Builders Association.

Charles J. Delisio (AE ’77) has been elected to the New Leadership Board of the Pittsburgh Symphony. Delisio is a partner with makato, architecture and design, where recent design work includes interiors for a fitness club and lighting design for two historic buildings on East Carson Street in Pittsburgh, a nationally recognized historic district.

### 1980s

Hyong C. Kim (NuE MS ’86; PhD ’89) has joined DANA International in Gwangnam-gu, Seoul, Korea, as a partner and patent attorney.

David Wu (IE MS ’85; PhD ’87) has been named dean of Lehigh University’s P.C. Rossin College of Engineering and Applied Science. Wu joined Lehigh’s faculty in 1987 and became chairman of the industrial and systems engineering department in 1998.

Bryan W. Lowe (CE ’99) and Marissa Rodgers Lowe (EDU ’93) announce the birth of their second child, a daughter, on Jan. 6. The infant, who was named Courtney Nicole, joins 3-year-old brother Patrick Shane. Bryan is an engineer with PBS&J/TrileLine Associates in Canonsburg, PA, while Marissa teaches elementary school in the Ringgold School District. The Lowe family makes their home in Washington, PA.

Richard E. Tannenbaum (IE ’92) was recently named vice president of distribution services for PETsMART, a leading retailer of pet products and services headquartered in Phoenix, AZ. In his new position, Tannenbaum will manage supply chain and distribution operation initiatives to support PETsMART’s retail stores, catalogs, and on-line business.

### 2000s

Nicholas Maffeo (AE ’04) has been named a Leadership in Energy and Environmental Design Accredited Professional by the U.S. Green Building Council for his achievement in fostering sustainable design and construction. Maffeo is a mechanical designer at GRC, Inc., in Maitland, FL.

Geoffry G. Scott (CE ’02) is employed by E.E. Austin & Son, Inc., a general contractor located in Erie, PA. Currently, he is serving as project engineer on the Research And Economic Development Center, a 160,000-square-foot building under construction at Penn State Erie, The Behrend College. Scott’s responsibilities include safety awareness, permit approval, scheduling, material procurement, cost reporting, and coordination of more than 20 subcontractors.

### In memoriam

William J. DeMauriac II (ME ’31) died Mar. 23 at the age of 96. DeMauriac, who spent his entire career with the Philadelphia Electric Co., resided in Ocean City, NJ. He is survived by his wife, Barbara DeMauriac.

William E. Diefenderfer (ME ’38) passed away Mar. 15 in Hartford, CT. He was 88. Diefenderfer joined the Hamilton Standard Division of United Aircraft in 1941. During his long tenure with the company, he advanced through a series of positions that included general manager, division president, group vice president, and senior vice president. Diefenderfer was an active supporter of the College of Engineering and a charter member of the Industrial and Professional Advisory Council. He received the College’s Outstanding Engineering Alumni Award in 1967 and was named an Alumni Fellow by the Penn State Alumni Association in 1994. He is survived by his wife, Francesca, a daughter, Barbara J. Moore (SCI ’63), and a son, William R. Diefenderfer (ESci ’63).

Neil N. Diehl (CE ’53) died in a traffic accident on Jan. 3 in Nashville, TN. He was 74. Diehl’s career included 24 years with U.S. Steel, followed by four years as president of Ohio Barge Line, Inc., and Warrior and Gulf Navigation Co. He joined Nashville-based Ingram Barge Co. in 1984, serving as chairman and chief executive officer until 1995. His wife, Judith Kraft Diehl (HHD ’54) preceded him in death in 2002.

Jef Raskin (MS CompSc ’67) passed away Feb. 26 at his home in Pacifica, CA. He was 61. Known as the “father of the Macintosh,” Raskin joined Apple Computer in 1978, where he pitched the idea of developing a computer that was easy to use. In 1979, he became director of the Macintosh project, a position he held until he left Apple in 1982. The College of Engineering named Raskin an Outstanding Engineering Alumnus in 1999. He is survived by his wife of 23 years, Linda Blum, and their three children, Aza, Aviva, and Aenea.
Continuing and Distance Education

Distance learning opportunities
You can take Penn State Engineering courses without having to come to campus. The courses, taught to distant learners through a rich blend of media and technology, have the same quality, rigor, and expectations as on-campus courses. The following are currently offered:

Nuclear engineering, graduate-level courses
J. Brenizer, Jr.
The mechanical and nuclear engineering department delivers graduate-level, credit courses to students located remote from University Park. Courses are delivered through a variety of media, including interactive video conferencing, streaming video, and the Internet. For information about the program and the courses offered, go to www.engr.psu.edu/cde/ and follow the link to nuclear engineering.

Human Factors and Ergonomics Certificate
A. Freivalds
Beginning fall 2005, the industrial and manufacturing engineering department will offer the following series of five graduate-level courses leading to a certificate in human factors and ergonomics.

- Human/computer interface design
- Analytical methods for system safety
- Engineering of human work
- Engineering of cognitive work
- Sociotechnical systems

Individuals involved in the design and development of products for human use will find the program content immediately applicable to their job. For more information, contact the C&DE office at the address on the next page.

Conferences and short courses
The following programs are offered at University Park. Anyone with an interest in a subject area is welcome to register and attend.

Rotary wing technology
Aug. 15–19—University Park, PA
B. McCormick
This course presents a comprehensive introduction to rotor craft technology. Leading experts will cover aerodynamics, dynamics, stability and control, structural design, acoustics, and (new this year) propulsion and drive systems.

Essential concepts of bearing technology
Sep. 1–3—University Park, PA
Dr. T. Harris
Presented in conjunction with the American Bearing Manufacturers Association, this course is designed for engineers and others with a technical background, who have little history in bearings and who need to either adapt their technical training to bearings or would like to upgrade their technical knowledge. The curriculum includes both quantitative and conceptual materials. For details, go to www.abma-dc.org/education/

Underwater acoustics and signal processing
Oct. 10–14—University Park, PA
A. Atchley
This short course from the Applied Research Laboratory provides a broad but comprehensive introduction to many important topics in underwater acoustics and signal processing. The major goal is to give participants a practical understanding of fundamental concepts, along with an appreciation of current research and development activities. It serves as a foundation for more advanced study of current literature or for other specialized courses.

Annual transportation engineering and safety conference
Dec 7–9—University Park, PA
Presented in cooperation with PennDOT, the Mid-Atlantic Universities Transportation Center, LTAP, and the Federal Highway Administration, this Pennsylvania Transportation Institute conference is aimed at improving the skills of the transportation professional through training, workshops, and presentations by transportation experts. The forum is designed to foster discussion, debate, and networking so attendees can maximize their learning experience.

9th International Symposium on Heavy Vehicle Weights and Dimensions
June 18–22, 2006—University Park, PA
B. Kulakowski
Penn State will host this symposium in 2006 on behalf of the International Forum for Road Transport Technology. This symposium provides a platform for contributions from vehicle technology, vehicle-infrastructure interactions, safety, regulations, and policy. The symposium provides a forum for interactions between people who do not normally interact—vehicle dynamics and performance experts; pavement, bridge, and road specialists; and regulators of heavy vehicles. For more information, go to www.outreach.psu.edu/C&I/9ISHVWD.

For more information
Additional information about these and other engineering conferences can be found on the Web at: www.engr.psu.edu/cde
You may also contact Engineering Continuing and Distance Education directly at:
Phone: 814-865-7643
Fax: 814-865-3969
E-mail: TJR10@psu.edu
Engineering and Medicine

Engineering education and research are increasingly being drawn to address issues in medicine and health care with engineers working in close partnerships with health-care professionals and scientists.

This year, we graduated the first class of bioengineering students with roughly a third of these students entering industry, graduate school, and medical school, respectively. The class benefited from the extensive efforts of faculty to develop a curriculum founded on principles of both engineering and the life sciences.

Our graduation speaker this spring was Dr. Robert Langer, a chemical engineer who has made seminal contributions to engineering and science by developing innovative methods of drug delivery. Dr. Langer was conferred with an honorary degree, the first engineer to be so recognized by Penn State. His previous awards and honors include the Charles Stark Draper Prize from the National Academy of Engineering; the Lemelson-MIT Prize, the world’s largest single award for invention and innovation; and the John Fritz Medal, given previously to inventors such as Thomas Edison and Orville Wright. Dr. Langer’s message was especially appropriate: each of us should pursue our dreams into new fields and uncharted areas, as he has during his career.

A significant number of our faculty and students are conducting research to advance our understanding of medicine and medical treatment. These efforts vary widely and include studying the flow of the circulatory system to help create artificial organs such as the artificial heart; understanding cell migration and mobility; developing new, minimally invasive surgical tools and medical imaging techniques to aid in cancer treatment; and improving our understanding of the respiratory system and the nature of stomach disorders. Faculty are utilizing nanobiotechnology to develop improved diagnostic systems. They are also studying ways to improve health-care delivery by applying techniques used to improve quality and efficiency in manufacturing systems to hospital operations.

Making significant medical advances requires partnerships between our faculty and medical professionals. To encourage these partnerships, the College of Medicine and the College of Engineering have established the Grace Woodward Grant Program to support research undertaken jointly by faculty in the Colleges of Engineering and Medicine. This program is aimed specifically at developing new approaches and innovative techniques and devices that are at very early stages of investigation.

For past engineering graduates, the pillars of engineering have been based on mathematics, physics, and chemistry. For future engineers an additional pillar—biology—will also be important. The significant advances in our educational and research programs at Penn State in engineering and medicine will provide a solid foundation for the education of future generations of engineers and for significant advances in health care.
The 13th annual PSES Golf Classic will be held at Toftrees Resort and Conference Center in State College, PA, at 8:30 a.m. on Sep. 24.

The 2005 Golf Classic provides scholarship support for undergraduate students. The entry fee, which includes breakfast and lunch, is $100 per player.

For information and registration, click on “Golf Classic” at www.engr.psu.edu/AlumniFriends or contact Stefanie Tomlinson at stomlinson@engr.psu.edu or 814-865-9031.