Henry Foley, Walter L. Robb Chair and Head of Chemical Engineering, was named the University’s Associate Vice President for Research and Director of Strategic Initiatives. Foley will be responsible for providing overall leadership of the Animal Resource Program, Center for Space Research, Homeland Security Council, Marine Corps Research University, and the Worldwide University Network. He will also assist with the development of major new initiatives and work closely with state and federal agencies.

Stephen Fonash, holder of the Bayard D. Kunkle Chair in Engineering Science and director of the Penn State Center for Nanotechnology Education and Utilization, was named a Fellow of the Electrochemical Society. Fonash was cited for his pioneering contributions, leadership, and service to the fields of device and processing physics and nanofabrication manufacturing technology.

Randall German, Brush Chair Professor in Materials, director of the Center for Innovative Sintered Products, and professor in engineering science and mechanics, was awarded an honorary doctorate at the Universidad Carlos III de Madrid in Spain. German was given a hat, ring, white gloves, diploma, and medal to culminate the honor. Past honorary doctorate recipients include the president of Costa Rica, former Secretary General of the United Nations Boutros Boutros-Ghali, and an economics professor from the University of London.

Mary Jane Irwin, holder of the A. Robert Noll Chair in Engineering in the Department of Computer Science and Engineering, is the 2004 recipient of the Design Automation Conference’s Pistilli Women in EDA Achievement Award. The award recognizes an individual who has notably helped advance women in the electronic design automation (EDA) industry. In addition, she is a member of the Computer Research Association’s Committee on the Status of Women in Computing Research (CRA-W). CRA-W was given the 2004 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring by President George W. Bush in recognition of its “significant achievements in mentoring women across educational levels.”

Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics, was appointed a visiting professor at New Zealand’s University of Otago department of physics. He was also named a visiting professor at London’s Imperial College.

Gary Settles, professor of mechanical engineering and director of the Gas Dynamics Laboratory, is the winner of the American Society of Mechanical Engineers’ Freeman Scholar Award. Freeman Scholar Award recipients are chosen based on their knowledge and experience in fluids engineering and their review of a key topic they suggest receive future research. Settles’ winning proposal is titled “The Fluid Dynamics of Sniffing: Airborne Sampling in Nature, Medicine, and Homeland Security.”

Mirna Urquidi-Macdonald, professor of engineering science and mechanics, was named a Fellow of the American Society of Materials International. She was cited for her contributions to the modeling of batteries, corrosion and electrochemical phenomena, and for pioneering the application of artificial neural networks to materials phenomena.
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Correction

In the previous issue, two were not listed among those named students marshals for the Class of 2004. William Enck of Myerstown, PA, was the student marshal for computer engineering. Enck is attending graduate school. Eric Rotthoff of State College, PA, was the computer science student marshal. Rotthoff is pursuing a master’s degree in scientific computing. Nathan O’Connor of New Kensington, PA, was incorrectly listed as the computer engineering student marshal. He was the electrical engineering student marshal.

About the Cover

Closing the gender gap in the field of engineering remains a top priority for universities and businesses. Accomplishing that goal, however, is easier said than done. At Penn State, the College of Engineering continues cultivating an environment that successfully welcomes—and retains—women students and faculty.
The changing face of engineering at Penn State

Inside the design studio in 314 Hammond, conversation gives way to concentration as teams of first-year women engineering students focus on the task at hand: inventing a new product for Everything, Inc., a fictitious company looking to boost its sales. Participants in WEPO 2004, the College’s annual orientation session for women, the students offer tangible proof that the face of the engineering student body is changing at Penn State.

In 2003-04, 1,008 women were enrolled in the College of Engineering at the undergraduate level, and activities sponsored by the College’s award-winning Women in Engineering Program (WEP) help ensure that they are retained (see related story on page 8). In 2003, 205 women graduated from the College with baccalaureate degrees, making Penn State one of the top ten producers of women engineers in the country.

But there’s another, equally important area in which the face of engineering is changing at Penn State. In fall 2003, 40 of the College’s 280 tenured or tenure-track faculty members—14.3 percent—were women, up from 8.6 percent in fall 1997—a remarkable increase.

What accounts for the College’s success in recruiting women faculty? The answer, though many-faceted, boils down to one factor: outstanding leadership at a number of levels throughout the University and College.
Starting at the top

According to David Wormley, the Harold and Inge Marcus Dean in the College of Engineering, support from the University has played a key role in the College’s progress toward gender equity among its faculty.

“The environment at the University has been very positive,” he says. “The administration has been very supportive of our efforts by providing assistance to make our faculty offers competitive with other institutions and by creating a positive environment.”

Judith Todd, the P. B. Breneman Department Head Chair in Engineering Science and Mechanics, now starting her third year at Penn State, agrees.

“This is an issue that is supported by the leadership from the top down,” she states. “From the president, the provost, the Academic Leadership Council, the College of Engineering, right through to the department heads—we hear about this issue at least once a month.”

In addition, she says, the issue is on the agenda at virtually every meeting of the College’s Academic Council, a group that includes the dean, department heads, and other key leaders in the College. “In my experience, this is quite unusual. I would say we have a very proactive dean.”

The message, she adds, is well received by her colleagues and is making a huge difference in recruiting an outstanding, diverse faculty—men and women alike—to the College. “If you can bring a qualified candidate to the institution, there are matches in terms of cost sharing,” she explains, referring to the University’s help with start-up funding. “All of this is leading by example. The climate here is very positive for attracting and retaining new faculty.”

In addition, the University is increasingly trying to provide benefits such as child care and leave policies that help families when they give birth to or adopt children. All of these issues come together to create an environment that’s supportive—not just for women, but for all faculty.
Expanding the pool

One challenge the College continually faces as it strives to increase the number of women engineering faculty is the fact that far fewer women than men earn doctorate degrees in engineering each year, substantially limiting the pool of qualified female applicants. In 2001, the last year for which statistics are available, only 16.8 percent of engineering PhDs awarded nationwide were received by women.*

In response, the College has adopted an aggressive strategy to identify qualified women during the recruiting process. A key part of this strategy is to search broadly in an effort to get a large, diverse pool of applicants.

Each department has a search committee whose members prepare and place ads in professional publications when there is an open faculty position among their ranks. Committee members also call their colleagues at other universities to find out who might be available and attend conferences to identify potential applicants. They then encourage qualified people to apply.

“IT’s a very active process,” Wormley says. “Each of our departments has worked very hard to attract strong women faculty as candidates when they’ve had an open position, and this has been very successful. By searching broadly, we’ve not only increased the number of women faculty in the College, we’ve increased the number of underrepresented minority faculty as well.”

Retention is key

Recruiting women engineering faculty to Penn State is an important first step toward achieving gender equity in the College. Making sure women want to stay at Penn State, however, is equally—if not more—important. That’s where the Council of Senior Faculty Women comes in.

“I think one of the major reasons why we’ve had a significant increase in women faculty in the College is because we’ve had particularly strong leadership by our senior women,” says Wormley. “They’ve worked very hard to provide a positive and supportive environment so that as we’ve added more women faculty, they’ve had good experiences in the College.

“We’ve had particularly strong leadership by our senior women. They’ve worked very hard to provide a positive and supportive environment.”

This is probably the best testimony we can have when we’re trying to recruit new women faculty.”

The Council of Senior Faculty Women was established as a result of the College’s participation in the Leveraging Experience to Accelerate Progress: Moving Towards Gender Equity in Engineering (LEAP) Conference, held in January 2003 at the National Academy of Engineering in Washington, DC. LEAP brought together teams of engineering deans, faculty, and staff from 26 universities to learn about initiatives in gender equity and formulate a plan of action to implement at their respective schools. In addition to Wormley, the Penn State contingency included Mary Jane Irwin, the A. Robert Noll Chair of Engineering and professor of computer science and engineering, Barbara Bogue, WEP director, and Todd. The three women have been the driving force behind the council’s creation and initiatives.

“The council had been in the making for a couple of years,” recalls Irwin, explaining that it grew out of concern over the possible loss of junior women faculty. “We want to avoid that,” she says. “We work too hard to recruit them here.”

The goal of the council is to create a positive and supportive environment for junior women engineering faculty and

provide assistance to help them advance in their careers. Toward that end, Irwin and Bogue have run two separate promotion and tenure workshops—one for women at the assistant professor level and another for those in the associate professor ranks.

Although the college publishes promotion and tenure guidelines for faculty seeking to advance to the associate level, Irwin believes it is important to discuss the unwritten rules. “We talk about success strategies and things women faculty can do, both to build their research program and build their external visibility.” Council members also volunteer to review the junior women’s dossiers and give them feedback on what they need to do to reach the associate level.

According to Irwin and Todd, however, the need for guidance is greatest when it comes to women advancing from associate to full professor.

“Essentially there are no guidelines,” says Irwin. “The rules and what you have to do to be considered for promotion to full professor are much less clear. Men hear this automatically from their peers. We need to make sure that women understand these unwritten rules as well.”

Todd mentions another pitfall, “Often, this is when women start their families. It’s very easy to get in a rut and not establish the publication record and full credentials you need to get to full professor. So we’re placing a lot of emphasis on ways to work smarter, and we’re creating awareness of the things that will get you promoted.”
Women in Engineering Program honored by President Bush

Penn State’s Women in Engineering Program (WEP) was among eight institutional programs honored in May by President George W. Bush with the 2003 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM).

WEP director Barbara Bogue accepted the award, which included a $10,000 grant to provide for continued mentoring work, in ceremonies at the Eisenhower Executive Office Building in Washington, DC.

According to the National Science Foundation, which administers the PAESMEM program on behalf of the White House, the institutional awards “recognize organizations that have developed mentoring approaches that encourage improved achievement, keeping young people in the ‘pipeline’ of science, engineering, and mathematics education and creating peer mentoring programs.”

Robert N. Pangborn, associate dean for engineering undergraduate studies, nominated WEP for the award. He says, “WEP and its director, Barbara Bogue, have been remarkably effective in demonstrating the value that can accrue at the department and college levels through support or adoption of its approaches and initiatives.”

Since Bogue became WEP director in 1996, retention of women students at Penn State has made steady gains. For example, in 1997, the year of the first Women in Engineering Program Orientation (WEPO) cohort, women were retained at an equal rate with men in the College of Engineering for the first time. Women of color participating in WEPO are also retained at a higher rate.

Mentoring and networking are the bases of all Penn State WEP activities. Upper-level engineering women and alumnae are among the first engineering contacts for women students entering their first year. These first-year women then become the first contacts with engineering for the 350 girls served annually through WEP activities such as Girl Scout Saturdays and other pre-college offerings for both boys and girls.

Senior women students welcome junior women and both are mentored by an active group of women faculty. In total, during a typical year, approximately 600 women and girls are reached through WEP mentoring activities.

WEP serves all women in the College of Engineering with an emphasis on undergraduates. However, many WEP programs are also offered to and attended by men. Approximately 20 percent of the women typically enrolled in WEP classes are women of color and WEPO averages 7 to 9 percent minority participation, going as high as 25 percent in some years.

WEP has also been recognized by the Women in Engineering Program and Advocates Networks (WEPAN) Women in Engineering Program Award and by Penn State’s Undergraduate Admissions Outstanding Recruitment and Retention Program Award. In August 2002, Essence magazine recognized WEP as one of the top 50 programs in the country that empowers girls.

In addition to the promotion and tenure workshops, the council sponsors and attends monthly luncheons for women engineering graduate students and holds other educational and social events for women faculty in the College. Last year, for example, the council sponsored a bus trip to the National Science Foundation and the National Institutes of Health in Washington, DC. Participants met with program directors in their respective fields of study, learned about funding opportunities, and discussed what is needed to get proposals funded.

Above all, the council strives to create a sense of community among the women engineering faculty at Penn State.

Acknowledging the important role the council has played in improving gender equity among the College’s faculty, Wormley says, “The senior women faculty group is a solid core that networks with one another and helps one another in many areas. There’s such a cohesive and supportive group of women faculty here. I believe that’s one of our strongest attractions for other women faculty to come and be part of our College.”

—Jane Harris

—Barbara Hale
To maximize a plane’s efficiency over a broader range of flight speeds, engineers have developed a concept for morphing airplane wings that change shape like a bird’s and are covered with a segmented outer skin like the scales of a fish.

George Lesieutre, professor and head of aerospace engineering, who leads the project, says, “Airplanes today are a design compromise. They have a fixed-wing structure that is not ideal for every part of a typical flight. Being able to change the shape of the wings to reduce drag and power, which vary with flight speed, could optimize fuel consumption so that commercial planes could fly more efficiently.”

Morphing wings can also be used for military defense and homeland security when applied to unmanned surveillance planes that need to fly quickly to a distant point, loiter at slow speed for a period of time, and then return, Lesieutre explains. Flying efficiently at high speed requires long, narrow wings. The morphing wings designed by the Penn State team can change both wing area and cross-section shape to accommodate both slow and fast flight requirements.

The concept is detailed in the paper, “Tendon Actuated Compliant Cellular Truss for Morphing Aircraft Structures.” Its authors are Lesieutre; Mary Frecker, associate professor of mechanical engineering; Deepak Ramrakhyani, doctoral candidate in aerospace engineering; and Smita Bharti, doctoral candidate in mechanical engineering.

The essential features of the Penn State concept are a small-scale, efficient compliant cellular truss structure, highly distributed tendon actuation, and a segmented skin. The cellular truss structure is the skeleton of the wing. The skeleton is formed of repeating diamond-shaped units made from straight metal members connected at the angles with bend-
able or “compliant” shape memory alloys. Tendons in each unit, like the ropes that shape a tent, can pull the units into new configurations that will spring back, thanks to the shape of memory alloys, when the tendon tension is released.

Since the underlying structure can undergo radical shape change, the overlaying skin of the wing must be able to change with it. Lesieutre says a concept that he thinks holds great promise is a segmented skin composed of overlapping plates, like the scales of a fish. He notes that conveyors on the baggage carousel in airports are composed of a similar pattern of plates.

So far, the design team has built a tabletop model of the compliant cellular truss structure and a computer graphic model of the wing structure.

The project is supported by grants from NASA and the Defense Advanced Research Projects Agency.

"Being able to change the shape of the wings could optimize fuel consumption so that commercial planes could fly more efficiently."

—Barbara Hale

Dr. Lesieutre can be reached at g-lesieutre@psu.edu or at 814-863-0103.
Star light, star bright

Engineers say today’s methods can’t precisely pinpoint stars’ locations

Whether viewed dimly through the haze and lights of a city or in all their glory in a pristine wilderness, the stars that surround the Earth are magnificent, and one day Earthlings will travel to some of the new planets that astronomers are locating. However, the stars we see are not necessarily where we think they are, according to an international research team.

“We know that the light from distant stars takes a very long time to reach the Earth,” said Akhlesh Lakhtakia, distinguished professor of engineering science and mechanics at Penn State. “But, taking into account the distance a star will have moved while that light travels, we still may not be able to accurately locate the star.”

Negative-phase velocity media or materials with negative refractive index may be responsible for this locational uncertainty. Recently, materials researchers at the University of California, San Diego, working with micro- and nano-materials, developed a metamaterial that had a negative refractive index for microwaves, proving that negative phase materials could exist at least in the microwave part of the electromagnetic spectrum. Their requirements for this material were that both the relative permittivity, a measure of the charge separation in a material, and the relative permeability, a measure of how electrons loop in materials, of a substance must be less than zero.
While the implications for negative phase velocity media in the nano world are the creation of a perfect lens, a lens with no distortion with applications for optical transmission devices, CDs, DVDs, microwave systems, etc., in the universe at large, these media can disguise the location of a star, according to the researchers.

A material with negative index of refraction transmits light or other wave energy differently than one with positive index of refraction. In all natural materials, when an energy beam—light, radar or microwave—passes through water or glass or some other material, the beam is displaced in the same direction. The amount of displacement depends upon how much the material slows the speed of the beam. In negative phase velocity media, the displacement is in the opposite direction.

Lakhtakia and Tom G. Mackay, lecturer in mathematics at the University of Edinburgh, decided to look at why the permittivity and permeability had to be less than zero. They found that one or both permeability and permittivity could be less than zero and negative phase velocity would occur. They then found that both could be greater than zero and a negative index of refraction would occur but only when special relativity came into play.

The researchers looked at transmission through space, where high velocities are common.

“First I did the derivations with the observer moving and the energy source stationary,” said Lakhtakia. “Then Mackay did the derivations with the observer stationary and the light source moving.”

What they found was that it depends on the state of the observer whether any particular media at any time has negative or positive index of refraction. The relative velocity of the observer changes the index of any material.

“Light coming off a stellar object passes through many different regions of space filled with different media and is affected by different gravitational fields,” said Lakhtakia. “When we finally see it, we cannot really know where it originated.”

While this may be of no consequence today, Lakhtakia believes it has important implications for when space travel is common. Because this is a direction-dependent effect, it will change the telemetry of objects and spacecraft.

“The business of space navigation and interpreting star maps could be a lot more complicated than we now think it is,” said Lakhtakia. “Imagine mining of extrasolar asteroids. We might not want to send humans to do the mining, but robots would have to know where the asteroid is and where on its surface to mine when it left our solar system.”

Calculations would need to be made from Earth on an asteroid that might not be where we visually see it. The effects of negative-phase velocity media would need to be taken into consideration.

Another problem would be navigating from somewhere far away from the Earth in a spaceship using information gathered from the Earth. Depending on the velocity of the spacecraft and the object aimed for, negative-phase velocity media between the spacecraft and the destination also would need to be considered.

—A’ndrea Messer

Dr. Lakhtakia can be reached at akhlesh@psu.edu or at 814-863-4319.
Distant mountains influence river levels 50 years later

Rainfall in the mountains can have a heavy influence on river levels, but the effects are seen 50 years after the rain has fallen, according to a civil engineer.

“The general thinking has always been that since it is 20 kilometers from the mountain to the river, it does not have an impact,” says Christopher Duffy, professor of civil engineering. “We are asking what the role of mountain recharge is and how it affects river conditions.”

In the Llano de Sandia in New Mexico, the Los Finos Mountains are about 9,000 feet while the basin where the river runs is at about 4,800 feet. An elevation of about a mile separates the mountains from the river. Precipitation in the mountains does not simply run off down the slope, nor does it all seep into the mountain. Part of the water does run off the slope, but the rest goes deep into the fractured rock beneath the mountains.

“The time between rain on the mountain and recharge of the riverine water table is about 50 years,” says Duffy. “The seven-year, 1950s drought in the area is what is now affecting the Rio Grande and the water table.”

Duffy is using a dynamic computer model to investigate ground water in central New Mexico. The model is not meant to predict but to be conceptual, helping to shed light on the interaction of precipitation, the mountains, the river, and the river environment.

Computer approach tailors drug doses

A computer-aided approach—based on software that learns—promises to provide a new tool that will help doctors tailor the dosage of abciximab, a medicine frequently used before angioplasty to lessen the chance of heart attack.

Mirna Urquidi-Macdonald, professor of engineering science and mechanics, says, “While we tried our approach first with abciximab, it may be applicable to other medicines that have a narrow therapeutical range between under dosing and overdosing.”

The new approach is based on neural network software that can “learn” when given a large body of data on which to train. Using a fast back-propagation neural network and data from eight patients undergoing coronary angioplasty and 30 healthy patients, the research team trained the software to predict the best dose strategy for an individual patient based on 17 characteristics.

The characteristics included race, sex, age, weight, stable angina, previous myocardial infarction, diabetes, hypertension, hypercholesterolemia, smoking, prior coronary angioplasty, coronary artery bypass graft, statins, beta blocker, nitrates, calcium antagonists, and diuretics.

Architectural engineering’s Geschwindner retires

After more than 35 years at Penn State, Louis Geschwindner retired as a professor emeritus of architectural engineering.

Geschwindner served as a University marshal for 18 years and helped design the official University regalia for doctoral recipients. He also was the chair of the faculty senate.

Geschwindner’s other notable accomplishments include writing the original proposal for an architectural engineering doctoral program and spearheading the creation of the exchange program with the University of Leeds in England. He also developed a special website in the aftermath of the Sep. 11 attacks that serves as an archive of articles, links, literature, and photos of the World Trade Center from the 1960s and 1970s.
Penn State among “25 Hottest”

The University was among one of America’s 25 hottest schools in the 2005 edition of the Kaplan/Newsweek College Guide, which dubbed Penn State “hottest for entrepreneurs.”

The publication cited the College’s entrepreneurship program, which is administered in partnership with the Smeal College of Business, for its efforts to meld technology and business.

According to Kaplan/Newsweek, inclusion on the list was based on admissions trends and extensive interviews with a broad array of educators, admissions officers, students, and other longtime observers of the admissions process.

Agricultural and biological engineering’s Manbeck retires

Harvey Manbeck, distinguished professor of agricultural engineering, retired after more than 24 years of service at Penn State.

Manbeck joined the faculty in 1980 as professor of agricultural engineering. In 1996 he was named distinguished professor of agricultural engineering. Manbeck served as interim department head from 1996 to 1998.

His main research interests included wood engineering, wood bridges, post-frame buildings, environment control systems for animal housing, and structural loads in bulk solid storages.
Engineers have designed ten concrete mixtures containing industrial by-products that make it possible for concrete bridge decks to last three times longer or 75 to 100 years. Study leader Paul Tikalsky, associate professor of civil and environmental engineering, says, “The exact life expectancy of bridges constructed with these mixtures will not be known for many years. However, in full scale trials, each of the mixtures optimizes the ingredients to produce concrete with substantially lower permeability, higher electrical resistivity, and lower cracking potential than the standard bridge deck concrete used in Pennsylvania for the past 30 years.” He adds, “The cost of bridges constructed with these mixtures is nearly identical to the previous generation of bridges. With life expectancies at least three times as long, the life-cycle cost savings will be more than $35 million annually in Pennsylvania with the added benefit of using environmentally friendly materials to contribute to a more substantial future for the highway infrastructure.”
Chemical engineering faculty member establishes professorship

Friedrich Helfferich, professor emeritus of chemical engineering, has committed $500,000 to endow a new professorship in chemical engineering.

The endowment will be named the “Friedrich G. Helfferich Professorship in Chemical Engineering” and will be used to support a faculty member’s efforts in teaching, research, and service.

Helfferich has established another endowment at Penn State, the Hana M. Helfferich Scholarship in Chemical Engineering, in memory of his wife. Helfferich joined the Penn State faculty in 1980 and retired in 1990. He continues to teach and conduct research on campus.

Co-op, internship program continues growth

Contrary to national trends and predictions, the College’s Cooperative Education and Internship Program experienced solid growth during the 2003-04 academic year.

Last year, a survey conducted by the National Association of Colleges and Employers found that employers expected to cut their cooperative education hires by 6.8 percent and reduce their internship hires by 1.8 percent in 2003-04. Despite this, the Engineering Co-op and Internship Program achieved the third highest student placement rate in its 19-year history.

Wattmuncher takes second at final FutureTruck contest

Penn State’s Wattmuncher, a hybrid electric 2002 model Ford Explorer re-engineered by students of the Pennsylvania Transportation Institute, placed second overall in the final FutureTruck competition at Ford’s Michigan Proving Ground and Allen Park Test Laboratory in Detroit.

In addition, the team won four awards, including the Best Workmanship Award, the Dr. Donald Streit Sportsmanship Award, the Best Vehicle Design Inspection Award, and the National Science Foundation Outstanding Faculty Advisor Award.

The Penn State team will compete in the next hybrid electric vehicle competition, called Challenge X. The contest is sponsored by the Department of Energy and General Motors.
Ethics with a sci-fi twist

Andrew Lau’s ethics of ‘Star Trek’ class fuses philosophers such as Aristotle and Plato with modern science fiction.

When people think about the Star Trek television series, they might recall the cheesy special effects, William Shatner’s hammy performances, or the ’60s-style take on futuristic fashions. So it might come as a surprise that a course in the College is using the series as a basis to teach ethics to students.

Andrew Lau, associate professor of engineering, says he was seeking to design an ethics course that was different from the traditional way ethics is taught.

“When the best education is when the students don’t know they’re learning,” he explains. “Star Trek was more subtle—when one looks at it through ethics, there are a lot of lessons in morality and in what’s right and what’s wrong.”

Though the show was about a spaceship exploring the galaxy, series creator Gene Roddenberry and his writers often used the Enterprise’s adventures as a guise to explore many of the issues confronting society in the 1960s.

Lau, who grew up watching the show, says he was seeking to design an ethics course that was different from the traditional way ethics is taught.

“Sometimes the best education is when the students don’t know they’re learning,” he explains. “Star Trek was more subtle—when one looks at it through ethics, there are a lot of lessons in morality and what’s right and what’s wrong.”

Not long after, the engineering professor developed the first-year seminar course, “The Ethics of Star Trek.”

Students in the course watch an episode every other week, which coincides with the course’s required reading of The Ethics of Star Trek, by Judith Barad and Ed Robertson.

Lau says the subsequent discussions on the episodes are tied into the teachings of philosophers such as Aristotle and Plato, among others. For example, students watched an episode titled, “The Enemy Within,” where a transporter accident splits Captain Kirk into two identical Kirks—a “good” Kirk, who has all of the intellect, and a “bad” Kirk, who has all of the emotions.

continued on page 19
Nearly a century after the Wright Brothers’ historic first flight, a duo embarked on their own quest to soar among the clouds.

David Shelton, an aerospace engineering senior, and Andrew Balk, a physics junior, conceived of an idea to design and build their own glider. In summer 2003, the two quietly cobbled together the money and materials needed to construct their brainchild. Over a period of three weeks, Shelton and Balk pulled together aluminum tubes, foam, window insulation plastic, and other materials to make the SB-1. The SB-1 was the first aircraft of the two’s fledgling flying organization, SB Aircraft.

“We didn’t tell anyone about it until we told the head of the department we finished it,” Balk recalls.

The SB-1’s inaugural flight took place at nearby Mifflin County Airport.

“We just kept it on the taxiway and the plane never left the airport,” Balk says. Towed by a van, the SB-1 flew about a hundred feet high before it landed. Shelton and Balk continued flying the SB-1 for the rest of the summer.

Costing approximately $500, the SB-1’s construction used a simple design. “We built it nicer than we had planned,” Balk says. “The fuselage is just a wooden truss structure, like old airplanes from the 1930s.”

The story doesn’t end there, however. With the proven success of their SB-1 design, Shelton and Balk set their sights on a more ambitious plan.

“After we put 70 flights on it, we decided to do a bigger, more expensive airplane and get other people involved,” Shelton explains.

Shelton and Balk envisioned creating a light sport aircraft that could carry two people. Unlike the effort to build the SB-1, the realization of the SB-2 required extensive research and planning.

SB-2’s winding road included research, studies, as well as multiple stages of design and construction. To help in the effort, the two got more students involved.

“We recruited a four-student team to create a 1/3-scale model of the SB-2,” Shelton says.

Balk adds, “We wanted people who are dedicated.”

In addition to the students, Shelton and Balk received equipment loans from the aerospace engineering department and have three faculty advisors. The team has moved to an off-campus workshop and has almost completed one wing.
The SB-2 is also becoming more than just an extracurricular activity for the students. The students involved are receiving two credits of independent study for their efforts.

With some luck and sponsorship help, Balk says he’s hopeful of having the SB-2 fly in the spring.

The two are also taking the SB-1 commercial as an airframe kit. “We are developing new manufacturing methods which allow us to specialize in personalized aircraft kits,” Shelton says. “Customers will choose from an extensive list of options that include custom cockpit width, turtle deck shape, and high or low-wing configuration.”

Always looking ahead, he adds that plans are afoot for the SB-3.

“The details of the SB-3 are currently secret,” he says, “But all I can say is that we will test fly an unusual manned aircraft in the next four weeks!”

—Curtis Chan

More information on the SB-1 and SB-2 can be found online at www.SBAircraft.com

Ethics continued from page 17

“The good Kirk starts to lose his decision-making ability when he gets split from his impulsive self,” he explains. “Aristotle’s idea was that the will and intellect controlled a person’s animal instincts.”

The course covers concepts such as cultural relativism, religion, and power. “We talk about ideas such as, ‘Do the ends justify the means?’ and the notion of the show’s ‘Prime Directive,’ where the crew is forbidden to interfere in the natural evolution of an alien species. Is this hands-off policy good or bad?” Lau says.

First-year student Natalya Lakhtakia says she enjoyed the class, though she readily admits she’s not much of a “Trek” fan. “The show definitely presents ethical dilemmas well, and it was good to see them, rather than just discuss them,” she says.

Lau says the class also focuses on engineering-related ethical dilemmas. In one such case study, a fictional student working for a consulting environmental engineering firm is asked to sample some drums for a client. The student believes the drums contain hazardous waste. By law, if the contents are toxic, the drums must be transported and disposed of according to strict guidelines and federal and state authorities must be notified. When the student informs his supervisor, he’s told to report that samples have been taken and not to conduct the analysis. The supervisor then proposes to tell the client where the drums are located, that they contain questionable material, and suggest they be removed.

“It’s situations like this that our graduates must be prepared for,” Lau says. “The idea of tying engineering education in with science fiction is a very neat segue.”

—Curtis Chan
NSF grant gives students summer research opportunities

Summertime for a lot of students means relaxing at the beach or spending time with friends and family. For fourteen students visiting the electrical engineering department, this summer was spent doing research as part of a National Science Foundation (NSF) sponsored Research Experience for Undergraduates (REU).

The nine-week REU program gave the students an opportunity to develop their interests in graduate studies and future research in electrical engineering areas.

To be eligible, students must have completed one or more years of academic training in electrical engineering, physics, or related engineering or science majors. More than 229 students from across the country applied for the program.

“It was nice to meet electrical engineering majors from different schools,” noted Kevin Lai Lin, a student from the University of California, Berkeley.

Travel expenses, housing, and a stipend were provided by the NSF.

The program, which included weekly field trips to industry and guest speakers every Tuesday, was ideal for students considering graduate school. Himani Suhag, a student from Rensselaer Polytechnic Institute and one of only two females in the program, explained, “I would definitely recommend a program like this to any student who wants to go to grad school. The research is fascinating! The guest speakers came in and gave us the dos and don’ts of grad school.”

Three Penn State students, Andrew Fontanella (EE ’05), John McGlade (EE ’05), and Tyler Sullivan (EE ’05, CompEng ’05) also participated. Funding for these students came from the professors with which the students worked.

Each student had a faculty advisor and a graduate student to oversee their research.

Research projects covered many areas of interest, from Sullivan’s “Steady-state model for the calculation of the electric field of a sprite” to Fontanella’s “Modeling defraction patterns from periodic nanostructures using rigorous coupled wave analysis” to Suhag’s work on a mathematical model for airports that would detect contraband—specifically explosives in sealed containers—and possibly replace the x-ray machines of today since they can’t detect what’s inside sealed containers.

Kenneth Jenkins, professor and head of electrical engineering, and Ruyan Guo, associate professor of electrical engineering, co-chaired this year’s program.

A mini-symposium was held July 29 for participants to present their work. Student research papers were compiled into an REU annual research report.

Fontanella and McGlade both agreed that writing the paper was their favorite part of their projects. Said McGlade, “Writing puts everything in an orderly manner and explains what you accomplished over the nine weeks.”

—Stefanie Tomlinson
As we near the end of the calendar year, I am once again reminded of how quickly time flies.

In my first column as PSES president, I talked about my son’s decision to attend Penn State. Next year will mark Kyle’s fourth year as a graduate (ChE ‘01) of Penn State. My oldest daughter, Kristen, graduated (BUS ‘03) from Penn State Erie more than a year ago. This fall, I accompanied my youngest daughter to campus to explore the possibility of her attending Penn State.

These milestones have prompted me to wonder how many Penn State “families” there are among our readers. I am interested in hearing from those of you whose parents, spouses, daughters and/or sons are graduates from the University in any discipline. Send your Penn State connections to Cindy Jones (cjjdo@engr.psu.edu) and she will forward them to me.

Although we are beginning the “quiet” winter season on campus, PSES will continue to be busy participating in several College-wide activities. Some members will be attending the College’s Open House for prospective students and their families on Saturday, Feb. 26, in the Hintz Family Alumni Center.

Our purpose at this event is to assure parents that there are job opportunities for successful engineering students after graduation. If you are planning to attend the Open House, please look for us in the Alumni Center. There will be a PSES banner to identify members.

In February and March, the Student Recruitment Committee and other volunteers will make phone calls to prospective engineering students still undecided about their college choice for the 2005-2006 academic year. We will be proud to tell people how much we value our Penn State education. Also, board members will review faculty nominations for the College’s awards for teaching, advising, research, and staff. The recipients of these awards will be recognized during a special ceremony in March, in conjunction with the spring PSES meeting. In 1994, PSES established an endowment to recognize excellence in teaching, advising, and research in the College.

Also in March, a PSES committee will select a senior student as the outstanding service awardee for 2005. This award recognizes exemplary volunteer service to the University, state of Pennsylvania, and national volunteer organizations. It is always amazing and encouraging to learn about students who not only excel in the classroom, but also take significant time to help others in need.

I am very pleased to welcome three new board members who will begin their terms of office at the March meeting: Welcome to Riley Murray (IE ’75, MS ’76), Diane Perry (IE ’92), and Karen Sweeney (AE ’80).

I look forward to hearing from our readers who have Penn State families and hope to meet some of you at the College’s Open House. If any of you are interested in helping with one of the activities mentioned above, or want additional information about PSES, please get in touch.
1960s

Fred Hauptman (ChE ’65) retired from his position as an administrative engineer with the Philadelphia Department of Public Health after 39 years of service. During his tenure with the department, Hauptman was responsible for source testing, air monitoring, and laboratory management. He also held offsite project manager positions for various studies, including the Philadelphia Metropolitan Aerosol Study conducted by the Harvard School of Public Health, the NARST-NE Ozone and Particulate Study conducted by Penn State, and the Terrorist Bio-Watch program conducted by the U.S. Department of Homeland Security. Hauptman and his wife, Margaret, reside in Philadelphia and Cape May, NJ.

Tom Roell (EE ’69) was appointed president of Parsons Corporation’s Infrastructure & Technology Group (PI&T), which provides engineering and management services in the chemical demilitarization, environmental resource management, construction and fabrication, defense and security, and international sectors. In his new position, Roell will be responsible for PI&T’s worldwide operations, including project execution, business development, state-of-the-art technical capabilities, and multi-discipline resources. He is based in Parsons’ corporate headquarters in Pasadena, CA.

John Samuels (IE MS ’68; PhD ’72) delivered the commencement address and received an honorary doctorate of engineering degree at Kettering University’s graduation ceremony on June 19 in Flint, MI. Samuels resides in Virginia Beach, VA, where he is senior vice president of operations, planning, and support at Norfolk Southern Railroad.

David Smith (EE ’63) received the Institute of Electrical and Electronics Engineers’ 2004 Award for Excellence in Power Distribution Engineering in recognition of his outstanding contributions to the field of distribution technology. Currently employed as an executive consultant with Shaw Power Technologies, Inc., Smith spent 25 years with Westinghouse Electric Corporation in a variety of engineering positions.

1980s

Rick Klingensmith (ESM ’82) was promoted to president of PPL Global in Allentown, PA. Formerly, Klingensmith served as vice president of finance with responsibility for managing PPL Global’s portfolio of international businesses. In his new position, he will focus on the operation of the company’s international electricity delivery systems in England, Wales, Chile, Bolivia, and El Salvador.

John Mutsavage (EE ’88) married Kelly Bogda on May 30. The couple lives in Braddock Hills, PA, with his daughter, Lauren, their dog, Mugwai, and their cat, Dewey. Mutsavage works for Westinghouse Electric Corporation as a process control engineer in the nuclear industry.

Unmesh Padval (ChE MS ’82) was named executive vice president of consumer products at LSI Logic Corporation, a leading designer and manufacturer of consumer, communications, and storage semiconductors. LSI Logic is headquartered in Milpitas, CA.

2000s

Daniel Cell (EE ’01) and Dorothy Morriah Davis (EE ’01) were married on Nov. 1, 2003. They make their home in Leonardtown, MD.

Jeff Coffey (ChE ’02) will wed Denise Nugent on Apr. 30, 2005, in Princeton, NJ. Coffey is employed by Environmental Resources Management in Exton, PA.
Susan Fullerton (ChE ‘02) is the recipient of a National Science Foundation Graduate Research Fellowship, which offers recognition and three years of support for research-based doctoral study. Fullerton is pursuing a Ph.D. in chemical engineering at Penn State.

Jim Kolmus (ME ’00) and Amber Kolmus (LB ’02) announce the birth of their first child, Ethan James, on May 4. The Kolmus family lives in Duncan, SC, where Jim works for Hayssen Packaging Technologies as a mechanical engineer.

Thanhvu Nguyen (CMPSC ’03) is pursuing a master’s degree in computer science at Penn State Harrisburg.

Andy Schlosser (ME ’01) married Alyssa Karakos (EDU ’02) on Apr. 24. The newlyweds live in North Ridgeville, OH, a suburb of Cleveland. Andy is a mechanical engineer at the Ford Motor Company Ohio Assembly Plant.

Jennifer Wingard (CMPSC ’01) and Jonathan Lucier (BUS ’01) were married on Aug. 23, 2003. Jennifer was recently promoted to senior data manager in the health evaluation sciences department at Penn State Milton S. Hershey Medical Center. The couple resides in Elizabethtown, PA.

IN MEMORIUM

Martin Dougherty (AE ’72) died Aug. 7 in an automobile accident in Calabash, NC, at the age of 54. A resident of Forty Fort, PA, Dougherty was a founding partner and president of the Architecture & Engineering Group, Inc., in Wilkes-Barre and was an active member of the Penn State Club of Wyoming Valley. He is survived by his wife of 33 years, Florence Gulick Dougherty, and their four children: Jonathan Dougherty (AE ’99), David Dougherty (SCI ’01), Jennifer Dougherty (BUS ’03), and Sarah Dougherty.

Boris Osojnak (ME ’44) passed away Feb. 21 at his home in Bountiful, UT. He was 81. A veteran of World War II, Osojnak enjoyed a long and fulfilling career as vice president of AeroTech Manufacturing in Salt Lake City. His wife, Margaret Osojnak, survives, along with four sons, two daughters, ten grandchildren, and five great-grandchildren.

Alumna recognized for her work in cooperative education

Engineering alumna Anita Todd (ME ’89) is the 2004 recipient of the Dean Herman Schneider Award. This prestigious award, bestowed by the Cooperative Education and Internship Association, recognizes Todd for her outstanding contributions to the advancement of the philosophy and practice of cooperative education.

Todd is the former director of Penn State’s Engineering Cooperative Education and Internship Program, a position she held from 1997 through 2002. During her tenure, she made many significant contributions to the program, including the resurrection of Penn State’s chapter of Kappa Theta Epsilon, the engineering co-op honor society; the ongoing development of the Fall Career Fair, now one of the largest campus career fairs in the country; and the inclusion of engineering students from all Penn State locations in the program. She served on the advisory board for the Penn State Women in Engineering Program and was active in the Pennsylvania Association of Colleges and Employers.

Currently, Todd is an assistant professor in the Division of Professional Practice at the University of Cincinnati, where she serves as the faculty co-op coordinator for electrical and biomedical engineering. She and her husband, Doug, live in Cincinnati with their two sons.

Feb. 26
College Open House for parents and students

Feb. 28-Mar. 2
Industrial and Professional Advisory Council

Mar. 7-11
Spring break

Mar. 18
PSES board and committee meetings

Apr. 8
Penn State Alumni Association Young Alumni Awards

Apr. 18
Outstanding Engineering Alumni Awards

Fall 2004 23
Penn State has named William E. and Wyllis Leonhard the 2004 Philanthropists of the Year in recognition of their many years of exceptional generosity and philanthropic leadership in support of the University. William Leonhard is a 1936 graduate of Penn State in electrical engineering and retired chair and chief executive officer of the Parsons Corp., one of the nation’s largest engineering and construction firms.

“Bill and Wyllis have directed their philanthropy to initiatives that are especially important to the economic and intellectual well being of our nation,” said University President Graham Spanier. “In particular, they have revitalized engineering education at this university by supporting programs that improve the quality and expand the creativity of engineering, thereby attracting more young people to enter this profession.

“Penn State has built on an already strong foundation to emerge as one of the nation’s most innovative centers for engineering education. This would not have been possible without the Leonhards’ vision and commitment. We are grateful for their involvement and proud to have their friendship.”

The Leonhards have established six major endowments at Penn State over the past 20 years. These include the Leonhard Center for the Enhancement of Engineering Education, the William and Wyllis Leonhard Honors Program that features merit-based scholarships for engineering undergraduates, an endowed faculty chair and a professorship in engineering

named in William’s honor, the Richard W. Leonhard Scholarship in Aerospace Engineering named in honor of their son, and the Jeanne Leonhard Endowment in Education named in honor of their daughter. Richard and Jeanne are Penn State alumni.

William Leonhard, a Middletown native, joined the U.S. Army Corps of Engineers soon after graduating from Penn State. He served worldwide in the military. While stationed in the Panama Canal Zone in 1940, he met and married Wyllis, who was born in the zone but traces her family roots to Nebraska. He transferred to the U.S. Air Force in 1950 and retired in 1964 as a brigadier general. He then began a civilian career with the Pasadena, Calif.-based Parsons Corp., retiring in 1990.

During their 64 years of marriage, the Leonhards have moved at least 38 times. During these years, Wyllis kept their home intact and helped to raise their three children, while finding time to serve as a community volunteer. The Leonhards now reside in Hershey.

In 1982 William Leonhard was elected to the National Academy of Engineering. That same year, Penn State named him a Distinguished Alumnus, the highest honor it can bestow on one of its graduates. He has also served in various leadership capacities as an advisor to the Leonhard Center and various Penn State fund-raising initiatives.

In 1993, Penn State named the Leonhard Building, one of its newest engineering facilities at the University Park campus, in appreciation of William’s many contributions to the professions of engineering and engineering education.

The Philanthropist of the Year award originated in 2002 to recognize outstanding generosity and philanthropic leadership that benefits the Penn State community.
Gehman named distinguished alum

Harold Gehman, a 1965 industrial engineering graduate, was one of eight named by Penn State as a Distinguished Alumnus.

Gehman is the former commander-in-chief of the U.S. Joint Forces Command and former NATO Supreme Allied Commander, Atlantic. He retired in October 2000.

After completing the Navy ROTC program and receiving his degree at Penn State, Gehman began his first tour of duty on the USS English as main propulsion assistant and damage control assistant. His next tour was in Vietnam, serving as officer-in-charge of a Swift boat and then as officer-in-charge of seven Swifts at Chu Lai.

He attended Destroyer Officer School in Newport, RI, and after a few other tours of duty, served as commanding officer of the USS Conserver. Gehman went on to serve as commanding officer of the guided-missile destroyer USS Dahlgren and the guided-missile cruiser USS Belleau, which also served as flagship of the Sixth Fleet. Gehman was commander of Cruiser-Destroyer Group Eight/Eisenhower Carrier Battle Group from 1993-94, during which he also served as commander of Joint Task Force 120 during Operation Support Democracy in Haiti.

Throughout his career, Gehman also served at numerous posts in Washington, DC. In September 1996, he was named vice chief of naval operations. He then served as commander-in-chief of the U.S. Joint Forces Command and NATO’s Supreme Allied Commander, Atlantic.

He has been at the helm of prominent investigations, including the USS Cole terrorist attack in Aden, Yemen, and the space shuttle Columbia accident in 2003.

His awards and honors include the Defense Distinguished Service Medal, the Legion of Merit, the Bronze Star with Combat “V,” the Meritorious Service Medal, and numerous unit and campaign awards.

In 1998, Gehman was named an Alumni Fellow and in 2001 he was named an Outstanding Engineering Alumnus. Of all Penn State alumni to have served in the military, he holds the distinction of being the highest ranking ever.

The Distinguished Alumni Award is the highest honor that Penn State bestows upon its alumni. It recognizes the achievements of outstanding alumni whose “personal lives, professional achievements, and community service exemplify the objectives of their Alma Mater.”

Gehman and his wife Janet reside in Virginia Beach, VA. They have two children, Katherine and Christopher.
Continuing and Distance Education

New distance learning opportunities
Now, you can take Penn State Engineering courses without having to come to campus. The courses are taught to distant learners through a rich blend of media and technology and have the same quality, rigor, and expectations as on-campus courses. We’ll be happy to work with you to explain the programs and determine if they are right for you. The following are offered:

Nuclear engineering master’s courses
J. Brenizer Jr.
For the past two years, the mechanical and nuclear engineering department has delivered graduate-level courses to students located at company sites away from University Park. The program is now open to qualified students who wish to work toward a master’s degree in nuclear engineering. 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 in 2005, the Harold and Inge Marcus Department of Industrial and Manufacturing Engineering 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

Conference and short courses
Professional Traffic Operations Engineer (PTOE) exam
Dec. 7—University Park, PA
The PTOE exam will be offered at Penn State on the day prior to the Transportation Engineering and Safety Conference. Visit www.ite.org for information and to register.

28th Annual Airport Conference
Mar. 14-16, 2005—Hershey, PA
Presented in partnership with the Federal Aviation Administration Eastern Region, this conference provides airport administrators and engineers an opportunity to network and to update their knowledge of the latest developments in airport engineering and operation.

Smoke School/Visible Emissions
Mar. 15-16, 2005—McKeesport, PA
Mar. 22-23, 2005—Allentown, PA
Mar. 29-30, 2005—University Park, PA
V. Irwin
This lecture/laboratory course covers the regulation and behavior of visible emissions (plumes) from industrial processes. Each individual’s ability to evaluate plumes will be tested using a smoke generator. Those who pass the tests will be certified in accordance with EPA Method 9.

To learn more
For more information about these or other Engineering Continuing & Distance Education programs, visit our Web site at www.engr.psu.edu/cde/ or contact the C&DE office at:
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Fax: 814-865-3969
E-mail: tjr10@psu.edu
The Engineer of 2020*

Recently, the National Academy of Engineering issued a report titled, “The Engineer of 2020.” The report describes a vision for the engineering practice as we approach 2020 and states the profession will undergo continuous change influenced by breakthrough technologies including biotechnology, nanotechnology, materials science and photonics, and information and communications technology. In identifying what traits engineers will need in 2020 to be successful, the report recalls the origins of the word “engineer.”

“The word ‘engineer’ has its roots in the Latin word ‘ingeniator,’ which means ingenious, to devise in the sense of construct, or craftsmanship.”

It declares that engineers in 2020 must have strong analytical skills, exhibit practical ingenuity, be creative, communicate well, and have mastered business and management principles. The report further asserts that engineers need to strive for leadership, hold high ethical standards, and maintain a strong sense of professionalism. It goes on to indicate that engineers in the future, even more than our current graduates, will enter a workplace in which dynamism, agility, resilience and flexibility, and lifelong learning will be of even more importance.

At a July 2004 conference in which the report’s findings were described and discussion groups were organized to identify what steps must be taken in engineering education to successfully achieve the vision of 2020, it was apparent that many changes will be required in engineering education and the way engineering is taught. It is even more of an imperative for those changes to begin now, knowing that the graduates of 2020 are now entering elementary school.

In many ways, the National Academy of Engineering report articulated and clearly identified attributes that relate closely and directly to the effort we have undertaken at Penn State to educate World-Class Engineers. In our continuing discussion of the actions that we need to undertake in the College, we have identified very clearly that engineering is, in fact, a lifelong learning experience. The National Academy report reinforces what we know—that undergraduate education provides the foundation that must last a lifetime for becoming a world-class engineer.

Amy Smith, a first-year student from McKeesport, PA, gets help unpacking from mother Denise and brother Erik during move-in weekend in August. Meanwhile, sophomore Jessica Horton and parents Lee and Diane of Memphis, TN, wait for the next elevator. Both students reside in McKee Hall, which houses the College’s E-House, or Engineering House, one of the three engineering-related on-campus living options.