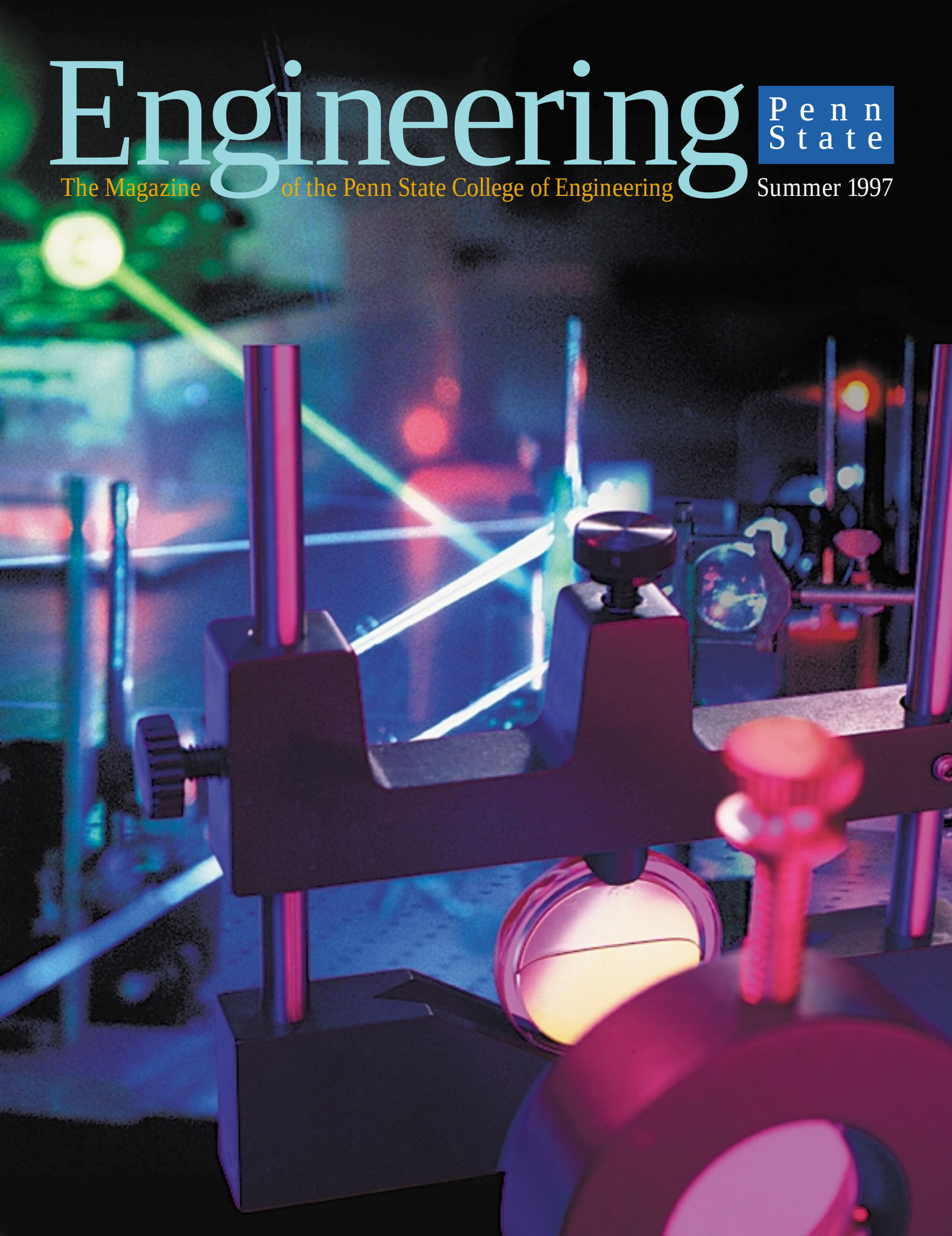
Engineering

Penn State

The Magazine of the Penn State College of Engineering

Summer 1997



Penn State Engineering Conferences

HEC-RAS River Analysis Program
July 14-18, University Park
Dr. Arthur Miller
Participants will learn the theory and application of the HEC-RAS river flow analysis computer program. Lectures will be supplemented with hands-on exercises in the computer laboratory.

Wastewater Biology
July 28-29, Indianapolis, IN
August 11-12, Greensboro, NC
August 25-26, Muncie, IN
September 8-9, Cleveland, OH
September 23-24, Charlottesville, VA
October 6-7, Kansas City, MO
October 20-21, Sacramento, CA
December 11-12, University Park, PA
Michael Gerardi
Through a series of modules, this workshop presents a biological approach to the operation of wastewater treatment plants and teaches participants to recognize and correct conditions causing plant operational or upset problems.

Computational Methods in Stormwater Management
July 28-30, University Park
Dr. Thomas Seybert
This short course is intended for engineers and planners who want to upgrade their skills in microcomputer methods for hydrologic analysis and hydraulic design of stormwater facilities. Topics covered represent a comprehensive array of tools for stormwater management planning, detention facility design, and subdivision planning.

Corrosion Short Course
August 4-8, University Park
Dr. Barbara Shaw
Co-sponsored by the College of Earth and Mineral Sciences, the Penn State Corrosion Center, and Gamry Instruments. This lecture/laboratory course includes morning lectures on the fundamentals of corrosion, and afternoon hands-on laboratory sessions that highlight the most commonly used experiments to assess corrosion.

IMAGE '97—Innovations and Materials for Green Engineering
August 6-8, University Park
Dr. Charles Bakis
At this course, featuring Penn State and industry experts, participants will learn how to design and manufacture products using environmentally-friendly materials and processes.

Rotary Wing Technology
August 11-15, University Park
Dr. Barnes McCormick
This course, designed for engineers, presents a comprehensive introduction to rotor craft technology. The lecturers, well-recognized in their respective disciplines, will cover a range of major topics including: Aerodynamics, Dynamics, Stability and Control, Acoustics, and Structural Design.

Modern Bearing Technology Short Course for Engineers
August 11-15, University Park
Dr. Tedric Harris
Presented in conjunction with the American Bearing Manufacturers Association, this course provides engineers with detailed information about bearing types and their design, and the manufacture, application, lubrication, and testing of bearings.

Advanced School in Power Systems Engineering
September 3 to December 4, Pittsburgh
Ralph Powell
Held annually for more than 25 years, the Advanced School provides electric utility engineers a comprehensive education in power systems engineering with emphasis on practical applications, while maintaining a rigorous academic environment. The instructors are practicing expert engineers, who provide students with an education that can be immediately applied to the workplace. The school also includes special lectures on current and emerging technologies and guided tours to manufacturing facilities and electric utility plants.

Underwater Acoustics and Signal Processing
September 8-12, University Park
Dr. William Thompson
This course provides a broad but comprehensive introduction to many important topics in underwater acoustics and signal processing. The goal of the course 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.

Vibration Control
October 13-17, University Park
Dr. Courtney Burroughs
This short course, for engineers and applied scientists concerned with reducing structural vibrations and their effects, emphasizes principles and physical insights with a minimum of mathematics. The goal of the course is to enable participants to understand new developments and to acquire efficient tools for addressing their own practical problems.

Smoke School
September 16-17, McKeesport, PA
September 23-24, Allentown, PA
October 7-8, University Park
Dr. Robert Heinsohn
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.

Shipboard Airborne Noise Control
November 11-13, University Park
Dr. Courtney Burroughs
This course is intended for ship designers and technical managers responsible for integration of airborne noise control into the overall construction of a ship to meet design specifications or goals. Topics covered include: fundamentals of acoustics, noise criteria, methods of noise and vibration prediction, effective design methods and noise treatments, and noise measurement methods.

Registration

To register by phone or to request a conference brochure and registration form, call 1-800-PSU-TODAY (1-800-778-8362).

Note: Preregistration is encouraged because the University may cancel or postpone any course or activity due to low enrollment or other unforeseen reason.

Additional information about these and other engineering conferences can be found on the World Wide Web at the College's Continuing Education Web site: **http://www.engr.psu.edu/**

You may also contact Engineering Continuing Education directly at: **Phone:** (814) 865-7643 **Fax:** (814) 865-3969
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Table of Contents

Engineering Penn State

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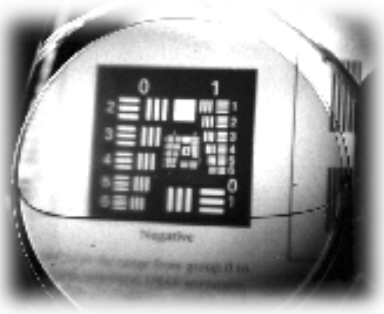


Editor's Note:

In this age of rapid technological development, continuing education is vital for established personnel (whether engineers or magazine editors!) to keep pace with advancements in their discipline. A new feature of our magazine is the list of Penn State Engineering Conferences inside the front cover, where you'll find it in each issue.

Each entry gives you the conference's lead presenter (many courses are team taught but we lack the space to list everyone) and a brief description along with the dates and locations scheduled at press time. Terry Reed, director of continuing and distance education, welcomes suggestions for new conferences or short courses if you or your employees need to update your knowledge.

Penn State engineering helped you get where you are today, continuing education may help you get where you want to go tomorrow!

Lani Bloomer–editor

Actively restoring peace and quiet—with a tunable vibration absorber

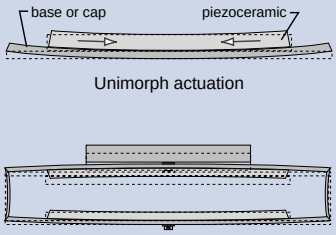
Vibrations in airplanes and machinery contribute to many significant engineering problems, including operating noise levels and material fatigue.

Future machines may be quieter because of one Penn State/industry team's research. They've developed a solid state, tunable vibration absorber that could reduce structure-borne vibration in aircraft, thus reducing cabin noise and to some extent structural fatigue. Such a device might quiet future industrial machinery and consumer products like cars, appliances, or hand tools as well.

The device is classified as "active" since it continuously tracks changing frequencies of undesirable vibrations and tunes itself to reduce these vibrations. **Christopher L. Davis**, a Penn State doctoral candidate; **George A. Lesieutre**, associate professor of aerospace engineering; and Jeffrey Dosch, of the AVC Instrumentation Division of PCB Piezotronics Inc. of Depew, NY, conducted the research.

Christopher Davis measures the frequency response of a tunable vibration absorber.

Davis and Lesieutre developed and experimentally verified a new electrical shunting method to adjust the piezoceramic component in an actuator that is commercially available from PCB Piezotronics. This shunting system makes it possible to tune the natural frequency of the device over a range of frequencies, corresponding to those expected in an application. In effect, the shunting system softens or stiffens the actuator in response to changing excitation.



Dual-unimorph inertial actuator uses two unimorphs to increase inertial mass displacement.

According to Davis, the solid state nature of the absorber provides three benefits: First, it is potentially more reliable than other current active vibration absorbers which rely on mechanical, moving parts. Second, it should be less expensive to produce than other active absorbers which are currently available. Finally, the absorber has the potential to be miniaturized for use in micro-electromechanical systems (MEMS)—a rapidly growing field.

Experiments using the device showed that it could predictably provide more than a five percent adjustment from its nominal design frequency.

Lesieutre says, "that doesn't sound like a lot but it's enough, for example, to accommodate typical variations in aircraft engine speeds during cruise. Furthermore, it should be possible to modify the design of the basic absorber to increase the frequency range over which it can be tuned."

This research, the focus of Davis' dissertation, grew out of an earlier Small Business Innovation Research (SBIR) contract from the NASA Langley Research Center to PCB Piezotronics Inc. and Penn State's Center for Acoustics and Vibration (CAV). **Gary H. Koopmann**, professor of mechanical engineering and CAV director, was also a principal investigator in the earlier project, as was **Shoko Yoshikawa**, senior research associate at the Materials Research Laboratory (MRL). ■

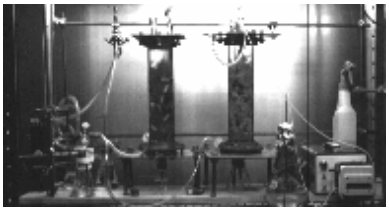
Dr. Lesieutre can be reached at (814) 863-0103 or g-lesieutre@psu.edu; Christopher Davis can be reached at cld103@psu.edu.

Production-line plants—engineering plant defenses to manufacture natural chemicals

Who says mother nature can't be fooled? Engineers at Penn State are learning how she works to successfully trick plants into producing naturally-occurring chemicals. Scaling-up the production of these plant chemicals for human applications means someday, plants won't just be found on shelves in greenhouses, but also on production lines in factories.

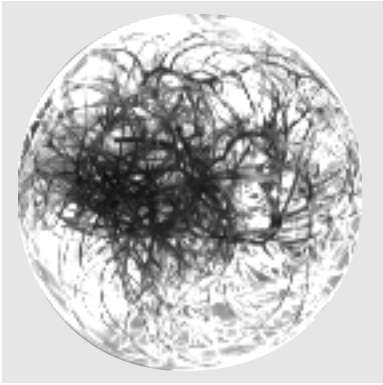
The only way plants can attract pollinators or deter predators is to produce chemicals that entice beneficial organisms and repel or destroy dangerous ones. These naturally-occurring chemicals including defense compounds, colors, and flavors produced by plants, are needed for commercial uses in things like vanilla, morphine, taxol, quinine, ginseng, and shikonen—a red dye. However, for manufacturing purposes the plants or plant cells must first be coerced into producing reliable and sufficient quantities.

"Plants or plant cells only produce these secondary metabolites when they need them, and manufacturers would like a reliable way of producing such chemicals in the factory," says **Gurmeet Singh**, assistant professor of chemical engineering. "What we are trying to do is bluff the plant into thinking it is being attacked," Singh reported at the spring American Chemical Society meeting in San Francisco.



A small scale laboratory reactor (1 liter) for comparing different methods of root culture to determine which would be best for industrial scale-up. The left column is a sparged column where the column is filled with the nutrient liquid and oxygen is bubbled through the liquid. The right column is a trickle bed column, where the column is air filled and the liquid is sprayed down, coating the roots as it drips down.

Singh's approach, elicitation, is to grow plant roots in nutrient solutions and to force the cells to produce secondary metabolites by inflicting the plant with dead, cell-wall fragments of fungus. The fungus won't kill the plant, but induces its defenses. "With this type of prodding we have observed increased chemical production as much as 500 fold in some species," he says.



Beet root culture.

In the manufacturing environment, producers want to use the exact amount of fungus fragments to optimize chemical production. "If manufacturers add too much, they might waste expensive fungus and risk damaging the plant cells, but if they add too little, they might under exploit the cells," says Singh. He is studying the fungus concentration in the liquid and the complicated interaction of this elicitor with the cells, to come up with commercially useful formulas for elicitor addition.

Singh is also studying a natural plant compound, methyljasmonate, and its interaction with fungal elicitors. Methyljasmonate is a chemical produced by most plants and is thought to be used to signal other plants. A very volatile compound, methyljasmonate quickly diffuses through the air where it can be sensed by other plants. The exact information conveyed is unknown.

"When methyljasmonate is mixed with the fungal elicitor, the amount of elicitor needed decreases dramatically," says Singh. "Since methyljasmonate is much less expensive than fungal elicitors, this could help manufacturers." ■

Dr. Singh may be reached at (814) 865-1628 or gxs11@psu.edu.

"Beefing-up" food manufacturing research—new center established

Did you ever wonder how much fat is really in that fast food hamburger patty?

Engineers at Penn State's new Center for Food Manufacturing (CFM) have, and they're focusing on questions like this to improve food manufacturing processes and in turn, make food cheaper and better in quality.

Determining the fat content of beef is one example of current CFM research. Through bringing state-of-the-art manufacturing technologies to the food industry, researchers are developing innovative applications of near infrared reflectance (NIR) spectroscopy. Using this technology, the fat content of beef can be determined precisely and time-efficiently as it comes out of a meat grinder. NIR spectroscopy is not a new technology, but has rarely been used in the food manufacturing industry for continuous on-line monitoring and control.

"Our Center's focus is uniquely matched with two of Penn State's strongest Colleges—Agricultural Sciences and Engineering," says **Paul N. Walker**, Director of the Center for Food Manufacturing and professor of agricultural and biological engineering. According to Walker, few research centers focusing on food manufacturing exist in the country. He saw establishing the CFM as a unique opportunity to fill a research gap while also capitalizing upon the resources of two of the University's leading programs.

Focusing on productivity, competitiveness, and safety in food manufacturing, the CFM's goal is to better educate students and train industry professionals concerning issues facing today's food manufacturing industry. A main objective, therefore, is effective technology transfer from research labs directly to industry.

"We need the input of food, food equipment, and instrumentation/controls companies to help us mold the Center for Food Manufacturing into something that will be beneficial to them. We want their guidance to know what challenges they face. We also need the companies to be willing to invest in the research of the Center by becoming members, and participating in the decision-making process," explains Walker.

Industry membership to the CFM requires a $5,000 yearly commitment, which entitles a company to help determine the Center's research focus. Companies sponsoring a specific CFM research project—such as the innovative NIR spectroscopy application—pay half that annual commitment.

Testing food science sensors.

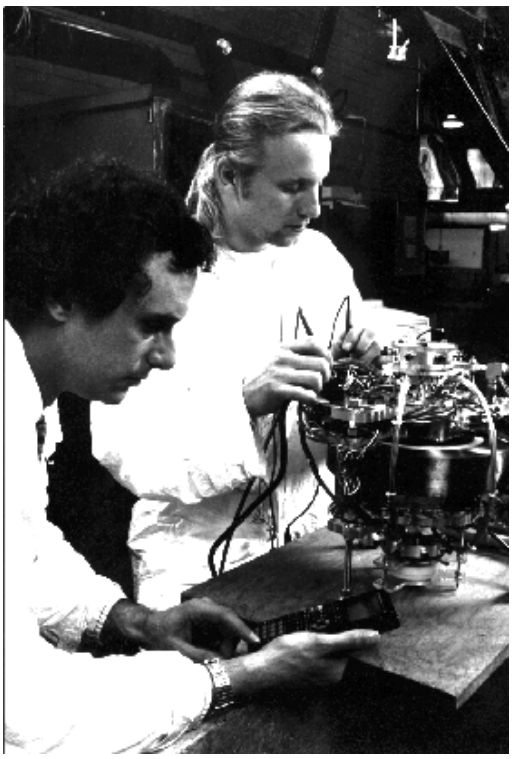
The CFM roster includes top graduate students and faculty from five Colleges at Penn State. Walker is assisted by three associate directors—**Richard A. Wysk**, Leonhard Chair in Engineering and professor of industrial engineering, **Gregory R. Ziegler**, associate professor of food science, and **Joseph L. Rose**, the Paul Morrow Professor in Manufacturing and Design.

The CFM is supported by funding from the Colleges of Agricultural Sciences and Engineering, and a Ben Franklin Technology Center Grant from the Commonwealth of Pennsylvania. CFM directors are presently seeking funding from the National Science Foundation to establish an Engineering Research Center at Penn State in 1998. If awarded, the CFM will expand in operation to serve a larger portion of the U.S. Food Industry. ■

For more information on the Center for Food Manufacturing, contact Dr. Paul Walker at (814) 865-4582 or pnw@psu.edu.

Spinning wheels for future energy—engineers develop fabrication method for safer flywheels

A team of Penn State engineers has been spinning its wheels—flywheels that is, to develop a new way to make them much safer.



Chris Gabrys (top) and Chuck Bakis test Chris' Ph.D. research project to fabricate and demonstrate a composite flywheel, attached here to a motor and generator. Chris also developed a magnetic bearing system to reduce friction and keep the flywheel running longer.

The implications for a safer flywheel are significant, since satellites, electric/hybrid automobiles, an electric substation, and telephone power backup systems all have the potential to be affected by this recent advance in fabricating composite flywheels.

Composite flywheels have been a promising technology for providing large amounts of uninterruptable, low-cost, and environmentally-friendly power for applications such as these for about fifteen years. Their use, however, has been severely limited by their potential for catastrophic failure—where, if one is spun too rapidly, stress on the material causes it to shatter explosively or separate from the hub on which it is spinning. This potential failure means that costly systems of safeguarding human life have been necessary where the flywheels are in use.

Christopher W. Gabrys, a consultant who earned a Ph.D. at Penn State in 1996, and his adviser, **Charles E. Bakis**, associate professor of engineering science and mechanics, have devised a method of filament winding large diameter flywheels that consist of high strength carbon and glass fibers embedded in an elastomeric matrix material. They write (in the May 1997 issue of the *Journal of Reinforced Plastics and Composites*) that their new method "should theoretically allow fail-safe or limited failure flywheels to be constructed."

The new technique reduces the possibility of catastrophic failure of the flywheels by changing the area where the flywheel can be expected to fail and by limiting the amount of the rotor that will fly off if the wheel is spun too fast.

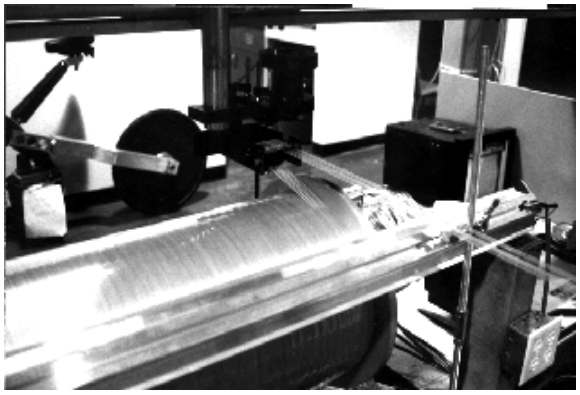
Bakis explains that current composite flywheel rotors are usually made from high-strength, lightweight, carbon, glass or synthetic fibers formed into a continuous filament that is wound around a spindle or mandrel, like thread on a spool. The filaments are impregnated with epoxy to "glue" them together and hold them in a rigid disk or cylinder shape.

In the new Penn State approach, a rubber-like elastomeric material is substituted for the epoxy. The filament passes through a special elastomer solution

"bath" that soaks it thoroughly with the rubber-like material. The elastomer-impregnated filament then solidifies in a matter of minutes after being wound on the mandrel.

Bakis says, "The result is a flywheel in which we predict failure will result in only the outer edge fibers peeling from the wheel. The breakdown process is also self-arresting since the inner material is operating at lower stress levels due to the unique properties of the elastomeric matrix flywheel. This is in contrast with rigid epoxy matrix wheels which usually fail explosively—all at once."

Two elastomeric flywheels wound directly onto hubs, fabricated for research purposes. The light one is a rotor made with a glass fiber filament, and the dark one is composed of carbon fiber filament.



Bakis is currently perfecting a 300 pound flywheel, shown here during the filament winding, for use by a large midwest power company. The power company hopes to use the new flywheel to store energy at night when the demand for power is low. Power companies might also use such large flywheels on a neighborhood basis in substations to absorb and provide sudden power surges as demand changes from location to location.

In their paper, the two researchers note that the use of elastomers in composite flywheels is not a new idea and had been theorized and reported in the technical literature previously. However, Gabrys and Bakis are the first to develop a simple, practical way to make very thick or wide disks and cylinders using elastomer-impregnated filaments. In the past, it has been difficult to fabricate these disks without having them develop flaws of waviness or buckling as the fibers are wound.

Bakis says, "Making very thick disks was the specific challenge that we took on. We've achieved a ratio of inside to outside diameter of 1:10, without wavy fibers."

Two fabrication innovations have led to the team's success: developing a low-cost hub design where the mandrel (on which the fibers are wound) serves as the means of connection to the power input/output shaft, and developing a technique for setting the elastomer quickly as the fibers are wound to keep them straight and smooth.

Limited-failure flywheels have the potential to be safe, low cost, non-polluting, replacements for chemical batteries in a host of applications, Bakis adds. High-performance composite flywheels are capable of storing or providing 20 to 40 times more power per kilogram than batteries. Their power comes from the fact that, once set rotating, a flywheel tends to keep rotating unless its kinetic energy is deliberately drawn off or friction slows it down.

Heavy, low-tech, metal flywheels have been used for years on auto crankshafts to assist gasoline engines between piston strokes. Currently, GM, Ford, Mercedes Benz, and Mitsubishi are all known to be developing flywheel/electric hybrid auto propulsion systems incorporating the new high-performance composite rotors.

Less well known are some of the other possible flywheel applications. Bakis says, "Power companies often keep a small plant in reserve which they fire up twice a day for peak needs. Flywheels could be a less costly or dangerous alternative that would enable the companies to run their plants at full use around the clock." Flywheels could also be an environmentally-friendly replacement for the battery-storage systems currently used by some power companies and industries which need an uninterruptable power supply for manufacturing.

Bakis adds, "On satellites, flywheels could not only replace batteries but could even be used as momentum wheels to orient the spacecraft."

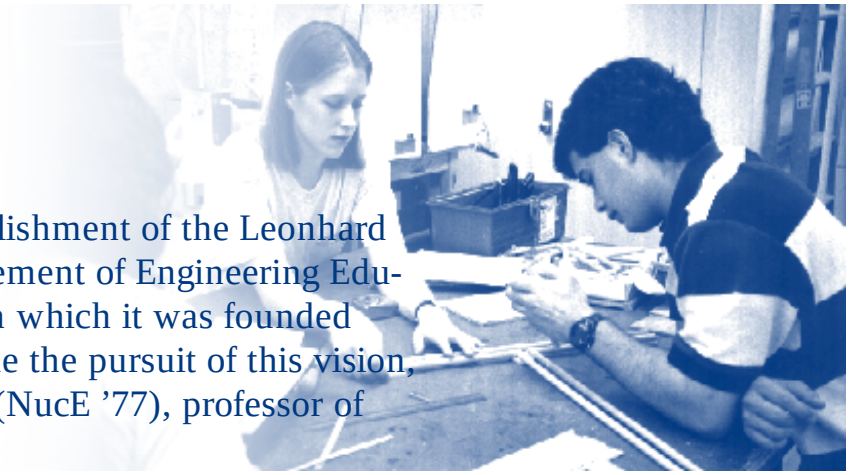
The research by Bakis and Gabrys has had two purposes: Add to our technological base by perfecting a rapid fabrication method for safer composite flywheels. And second, technology transfer, to assist their research sponsors develop a commercial unit for manufacturing the elastomeric flywheels. Gabrys is now working as a consultant in Seattle, where he was instrumental in designing and setting up a plant to manufacture various types of composite flywheels for energy storage, including the elastomeric flywheel he helped develop as a student at Penn State.

Their research proves that in some cases, spinning your wheels can be a productive process. ■

Dr. Bakis can be reached at (814) 865-3178 or cbakis@psu.edu.

New leadership at the Leonhard Center

—enhancing engineering education



Six years after the establishment of the Leonhard Center for the Enhancement of Engineering Education, the vision upon which it was founded continues. And to guide the pursuit of this vision, **Thomas A. Litzinger** (NucE '77), professor of mechanical engineering and director of Penn State's Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL), has been appointed the Leonhard Center's new director.

Litzinger says, "I'm honored and excited to accept the challenges and responsibilities of leading the Leonhard Center. I believe 'leadership' means asking—at all times—what is the best thing to do for our students and the College."

Established by an endowment gift from alumnus **William E. Leonhard** (EE '36), The Leonhard Center for the Enhancement of Engineering Education's focus is to produce graduates who are "world class engineers," and to improve engineering education by bringing together students, faculty, industrial partners, and practicing engineers to provide direction.

"Our goal is to enroll and retain an increasing share of the best and brightest students in engineering," says Mr. Leonhard. "We need to prepare them for a challenging and rewarding career and equip them with the technical and managerial skills to succeed as leaders in their chosen fields." Those working with the Leonhard Center and its former director, **Jack V. Matson**, professor of civil engineering, established many innovative programs, some of which have been adopted by other engineering schools across the United States, including:

- founding the Engineering Leadership Development Minor,
- establishing "hands-on" courses, such as Product Dissection, and
- integrating creativity and design components, teamwork, and problem-solving into courses throughout the engineering curriculum.

As the new director, Litzinger brings a great deal of administrative experience in facilitating permanent change. He explains, "I've learned the value of teamwork in achieving long-term viability of innovations. We must obtain input from all groups involved and provide resources to accelerate the rate of change."

As Litzinger assumes his new position, he does so with key challenges for undergraduate engineering education in mind—challenges which he feels the Leonhard Center can help address. "In meeting these challenges now, we can surpass future accrediting standards before they're actually instituted and maintain our leadership in engineering education," he explains. These challenges include:

- intensifying the focus on learning and learning skills,
- increasing integration of technical courses with both professional and general education,

Tom Litzinger (NucE '77) is a man who keeps his focus high, constantly challenging and encouraging those around him to work together and strive for excellence. He is widely respected for his teaching, research, and for his accomplishments as director of ECSEL at Penn State.

An award-winning teacher, Litzinger uses a holistic teaching approach to incorporate real-world issues and global implications of engineering into his classes with active and collaborative learning design projects. He has taught courses on thermodynamics, fluid mechanics, and internal combustion engines and gas turbines, and combustion.

Litzinger's research focuses on applied R&D for practical industrial problems, and involves chemical aspects of combustion related to internal combustion engines, gas turbines, and rockets. His experimental research ranges from fundamental, bench-top experiments on the combustion chemistry of new rocket propellants to investigations of commercial automotive engine emissions. He is involved in three DoD-funded, multi-university research programs on propulsion and is part of a research team at the Pennsylvania Transportation Institute investigating bus emissions. He was a recipient of a NSF Presidential Young Investigator Award and a PSES Outstanding Research Award.

He describes his experiences as director of ECSEL as an "apprenticeship in enhancing engineering education" which thoroughly prepared him for the responsibilities of his new position. Under Litzinger's leadership, ECSEL's joint efforts with departments include: the revision of the freshman engineering course and its adaptation to all campuses, the sailplane curriculum in aerospace engineering, vertical integration of case studies in chemical engineering, the integration of design into introductory circuits courses in electrical engineering, and a national faculty development workshop at Penn State.

Litzinger graduated from Penn State with highest distinction and a 4.0 cumulative grade-point average. He then spent four years working for General Electric, including three years in their Corporate R&D Center. He earned his M.S. and Ph.D. in mechanical engineering from RPI and Princeton, respectively. He became a Penn State mechanical engineering faculty member in 1985, and was promoted to full professor in 1995.

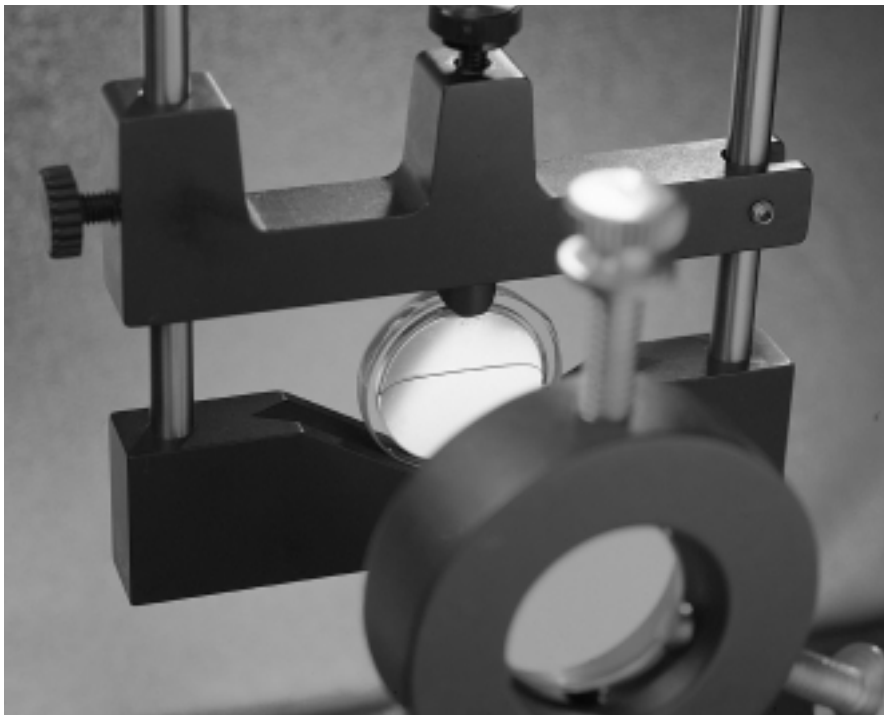
- expanding the number of integrative courses in sophomore and junior years,
- enhancing math, physics, and chemistry courses,
- meeting the challenges posed by ABET 2000, and
- assisting faculty in developing and adopting new, more effective teaching methods.

"A key to the success of the Center is involving faculty and department heads," says Litzinger. "I plan to work with department heads and each department's undergraduate curriculum committee to develop goals that are department-specific, yet consistent with the College's vision. It's time to begin working toward the next level of achievement—to maintain Penn State's lead in engineering education." ■

International incident demonstrates need—liquid crystal fibers provide laser protection

The Washington Post headline read: "Russian Ship Suspected in Laser Beam Incident—Two Aboard Canadian Helicopter Were Injured."

"A Russian fishing vessel off the northwest coast of Washington state may have fired a laser beam suspected of injuring a Navy lieutenant and Canadian military pilot flying above the ship trying to determine if it was spying..." the article began.

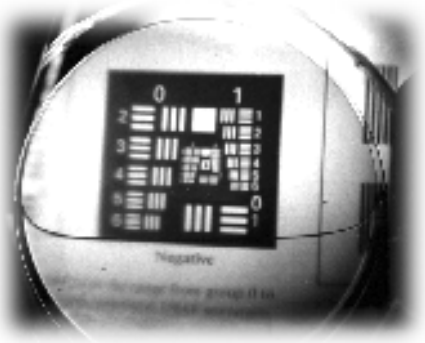


Revolutionary liquid crystal fibers, contained in the disk at the center of this test apparatus, provide automatic protection from excess laser light.

The two men "...suddenly developed... eye problems associated with laser burns...." A passenger aboard the helicopter photographed the event, and one frame showed "...definitive evidence of an emanation coming from the bridge area of the merchant vessel...." The incident had occurred on April 4, and this summary of the subsequent investigation ran on page A16 in The Washington Post on May 15, 1997.

A team of Penn State engineers, led by **Iam-Choon Khoo**, professor of electrical engineering, is developing a device which one day will provide optical protection from such stray (or intentionally fired) laser light.

"This is a key technology that the U.S. government is interested in developing," says Khoo, whose research is funded by the U.S. Department of Defense. "Anyone can shoot a relatively inexpensive laser into the sky. These lasers might blind a pilot, or destroy the optical sensors in a complex, billion-dollar telescope. The optical device we are perfecting provides a physical



A photograph of a resolution chart seen through the fiber array and a 1x telescope.

protection from errant lasers or other intense light sources."

The word laser is an acronym (for light amplification by stimulated emission of radiation) coined when lasers were first developed in the late 1950s and early 1960s. Today, lasers are used daily in medicine, for military purposes, in office equipment, for manufacturing, and a myriad of other beneficial applications.

While lasers are effective tools, they can also inflict critical damage if they hit human eyes or sensitive optical sensors—such as those found in a telescope. And protecting eyes and equipment from such damage is a serious issue with both military and civilian implications, clearly demonstrated in this recent international incident.

Developing protection from errant laser light became much more difficult with the advent of frequency-agile, high-powered pulsed lasers in the last decade, which render current fixed wavelength protective devices useless. Such lasers might have a wavelength from any part of the light (color) spectrum, and be in the form of pulses lasting as short as a nanosecond.

To protect eyes or equipment from these new lasers, protective devices must be able to work instantly and automatically, without human or mechanical activation, because damage would be done before a device could react. These devices must be able to absorb light from the entire spectrum, or a laser with a different wave length would simply bypass the device. Yet while providing this protection, these devices must also be able to transmit a clear image with minimal distortion.

How could a protective device meet this range of conditions?

That is the challenge a research team at Penn State is working to solve. Khoo's research team includes two doctoral candidates—**Michael V. Wood** and **Brett D. Guenther**—who, with Khoo, presented their research at the spring meeting of the Materials Research Society in San Francisco.

They have developed a protective device using revolutionary liquid crystal fibers which has the potential to meet these conditions, providing automatic protection from lasers, including pulsed laser light.

Their goal is to establish the thinnest possible protective device or "faceplate" (a thinner one creates less image distortion) while providing the most protection from excess laser light. Such a faceplate might be installed inside equipment like telescopes or periscopes to protect sensitive optical equipment, or one day, be developed into protective coverings for satellite or airplane windows and pilots' equipment, like goggles or glasses, to protect human eyes—like the pilots in the helicopter on April 4th.

Making optical fibers with liquid crystals

Khoo's faceplate is a glass disk from 3-7 millimeters thick and 2 1/2 to 3 centimeters in diameter. The disk has millions of tiny holes—called a capillary array—running through its thickness. These holes, or short channels, are filled with a liquid crystal mixed with carbon 60—a fullerene—and sealed. The fullerene C_{60} enhances the limiting effect of the liquid crystal. The channels of liquid crystal become optical fibers, which permit a good-quality image transmission and low levels of light to pass through, while absorbing higher light intensities.

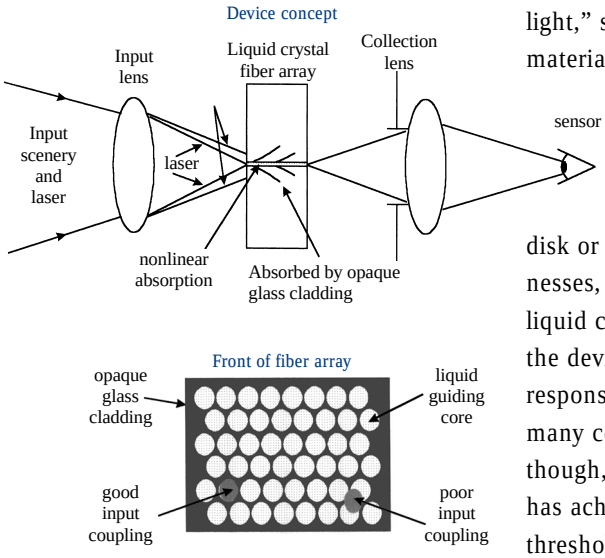
"The optical fibers made from liquid crystals will allow low levels of laser light to pass through," says Khoo, who holds a patent on the device. "But once the intensity reaches a set level, the fibers automatically absorb the light."

One of the important properties of this faceplate is that it is completely non-electronic and has no moving parts. "If we relied on sensors to detect high levels

Continued on next page

In the classroom:

Dr. Khoo, who is internationally known for his ground-breaking work in liquid crystals, developed and has been teaching both senior and graduate-level courses in lasers—EE414 and EE524—at Penn State for thirteen years. His research lab—one of the few places in the world where engineers are studying liquid crystals—serves as a center for instructional demonstration in lasers, liquid crystals, and advanced optical instrumentation for these courses. He has also obtained special research funding to support undergraduate students' research in his lab as well as his that of his graduate students.



A schematic depiction of the fiber array placed in a 1x telescope, showing how scenery from a wide field of view and laser energy emanating from a distant point source are imaged through the array. The lower diagram shows a front view of the array.

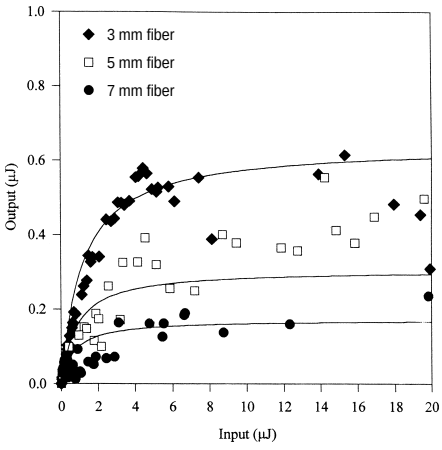
of laser light and send a signal to a processor to initiate a response, the light will have done its damage before any action takes place," says Khoo. "With this material, the response is immediate." The liquid crystal acts as a limiting switch, because it absorbs light differently than most light absorbers.

Conventional light limiters, whether for sunglasses, windshields or other uses, only absorb very specific wavelengths—or colors—of light and only the percentage of light they were created to absorb. For example, a pair of sun glasses manufactured to absorb fifty percent of the green light, will absorb half the green light at dusk and half the green light at noon, independent of the intensity of the light. The liquid crystal fibers absorb all colors of light and react non-linearly to intensity.

"As the intensity of the light increases, the liquid crystal absorbs higher and higher percentages of the light," says Khoo. "As a result, the material actually allows very little of the intense light to pass through."

Khoo's research team is investigating both various disk or faceplate concepts and thicknesses, as well as different liquids and liquid crystals in order to optimize both the device function and the material responses. Other researchers have tried many concepts and materials. To date, though, Khoo's liquid crystal fiber array has achieved the lowest switching threshold and limited transmission—that is, it will "turn on" at low laser power and clamp or restrict the transmission of the harmful laser radiation to a very low level—offering more protection than previous developments.

"The use of lasers is becoming much more common, as is the use of equipment with optical sensors," says Khoo. "Laser light hitting the sensor mechanism of an optical telescope, for example, will burn out the sensors. So optical limiting devices such as these are becoming more important."



Experimentally observed transmitted laser energy (y axis) versus input laser energy (x axis) for three different fiber lengths, showing the optical limiting effect of the fiber array on picosecond laser pulses. The solid lines are theoretical simulation curves.

While direct application of liquid crystal fibers in glasses or goggles to protect the eyes is a future possibility, a more current application is for optical circuits. A liquid crystal faceplate might be placed before the sensors in a telescope or in the remote viewing apparatus for a tank, submarine or aircraft, and would automatically prevent sensor burnout and protect human eyes from stray laser light.

Navy lieutenant Jack Daley and the Canadian helicopter pilot suffered "...cuts to the retina, swelling around the eyes, headaches and foggy vision for several days," from the April 4th incident. The technology Khoo's team is developing, will one day, protect pilots from such injury. ■

Dr. Khoo can be reached at (814) 863-2299 or ick1@psu.edu. Additional information about this research can be found on the Web at http://www.clubs.psu.edu.nlo/

Engineering Fact

U. S. News & World Report rated Penn State's College of Engineering 10th among the top graduate programs in engineering in public institutions nationwide (1996), and seventh among all public university undergraduate programs (1996). The magazine also ranked Penn State among the nation's 10 "most efficient" national universities in 1996—institutions that rank highest in academic quality while spending relatively less than their peers.

Administration for two departments to merge in 1998

Dean **David N. Wormley** has announced that plans are being developed for two engineering departments—mechanical and nuclear—to be merged, effective for the fall semester 1998. The new administrative unit will be the Department of Mechanical and Nuclear Engineering.

This administrative consolidation is a result of the College's five-year strategic planning process and an analysis of enrollment trends based on a decline in nuclear engineering enrollments.

"A principle foundation of this merger is to maintain and continue the significant contributions the College of Engineering has had to the nuclear engineering profession and discipline," Wormley says. "It is planned to continue the ABET accredited undergraduate and the graduate degree programs in nuclear engineering and the education, research, and service activities of the Breazeale Nuclear Reactor facility."

The basic conditions established for the planned merger are:

1. To continue the degrees currently offered in both the mechanical and nuclear engineering programs. All students will be able to continue in their current degree program to completion, and the College will continue to recruit and admit students into the nuclear engineering programs at the bachelor's, master's, and doctoral levels.

2. No staff will be discharged as a direct result of the merger, and faculty tenure processes currently in place will continue.

3. The new department will maintain and enhance the operation and utilization of the Breazeale Reactor.

Dean Wormley has appointed a transition committee, charged with identifying and prioritizing issues related to the merger, and to establish a process to address these issues. The committee is being chaired by Associate Dean for Administration and Planning **George J. McMurtry**.

In presenting the charge to the Transition Committee, Dean Wormley established the following two principles for the planned merger: "To maintain the viability and visibility of nuclear engineering while enhancing mechanical engineering; and to combine the strengths of both into a strong and unified department."

According to McMurtry, "There are strong mutual research interests between these two groups of faculty—particularly in the thermal and heat transfer areas. This administrative change will foster increased interaction and collaboration among the faculty and students in the two fields."

The College expects to submit a formal proposal later this summer for consideration by the University Faculty Senate and the University Administration.

The Transition Committee meetings' minutes will be posted on the Web for those interested in the merger (http://www.engr.psu.edu/www/dept/mech_nuce_merger/). ■

GE Fund grant integrates engineering and science courses

A $431,734 three-year curriculum development grant from the GE Fund, "Pathways to Effective Learning in Engineering," will help integrate engineering problems and applications into two foundation physics courses for engineering students in a new "studio physics" format.

The grant will also help develop a model for converting traditional engineering courses to Web-assisted classes. Both facets of the grant will involve students in course changes, will integrate industrial partners' projects and mentoring into active-learning classroom problems, and will creatively exploit technology to facilitate cross-disciplinary interaction and learning.

"The interdisciplinary nature of the project—in which faculty from engineering will work closely with faculty from the Eberly College of Science to develop the new courses—is important to the future of engineering education," remarks **David N. Wormley**, Dean of the College of Engineering. "We are extremely grateful for the GE Fund's support. It will allow us to expand the improvements in engineering education already established here through ECSEL and the Leonhard Center."

In the first year of this grant, participants will develop

—two pilot studio physics courses,
—techniques or models for sharing interdisciplinary course materials on the Internet,
—a student Teaching Intern program for the studio courses, and
—faculty development seminars in new teaching methods, using multimedia or the Internet.

Continued on next page

What is Studio Physics?

In studio physics, students attend several two-hour class sessions per week or "studios" instead of standard lectures or recitations. Each session presents students with a new problem or "module," for which student teams must find a solution and submit a written report. The module problems are open-ended and require each team to bring many tools and concepts to bear in determining the solution. Learning is active, and emphasizes teamwork, collaborative learning, writing skills, and problem solving. Since lecturing on new material is kept to a minimum, students are expected to conscientiously read assigned material in the textbook. At Penn State, studio physics was implemented for selected first-year physics sections in the fall of 1996.

Engineering and physics faculty will create modules integrating engineering mechanics into one physics course, and electrical engineering and electronics into the second physics course. Subsequent years will see the pilot courses and web techniques expanded to include additional engineering and science courses and faculty, and evaluations and refinements will be ongoing.

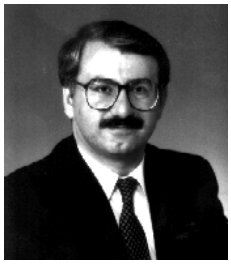
Principal Investigators for the project are **Dhushy Sathianathan**, assistant professor of engineering design & graphics, and **Robert Pangborn**, professor of engineering mechanics and associate dean for undergraduate studies; and **Howard Grotch**, professor of physics and interim dean of the Eberly College of Science.

The College of Engineering will also contribute approximately $454,000 to the project over the three year period.■

Dr. Sathianathan can be reached at (814) 865-2952; Dr. Pangborn can be reached at (814) 863-3750; and Dr. Grotch can be reached at (814) 863-1089.

First Weiss Chair appointment announced

Moshen Kavehrad has been appointed the first holder of the W. L. Weiss Chair in Information and Communications Technology in the Department of Electrical Engineering.



Kavehrad joined the Penn State faculty in January 1997, as professor of electrical engineering and director of the Center for Information and Communications Technology Research. He is a former professor of electrical engineering at the University of Ottawa.

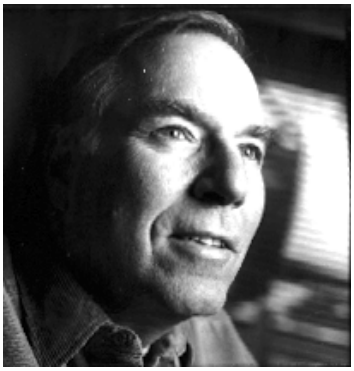
Kavehrad's research interests are wireless communications, optical fiber communications, and networking; and he holds several patents in these areas. He is on the editorial board of the *International Journal of Wireless Information Networks*, and has published extensively in the field. In 1992, he was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to digital wireless communications, optical systems, and networking. For his work in communications technology, he has been cited in several international "Who's Who" publications.

Kavehrad received his Ph.D. in 1977 in electrical engineering from Polytechnic University, NY. He previously worked for Fairchild Industries (Space Communications Group), and GTE Satellite Corporation and GTE Laboratories in Massachusetts. Before teaching at the University of Ottawa, Kavehrad worked with Bell Telephone Laboratories of New Jersey in research, development, and systems engineering. He has also been a visiting research professor at NTT Laboratories in Japan, and served as visiting researcher at Ottawa's Bell Northern research center in 1996.

This chair was endowed by the Ameritech Foundation to honor **William L. Weiss** (EE '51), chairman emeritus of Ameritech. Weiss was named chairman and CEO of Ameritech in 1984, following a career with Bell companies in Pennsylvania, Wisconsin, Indiana, and Illinois.

Weiss was named an Outstanding Engineering Alumnus in 1985, and a Distinguished Alumnus in 1986. He has served as a Penn State Trustee, vice chairman of the National Development Council, and as a member of the executive committee for The Campaign for Penn State. ■

Dr. Kavehrad may be reached at (814) 865-7179, or at kavehrad@engr.psu.edu.



Commencement address by Philadelphia engineer

Bennett Levin, P. E., engineering consultant, and retired businessman, spoke at the engineering commencement in May. His address, *Possibilities*, focused on traits of successful engineers, particularly "the art of the possible ... that ability to evaluate the possibilities and undertake a plan to bring concepts to reality."

Levin is a two-time graduate of Penn State, having earned degrees from both the College of the Liberal Arts ('61) and the College of Engineering (IE '65). By the age of twenty-seven, he was a Professional Engineer registered to practice in twenty-four states and he had established his own firm, Consulting Mechanical and Electrical Engineers in Philadelphia, which soon became a national practice.

His firm pioneered the application of advanced technology and methods for designing mechanical and electrical systems for building structures. Mr. Levin holds two patents relating to the application of heat pump technology. Projects designed by his firm have often been the subject of national attention, and noted for their economy in design as well as their practicality in operation. Hotels, office buildings, high-rise apartments and shopping malls are among the structures containing systems he designed.

Levin also served for many years as a public administrator in Philadelphia and was named by *Governing* maga-

zine as one of America's nine top public officials in 1995.

Mr. Levin is currently a member of the Advisory Board of Penn State's Leonhard Center for the Enhancement of Engineering Education, and serves as a member of the College of Engineering's Committee for the new campaign for Penn State. He has long been an active supporter of the Department of Architectural Engineering's thesis program, and was instrumental in establishing the Lawrence J. Perez Memorial Student Advocacy Award.

Levin retired in 1991 and shares a lifelong love for trains and railroading with his sons. ■

1997 PSES faculty and staff awards

These awards are given annually to honor outstanding teaching, research, advising, and service among the faculty and staff of the College. Award recipients were nominated by their respective departments and selected by colleagues and representatives from the Penn State Engineering Society (PSES), an alumni constituent organization and sponsor of the awards program.

PSES Premier Teaching Award recognizing and honoring an individual whose contributions to engineering education or to the art of teaching are of exceptional quality: **Russell R. Barton**, associate professor of industrial and manufacturing engineering.

PSES Outstanding Teaching Awards recognizing and honoring outstanding engineering educators for excellence in teaching and for contributions to the art of teaching: **Robert Avanzato**, associate professor of engineering at Penn State Abington-Ogontz; **Renata S. Engel** (ESC '82), associate professor of engineering science and mechanics, and of engineering design and graphics; **John S. Lamancusa**, associate professor of mechanical engineering and director of The Learning Factory; and **Mario Sznaier**, assistant professor of electrical engineering.

PSES Premier Research Award recognizing and honoring individuals whose contributions to scientific knowledge through research are exemplary and internationally acclaimed: **Philip J. Morris**, Boeing/A. D. Welliver Professor of Aerospace Engineering; and **Christopher R. Wronski**, Leonhard Professor of Microelectronic Materials and Devices, Electrical Engineering, and Engineering Science and Mechanics.

PSES Outstanding Research Awards recognizing and honoring accomplishments in advancing the frontiers of knowledge. These research awards honor individuals who have brought recognition to themselves, the College, and Penn State: **Kristin A. Fichthorn**, associate professor of chemical engineering with a joint appointment in the physics department; **William E. Higgins**, associate professor of electrical engineering; and **Joseph L. Rose**, Paul Morrow Professor in Design and Manufacturing, in the Department of Engineering Science and Mechanics.

PSES Advising Award recognizing and honoring those serving as academic advisers to engineering students: **Timothy C. Ovaert**, associate professor of mechanical engineering.

PSES Staff Award recognizing and honoring outstanding service by staff employees in the College of Engineering: **Glenna R. Young**, administrative assistant III in the Department of Electrical Engineering.

PSES Service Award recognizing an alumnus or friend who has donated time, expertise, and energies in the form of outstanding and special service to the College: **Harry L. Bell** (EE '48) of State College, retired assistant division manager of Hughes Aircraft Company, California. ■

Three engineering faculty receive prestigious University awards

Three Department of Mechanical Engineering faculty members were recently among select University personnel receiving Penn State's highest faculty and staff awards. **Stephen R. Turns** (ME '70), professor of mechanical engineering, **John M. Cimbala** (AERSP '79), associate professor of mechanical engineering, and **Robert J. Heinsohn**, professor of mechanical engineering, were all recognized for outstanding contributions to the University.

Stephen R. Turns

Turns was a recipient of the Milton S. Eisenhower Award for Distinguished Teaching, created to underscore the importance of undergraduate education.

Turns has taught a variety of undergraduate and graduate mechanical engineering courses, as well as having supervised many graduate students. He has been instrumental in revising the mechanical engineering curriculum and in developing experimental laboratories. His most recent publication is an undergraduate textbook, *An Introduction to Combustion: Concepts and Applications*, which has received outstanding reviews and has been adopted by more than twenty-five schools in its first year of publication. He joined the Penn State faculty in 1979.

Cimbala received a George W. Atherton Award for Excellence in Teaching, established to recognize excellence in teaching.

Cimbala is recognized as a consistently outstanding teacher, having

Continued on next page

College Update

John M. Cimbala

previously received two teaching awards from the College of Engineering. To make the courses he instructs more interesting, Cimbala provides World Wide Web pages for each course, has helped improve the undergraduate and graduate curricula in his department, and also created a graduate sequence in fluid mechanics. He has been instrumental in the continuous development of the College's Fluid Mechanics Laboratory, which he has built into one of the world's finest and most sophisticated. He joined the Penn State faculty in 1979.

Robert J. Heinsohn

Heinsohn was the recipient of the McKay Donkin Service Award, presented to a full-time member of the faculty or staff, or to a retiree who has contributed most to the economic, physical, mental or social welfare of the faculty.

For the past ten years, Heinsohn has devoted one-third of his time to serving his department as both the graduate adviser and the undergraduate program coordinator. He has chaired many departmental committees and was also the department's acting head from January 1994 to January 1995. In addition to receiving this award due to his contributions to the College, Heinsohn was also chosen because of contributions he made to the Faculty Senate. He joined the Penn State faculty in 1963. ■

Todd appointed Co-op director

Anita Todd has been appointed director of the Engineering Cooperative Education Program, following the resignation of Garth Motschenbacher. She had served as the Program's associate director since October 1995.

As Director, Todd supervises the Cooperative Education personnel who work to recruit and train students and to develop relationships with potential employers. She also develops policies and procedures for the program. In her new role, Todd plans to cultivate a system for the Co-op program to assist engineering alumni in seeking post-graduate placements.

Todd made many significant contributions to the Co-op program while serving as Associate Director. In addition to restarting Penn State's Chapter of Kappa Theta Epsilon—the Engineering Co-op Honor Society, she initiated a system of including Commonwealth Campus students in the Co-op Program located at University Park.

A 1989 graduate of Penn State with a B.S. in mechanical engineering, Todd was a member of the first class able to utilize the College of Engineering's Co-op Program. Through the Co-op, Todd was placed as an intern at Walt Disney World in Florida, and Cummins Engine Company, Inc., in New York. She was employed for several years by Cummins and served on the Co-op's Advisory Board before returning to Penn State as assistant director. Todd is currently pursuing an M.B.A. ■

Our Apologies:

The following errors appeared in the College of Engineering's Dean's Report in December 1996:

The correct name of the Rolling Scholarship is *The Charles J. Rolling Scholarship in Engineering.*

The following names were inadvertently omitted from the Honor Roll:

- Dean's Council
  Arthur L. and Betty Wilton Glenn
  Kenneth S. and Barbara K. Moffitt
- Engineering Associates
  William B. and Dorothy Trout Korb
- Second Century
  Charles H. Rehkopf

Engineering Fact

Since 1983, the number of University Park engineering faculty members has increased by almost 40%, improving the undergraduate student/faculty ratio and the overall quality of the engineering student experience. The number of female faculty members has increased six-fold during that time, and the number of minority faculty members by a factor of five.

President's Perspective

by Susan Schall

Do you know there are more than 3,000 junior and senior engineering students at Penn State taking over 300 courses? Do you know that many of these courses need speakers, case studies, design projects, and project consultants?

Do you know that there are over 40 engineering student organizations at Penn State? Do you know that these student organizations need practicing engineers as speakers, panelists, facilitators, and mentors?

Do you know that as a Penn State Engineering alum, you can help fulfill these needs? Just complete an Alumni-On-Line form (see page 22), send it in, and we'll match your interests with class and student organization needs.

If your schedule does not permit travel to Penn State, consider bringing a Co-op student into your organization. Just check off the Co-op/Intern box on the Alumni-On-Line form.

Do you have a problem in your business that you can not resolve due to lack of technical expertise or resources? Have you ever considered turning to Penn State faculty and students for help? If you need such assistance, check off the "Research" box on the Alumni-On-Line form.

Blue/White Tailgate

Thanks to the alumni and their families who attended the PSES Blue/White Game "tailgate" to learn more about PSES activities and indulge in stickies and Creamery ice cream before the game. A great time was had by all! A special thanks to **Will Kresge**, (EE '66) Chair of the Special Events/Membership Committee, for coming up with the idea and making it a success!

Golf Classic

If you are interested in playing a round of golf and supporting a worthy cause, join us for the Fifth Annual PSES Golf Classic on September 27th at the PSU Blue Course. The proceeds will be used to establish a Student Scholarship Endowment. (See page 18 for details.)

I hope to see you soon at Penn State!

Susan O. Schall

PSES

The Penn State Engineering Society is the alumni advisory arm of the Penn State College of Engineering.

PSES means:

- Interaction with students, faculty, and engineering alumni.
- Awareness of and support for meeting the academic and professional needs of students.
- Active involvement with the College and the University.

A note to recent graduates:
You are now a member of PSES! We welcome your participation, so please call me to find out how to stay involved with the College of Engineering.

For more information, contact:
PSES
c/o Cindy Jones,
e-mail: cjjdo@engr.psu.edu
101 Hammond Building
University Park, PA 16802
Tel: (814) 865-9031
Fax: (814) 863-4749

Co-op Corner

Company Testimonial

McNeil Consumer Products, a division of Johnson and Johnson, has had a long standing cooperative education relationship with Penn State's College of Engineering. McNeil, located in Fort Washington, PA, has hired more than fifteen students over the past three years in research and development of over-the-counter drugs, such as Tylenol.

Nancy Warrick, employment administrator at McNeil, recruits at Penn State because of the variety of engineering majors available, and the opportunity to recruit both full-time and Co-op candidates. McNeil Consumer Products recruited one of the first Material Science and Engineering students to accept a Co-op position.

Jason Spiegler, a mechanical engineering student in the Engineering Leadership Development Minor (ELDM), is currently on a Co-op assignment with McNeil. Jason believes the skills he developed in the ELDM have positively affected his contribution to McNeil. McNeil has given him some very challenging projects beyond the scope of young recruits without this leadership development background. Also important to Jason are the credits he receives through his Co-op experience with McNeil which contribute to the completion of his minor.

The Co-op relationship with McNeil Consumer Products is a win-win situation for the College. The quality of our engineering program brings McNeil back for more Co-op students and the students gain valuable experience plus credit for their degree. ■

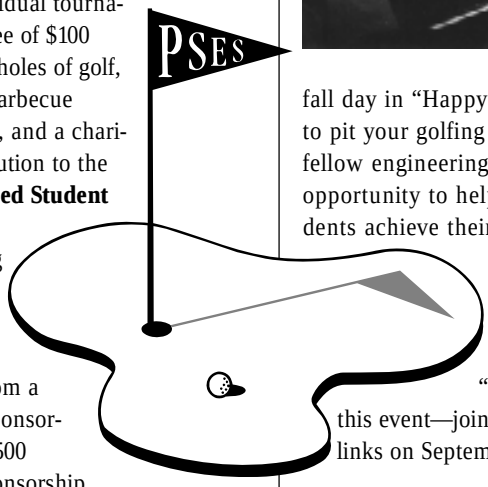
If you would like more information about the Engineering Cooperative Education Program, call (814) 863-1032 or e-mail coop@engr.psu.edu.

The Fifth Annual PSES Golf Classic will tee-off on the Penn State Blue Course at 9 a.m., Saturday, September 27, 1997.

Proceeds from this tournament will benefit the newly established **PSES Endowed Student Scholarship** fund.

Increasing tuition costs make it difficult for some qualified students to afford a college education without scholarship aid. The Penn State Engineering Society recognizes this fact and plans to provide financial support to at least one engineering student annually with this scholarship.

The individual tournament entry fee of $100 includes: 18 holes of golf, cart rental, barbecue lunch, prizes, and a charitable contribution to the **PSES Endowed Student Scholarship**.



Beginning this fall, corporate sponsorship will range from a $500 Hole Sponsorship to a $2,500 Platinum Sponsorship, which will include: hole advertising, two teams, engraved plaque, and advertising on a permanent College "Wall of Fame."

We welcome you for a glorious fall day in "Happy Valley," a chance to pit your golfing prowess against fellow engineering alumni, and the opportunity to help prospective students achieve their dream of earning an engineering degree at Penn State.

Don't be a real "duffer" and miss this event—join us for a day on the links on September 27, 1997. ■

For additional information, contact Cindy Jones at pses@engr.psu.edu. To register on-line, visit the Web site at http://www.engr.psu.edu/www/coe/alumni/golf.stm

Ready, set, tee-off!

PSES establishes student service award

The Penn State Engineering Society is pleased to announce a new annual award recognizing student service to the College, University, and/or community. A cash award will be presented annually at commencement by the PSES Board of Directors to a deserving engineering senior.

The first recipient of this new award was **Shannon Isovitsch** (CE '97) of Butler, PA. In addition to her many engineering activities, Shannon was heavily involved in Habitat for Humanity activities—organizing three Spring Break trips for Habitat projects and establishing a student chapter at University Park.

1997 Alumni Calendar of Events

July 11-13
Arts Festival Alumni Weekend

September 6
Home football game—PITTSBURGH

September 13
Home football game—TEMPLE

September 24-26
Engineering Career Fair

September 26
PSES Board and Committees meeting

September 27
PSES Fifth Annual Golf Classic

October 11
Home football game—OHIO STATE

October 18
Homecoming—MINNESOTA

October 29-31
IPAC meeting

1997 Outstanding Engineering Alumni

Leaders in industry, government, medicine, and in the development of state-of-the-art technology were honored as 1997 Penn State Outstanding Engineering Alumni in April. The annual Outstanding Engineering Alumni Awards are the highest honor conferred by the College of Engineering. Only 175 men and women—out of more than 72,000 alumni world-wide-have received the award during the thirty-one years since its inception. This year's awardees include:

William R. Bastian
Industrial Engineering
B.S. 1947
Retired CEO and Chairman of the Board
AM Communications

Dr. John R. Bruning
Electrical Engineering
B.S. 1964
President and CEO
Tropel Corporation

Dr. Ernest J. Cross, Jr., P.E.
Aeronautical Engineering
B.S. 1959
Manager of Special Projects
Old Dominion University

H. Alfred Eberhardt
Mechanical Engineering
B.S. 1948
Retired President and CEO
Hale Products, Inc.

Larry M. Girvin
Industrial Engineering
B.S. 1965
Nuclear Engineering
M.S. 1970
Senior Vice President, Commercial Operations, Virginia Power

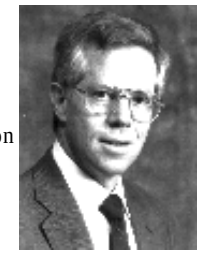
Joseph C. Hurlburt
Agricultural Engineering
B.S. 1961
President
Innovation by Contract, Inc.

James S. Lee
Chemical Engineering
B.S. 1963
Executive Vice President
Henkel Corporation

Dr. John R. Mashey
Mathematics
B.S. 1968
Computer Science
M.S. 1969, Ph.D. 1974
Director, Systems Technology
Silicon Graphics Computer Systems

Walter K. Morris, P.E.
Sanitary Engineering
B.S. 1951
Retired Executive Vice President
Gannett Fleming, Inc.

Dale M. Mosier
Engineering Science
B.S. 1967
Vice President
Menasha Corporation
President
Poly-Hi Solidur, Inc.



Dr. Terry E. Spraker
Electrical Engineering
M.S. 1974
Bioengineering
Ph.D. 1978
Consultant
Venture Capital Firms and Medical Device Companies

Richard F. Tomlinson II
Architectural Engineering
B.Arch.Eng. 1971
Partner
Skidmore, Owings & Merrill LLP

Class Notes

1940s

Colonel Dave E. Pergrin (CE '40) has written his second book, *Engineering the Victory, The Battle of the Bulge — A History*, published by Schiffer Publishing, Atglen, PA. Upon graduation, Pergrin entered the Army where he commanded the 291st engineering combat battalion. After WWII he remained a colonel in the Army reserves. He later worked for the Pennsylvania and Penn-Central Railroads where he became system chief industrial engineer. In 1978, he was appointed by the Secretary of Transportation as an adviser to the Federal Rail Administration. His previous book, *First Across the Rhine*, is used throughout the military as required reading and tells the full story of the 291st engineer combat battalion. Pergrin is a Penn State Outstanding Engineering Alumnus.

Theodore W. Hissey Jr. (EE '48) is director emeritus of the Institute of Electrical and Electronics Engineers, Inc. In this capacity, he serves as a member of the IEEE board of directors and continues to represent the Institute as liaison to international societies and industry. Hissey was executive director in 1995 and 1996, the only person to serve in that role in a volunteer capacity. A member of the Institute since 1947, Hissey has held numerous leadership positions. He resides in Erdenheim, PA, and St. Petersburg, FL, and is executive consultant at KEMA Consulting, Horsham, PA.

Herbert Beckhard (ArchE '49), Penn State Distinguished Alumnus and Alumni Fellow, with his long-time partner, the famed Marcel Breuer, has been featured in *Modern American Houses, Four Decades of Award-Winning Design in Architectural Record*. Beckhard and Breuer were partners and design collaborators over a period of twenty-eight years. The current office of Herbert Beckhard Frank Richlan & Associates is the only active architectural office which traces its roots to the world-renown firm of Marcel Breuer & Associates. Beckhard's recent projects include the new Research Center for the Colleges of Engineering and Earth and Mineral Sciences at Penn State. Beckhard is a Fellow of the American Institute of Architects and is newly-appointed to the prestigious National Academy of Design.

Dale E. Woomert (ME '49 MS '51) writes that he enjoyed the "Corn Oil In Your Engine" article in our winter issue. Woomert authored *Survivability Primer* for the Army a number of years ago on expedient repairs directed towards keeping systems operating under combat conditions. In it was a chapter on expedients that could serve as fluids in vehicle systems, including the types of items being researched today at Penn State. Today, in retirement, Woomert and his wife, Sally, are active in a local history museum. The couple reside in Havre de Grace, MD.

1960s

Jerome C. Schutzler (Aero '61, EMch MS '64) is a recent appointee to the Leonhard Center Advisory Board. Schutzler and his wife, Jan, committed a graduate fellowship to engineering through a charitable remainder unitrust. Retired from PDA Engineering, Schutzler currently does consulting work from his home in Camano Island, WA.

1970s

Charles W. Maxin, M.D. (ChemE '70) is senior vice president, clinical operations for Geisinger's western region. Maxin joined Geisinger in 1987 after a number of years in private practice in State College, PA.

Ronald L. Strykowsky (CE '73) is head of the cost and schedule control office at Princeton University's Plasma Physics Laboratory (PPPL). PPPL is conducting research into the development of nuclear fusion as a potential alternate energy source. Strykowsky is responsible for the laboratory's project controls systems which include project scheduling, estimating, and performance measurement. Strykowsky resides in Mt. Laurel, NJ.

Michael W. Myers (IE '78) is senior vice president of operations for Boston Whaler, a boat building division of the Brunswick Corporation. Myers resides in New Smyrna Beach, FL.

Daniel E. Cook (IE '79) is vice president, business units for Bundy Corporation in charge of sales, marketing, engineering, and program management. He resides in Northville, MI.

1980s

Chunill Hah (Aero '80 PhD) wrote *Turbomachinery Fluid Dynamics and Heat Transfer* in honor of **Budugur Lakshminarayana**'s 60th birthday. Lakshminarayana is professor of aerospace engineering at Penn State. Hah is senior scientist in the internal fluid mechanics division of NASA Lewis Research Center, Cleveland, OH.

Gregory J. Gromicko (ChemE '86) recently received his MBA from the University of Pittsburgh. A project engineer for Fluor Daniel GTI, Gromicko and his wife, **Thalia M. Jones**, (Bus '86) reside in Monroeville, PA.

Lloyd Fletcher (EE MS '86) returned to the U.K. in May 1996 after 12 years of living and working in the U.S. Fletcher is now a producer in the electronic publishing group at the Institute of Physics Publishing in Bristol, U.K.

Brian L. Foreman (ME '86) is staff mechanical engineer for Broadcast Sports Technology. BST provides specialized miniature TV cameras and custom designed RF equipment for the broadcast television industry. The company is famous for their work in auto racing coverage by providing in-car camera systems to CBS, ABC, and ESPN, for NASCAR, CART, IRL, and

IROC racing. BST provided camera systems for last summer's Olympic games at several of the venues. They have also designed and produced similar cameras for on-board shots for several America's Cup yachting competitions. In addition to the racing events, BST will provide camera, communication, and microwave support to CBS for many PGA golf events nationwide. Early in 1997, BST was approached by NASA to produce a new specialized miniature camera system for use on board the space shuttle. Foreman resides in Westminster, MD, with his wife, Lisa and their two children, Colin (age 5) and Allison (age 2).

Joy Huff (Aero '87) presented a paper on the space shuttle orbiter's thermal protection system at the eighth annual AeroMat Conference in Williamsburg, VA, in May 1997. Huff is thermal protection system engineer for NASA, residing in Merritt Island, FL.

Edward M. Manns (Aero '87) is product manager, technical publishing for the Society of Automotive Engineers. Married to Samantha A. Terzich, Manns resides in Baldwin, PA.

Barbara Bayer Downing (ChemE '88) is market manager for Rohm and Haas' ion exchange resins business in Asia. Downing and husband, Bob, recently relocated from Tokyo to Bangkok.

Girish Subramaniam (AgE '89 MS, '93 PhD), process specialty engineer in the food and beverage group of Fluor Daniel, is a registered professional engineer in South Carolina. Subramaniam and his wife, **Chemba Raghavan** ('94 HHD PhD), are the parents of one-year-old Disha.

Kevin J. Lane (EE '89) is a senior systems engineer with Countermeasures Division, a Lockheed Martin Company. Lane resides in Merrimack, NH.

1990s

Dean F. Poeth II (IE '90 MS, '93 PhD) is senior manufacturing engineer at Knolls Atomic Power Laboratory, Schenectady, NY. Poeth is responsible for several programs in manufacturing cost reduction and education. He transfers from the nondestructive test engineering (NDTE) department where he worked for three years performing research in advanced NDTE techniques. He and his wife, Opal, live in Clifton Park, NY.

Greg Mester (ME '90) recently completed the master's of management degree at Penn State Great Valley. Mester is an active member of the PSES Recruitment Committee and is employed by the Naval Inventory Control Point, Philadelphia. NAVICP-PHIL manages spare parts for the U.S. Navy's aviation fleet. Mester is involved in designing shipping containers for delicate items—ranging from jet engines to gyros—for transport to and from the fleet while at sea. Two of Mester's current projects are containers for the new General Electric F414 engine modules (this engine is for the new F/A-18E Navy fighter) where he works with engine designers; the other is a new logistics system for managing, storing and shipping advanced composite repair materials used by the fleet in the repair of aircraft.

Leslie A. Schnautz (ChemE '91) is controls manager with Procter & Gamble's health care research center in Mason, OH. Responsible for the controls initiatives for all of North America's dentifrice manufacturing for P&G, Schnautz is married to Maureen Monahan, a speech pathologist at Children's Hospital in Cincinnati.

Donald F. Heaney (ESci '91, MS '93, PhD '97) is senior process development engineer for the electronic products division of 3M. Heaney resides in Austin, TX.

Jeanne McTamney Sax (IE '91) and David Sax are the parents of Ryan David, born April 5, 1997.

Richard Williams (IE '95) is an industrial engineer with Columbia Lighting. In addition, he is owner of PS Brew, selling wine and beer home brewing supplies through mail order. Williams continues to serve on the Alumni Council, and resides in Lansdale, PA. He may be contacted at lionius@erols.com.

Franklin King (CE '96) works in the environmental division of Larson Design Group in Williamsport, PA.

Young entrepeneur

"The word exciting does not do this year justice," exclaims **Phillip G. Foreman**, (ArchE '85) president and founder of Foreman Program and Construction Managers (FPCM) which specializes in multiple prime construction management.

Reflecting on 1996, Foreman's confidence level should surely be on the rise. He was named one of the top forty executives in Central Pennsylvania under the age of forty by the *Central Penn Business Journal*. While celebrating this achievement, Foreman received word that he had been named the 1996 Central Pennsylvania Entrepreneur of the Year for Construction and Engineering sponsored by *USA Today*, NASDAQ, and Ernst & Young. In addition, Foreman is responsible for more than $190 million of the construction management work in Pennsylvania.

"I attribute my success to hiring the right people," comments Foreman. "You cannot succeed in this business without the proper team mix and employee support."

Foreman's father, Cliff, founded Foreman Architects Engineers (FAE), a full-service architectural and engineering firm, more than forty years ago. Phillip is now partner and part owner of both FAE and Foreman Computer Solutions, which creates computer-animated three-dimensional layouts based on building plans. With offices located near Harrisburg and Pittsburgh, Foreman's three companies employ nearly 100 people.

As a result of his business success, Foreman was able to create the Foreman Foundation in memory of classmate and Penn State Nittany Lion punter **John Bruno** ('87 Finance). "John and I were classmates at Penn State," explains Foreman. "He passed away in 1992 from melanoma. Now we at Foreman are determined to fight back and find a cure for this deadly disease." In its first year of existence, the Foundation donated $50,000 to the Penn State Hershey Medical Center to research a cure for melanoma.

Alumni-On-Line Participant Survey

To join the Engineering Alumni-On-Line program as a volunteer, please complete and return this Participant Survey to: **Engineering Alumni-On-Line Survey**
243 Hammond Bldg.
University Park, PA 16802-1400

Name _____

Preferred Address _____
(Indicate home or office)

_____
Street City

_____
State ZipCode

_____ _____
☐ I may be called at Home ☐ and/or Business

FAX _____ E-Mail _____

EDUCATION:

Penn State (include all degrees with year/major): _____

_____

Other Universities (include university/year major): _____

_____

Employer: _____

Job title or description: _____

Summary of professional experience since graduation: _____

_____

_____

_____

Other professional or recreational interests: _____

_____

_____

Significant accomplishments or awards: _____

_____

_____

P.E. Registration ☐ Yes ☐ No

List State(s): _____

Current and past volunteer activities: _____

_____

PSES Activities: _____

_____

Other current or past interactions with the University or College of Engineering: _____

_____

_____

AVAILABILITY TO COME TO PENN STATE:

☐ **University Park**	☐ Weekday	☐ Weeknight	☐ Weekend
☐ **Commonwealth Campus**	☐ Weekday	☐ Weeknight	☐ Weekend

VOLUNTEER ACTIVITIES AND PROGRAMS:
(please check one or more)

Education/Career Counseling:

☐ Speaking or serving on a panel at student group meeting or for a summer program

• preferred type of group _____

_____

• preferred topic(s) _____

_____

☐ Speaking to or instructing a class:

• about your career (specify discipline) _____

_____

• about your company (specify topic) _____

_____

• on technical subject area (specify topic) _____

_____

☐ Providing design project case studies
(discipline) _____

☐ Serving as a consultant to a student design team (discipline) _____

☐ Conducting a group tour of your company

☐ Hosting a job shadow for a day

Recruiting:

☐ Making recruiting calls to high school student prospects

☐ Serving as mentor to students by phone or E-mail

☐ Participating in career fair at the Open House or other College recruiting event

Employment/Job Opportunities:

☐ Listing jobs for co-op students or interns
(specify majors) _____

_____

☐ Listing job opportunities for graduates:
• Indicate level(s) ☐ BS ☐ MS ☐ PhD
(specify majors) _____

_____

☐ Participating in job relocation network
(contact person in community for alumni moving into the area)

Research and Development:

☐ Partnership in research (technological areas) as:

_____

_____

☐ Industrial affiliate and/or ☐ sponsor of research project (specify topics) _____

_____

☐ Guest speaker to faculty groups (specify topics)

_____

_____

_____

For more information, contact Anita Todd, (814) 863-1032 (tel); (814) 863-7496 (fax); or coop@engr.psu.edu

1997 Student Marshals

Each spring at the College of Engineering's commencement ceremonies, one student from every department has the honor of being named student marshal. Student marshals are chosen on the basis of their academic achievement and contributions to the College. The following were student marshals for spring 1997 graduation ceremonies. They're the best, and we're proud to introduce them!

Aerospace Engineering
John R. Fulmer of Lancaster, PA

—Member of AIAA; Aerospace Honor Society—Awarded the Penn State Academic Excellence Scholarship; PSES Scholarship; Dean's List every semester—Attending graduate school in aerospace engineering

Agricultural & Biological Engineering
Amy Kaleita of State College, PA

—Member of the Marching Blue Band; treasurer of the National Engineering Honor Society—Participated in the University Scholars Program—Attending graduate school in civil engineering at University of Illinois

Architectural Engineering
Gregory A. Spaulding of Strasburg, PA

—Member of the Lion Ambassadors; SSAE; Glee Club; Soccer Club; ACI Fiber Reinforced Plastic Beam Competition—Awarded the AE Structural Engineering Scholarship-Cagley & Associates; Ewing Cole Cherry Brott GPA Award; REU Scholarship for Outstanding Undergraduate Research—Beginning a career in structural engineering

Chemical Engineering
Carolyn S. Nestleroth of Manheim, PA

—Member of AIChE; Usher for the Center for the Performing Arts; VP of University Lutheran Parish—Awarded the 3M Engineering Scholarship; Evan Pugh Scholar Award; Merck & Company All-around Junior Award—Employed by Merck as an environmental engineer

Civil Engineering
David A. Thompson of Duncansville, PA

—Member of ASCE; the National Engineering Honor Society; Golden Key National Honor Society; ASCE Steel Bridge Team; National Civil Engineering Honor Society—Awarded the Evan Pugh Scholar and President Sparks Awards; and President's Freshman Award and Baccalaureate Degree Award from Penn State Altoona; and the Helen Wood Morris, Bayard B. Kunkle; Thomas A. Mekis Scholarships; —Pursuing structural engineering career

Computer Engineering
Justin Connors of Waynesburg, PA

—Served as a desk consultant in the Center for Academic Computing—Awarded the University Scholars Program's Academic Excellence Scholarship—Employed by IBM in Microprocessor Development

Computer Science
David B. Helfrick of Waynesboro, PA

—Member of the Golden Key National Honor Society—Awarded the Anderson Consulting Scholarship—Pursuing a career in computer science

Electrical Engineering
Feng Zhang of Collegeville, PA

—Member of IEEE; participant, University Scholars Program—Awarded the Evan Pugh Scholar Award, President's Freshman Award—Pursuing a Ph.D. in electrical engineering

Engineering Science
Neil A. Bomberger of Harrisburg, PA

—Member of SES; Intramural sports-basketball, soccer, football, softball—Awarded the Evan Pugh Scholar, President Sparks, and President's Freshman Awards; received the Penn State Academic Senate, Bayard D. Kunkle, Academic Excellence, and PSES Scholarships; —Attending Boston University's Ph.D. program in Cognitive and Neural Systems

Industrial Engineering
Jason T. Kirk of DuBois, PA

—President of the ASQC; secretary of the American Foundrymen's Society and the IIE—Awarded the Evan Pugh Scholar Award; participant, University Scholars Program—Pursuing a masters degree in industrial engineering at Penn State

Mechanical Engineering
Michael K. Medaska of Oakland, NJ

—Member of ASME; ME Honor Society; student-faculty liaison, National Engineering Honor Society; intramural softball; indoor soccer—Awarded the Fred B. Schneider Scholarship in ME; Thomas and Dorothy W. Hallowell Scholarship; Class of 1934 Grant-in-Aid Award; participant, University Scholars Program—Pursuing a master's degree in mechanical engineering at Georgia Tech

Nuclear Engineering
William S. Miller of Curwensville, PA

—Member of the American Nuclear Society—Awarded the National Collegiate Engineer Award—Pursuing a master's degree at Penn State in nuclear engineering

ROTC (major: Computer Engineering)
Patrick T. Bayer of Midlothian, VA

—Head coach, PSU Women's Soccer Club, Executive Officer-NROTC, Racquetball teaching assistant—Awarded the ROTC Scholarship, Anderson Consulting Scholarship, Eta Kappa Nu, Quarterdeck Society, Tau Beta Pi, Scabbard & Black Honor Society—Navy Commission as an Ensign and Navy Nuclear Power School, future M.S. in electrical engineering ■

Lily Wang, a graduate student in acoustics, discusses her research display with Cheng Dong, assistant professor of bioengineering and engineering science and mechanics and a judge at Penn State's 12th annual Graduate Research Exhibition this spring. Wang's research exhibit, "Characterizing the Radiated Sound Field around a Violin Source using Planar Nearfield Acoustic Holography," earned her a third place award in the exhibit. The exhibition included research displays of nearly 150 Penn State graduate students who competed for awards totaling $10,000.

National Engineers Week

"Engineers Make a Difference" was the theme of this spring's annual National Engineers Week. For the first time, students from Penn State's National Society of Black Engineers (NSBE) teamed-up with Motorola to host an Engineering Expo at the Nittany Mall in State College.

All events at the Expo emphasized the impact engineers have on society, and some activities were specifically geared toward children. Students from Penn State's American Helicopter Society chapter held a paper plane contest for kids, demonstrating basic principles of aerospace engineering. For an audience of children, one member of the NSBE demonstrated a lemon-powered clock.

Other student societies from Penn State's College of Engineering participated in the Engineering Expo, which gave community members a hands-on introduction to the vast field of engineering. The Society of Women Engineers ran a trivia booth modeled after the Jeopardy game show, asking questions that focused on engineering, math, and science.

A highlight of the Expo was no doubt the mousetrap car design contest with student participants from the Mount Nittany Middle School in State College. For about three weeks prior to the event, students from the middle school worked on designing their cars with guidance from Penn State students. The cars were judged at the Expo, and participants were awarded prizes. ■

You may contact Saundra Johnson, NSBE adviser and director of the Minority Engineering Program, at (814) 865-7138, or sdjdo@engr.psu.edu.

NSBE members Sabrina Dixon and Steve Henry take a break during the Engineering Expo.

Students from the Mount Nittany Middle School eagerly await their turn to race cars built for the Expo's mousetrap car design contest.

Roger Thies' story isn't so unusual

Roger Thies, architectural engineering major—environmental option with a specialty in mechanical systems, is confident as he presents his senior thesis/project to the AE department's faculty jury in April. Thies is more assured than many college students expecting to graduate this year—he already found a job in his field!

Before Christmas, more than thirty engineering firms from around the country invited Thies to visit and interview. He decided to talk with fifteen companies before accepting a position in early January with JDB Engineering of York, PA. Since accepting the position, he's gotten several other job offers and more than ten additional invitations to interview with engineering firms.

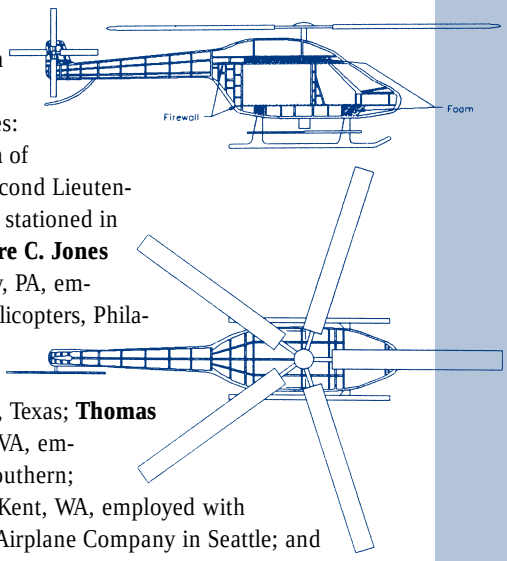
Sounds like a lucky guy, right? According to the AE department, Thies' story isn't so unusual. Typically, AE students at Penn State are heavily recruited by industry and have several job offers before graduation. The high demand for these graduates is due, in part, to the few AE programs in existence throughout the country. Penn State's AE program is even more unique because here, undergraduate AE degrees require five years of study. Penn State is also the only school in the country offering a Ph.D. in the field.

Penn State students win honors from American Helicopter Society

Penn State aeronautical engineering students once again earned top honors in the thirteenth annual American Helicopter Society (AHS) International Vertical Flight Organization Student Design Competition. Penn State students share first place honors with the U.S. Military Academy, tying in the undergraduate category. The Penn State team received a $1500 cash award. Georgia Institute of Technology won the graduate-level competition.

Sikorsky Aircraft Corporation was the sponsor of the competition which challenged students to design a fire fighting helicopter which could most quickly fight and squelch a 200-acre forest fire burning for ten hours prior to intervention. Design requirements were not fully specified and students created the designs by carefully evaluating the prescribed situation to determine a design strategy. Factors such as the type, size, and number of rotorcrafts needed to most efficiently perform the fire-fighting job were considered, while also attempting to minimize project costs.

The award-winning Penn State aerospace engineering team was advised by faculty members **Edward C. Smith** (AERSP '88) and **Farhan S. Gandhi**, assistant professors of aerospace engineering. Student team members included the following, all of whom are 1996 Penn State aerospace engineering graduates:



Michael J. Bryan of Uniontown, PA, a Second Lieutenant in the U.S. Army stationed in El Paso, TX; **Theodore C. Jones** of Huntingdon Valley, PA, employed by Boeing Helicopters, Philadelphia, and temporarily assigned to the Bell Helicopter Plant, Texas; **Thomas Mallon** of Roanoke, VA, employed by Norfolk Southern; **Sharon M. Spatz** of Kent, WA, employed with Boeing Commercial Airplane Company in Seattle; and **Ryan W. Vallieu** of Lexington Park, MD, employed by the U.S. Navy Air Warfare Center at Patuxent River, MD. ■

Dr. Edward Smith may be contacted at (814) 863-0966, or ecs@rcoe.psu.edu; Dr. Farhan Gandhi at (814) 865-1164, or fxg11@psu.edu.

WEP students volunteer for BuildPEN

An all-female Penn State team installed high speed network wiring this spring to modernize the computer facilities at Radio Park Elementary School in State College. Participation from Penn State's Women in Engineering Program (WEP) was coordinated by **Marilyn Scott**, an architectural engineering major from Tunkhannock, PA.

Splicing and connecting—getting "wired" for Internet technology.

The team is part of a state-wide volunteer effort known as the BuildPEN Partnership that expects to improve the wiring in 200 schools across Pennsylvania so they could be connected to the Internet. PEN stands for the Pennsylvania Education Network and is the centerpiece of Governor Tom Ridge's Link-to-Learn education technology initiative. Link-to-Learn complements the BuildPEN Partnership by providing $121 million over three years to supply schools with computer equipment, planning expertise and other resources.

Scott says, "March was designated 'BuildPEN Month' and during that month, many schools across the state benefited from the efforts of volunteer groups and the gifts of corporate partners. In general, corporations provided the materials and the local communities provided the 'person power.' "

Volunteers from the College of Engineering included: **Lisa Brown**, a chemical engineering major from Waynesburg, PA; **Deanna Corbett**, a graduate student in civil engineering from Philadelphia; **Delphine Lee**, an environmental engineering major from Fort Washington, PA; **Rose Marra**, director of Engineering Instructional Services at University Park; **Taralee Sanduskey**, a general engineering major from St. Clair, PA; and Scott. ■

You may contact Penn State's WEP Director, Barbara Bogue, at (814) 863-1080, or bxbdo@engr.psu.edu.

Envisioneers debut Nittany Newtonian

It's flash was bigger than its dash! It was orange like a carrot, and sort-of shaped like one too. They called it "the Peeler!" and it was one of six cars entered in the first annual Nittany Newtonian, a soap-box derby race. Held this spring during the College of Engineering Open House, the race was hosted by the Envisioneers, student members of The Leonhard Center for the Enhancement of Engineering Education.

"We didn't start building our car until very close to the day it had to qualify for the real race, and most of the functioning parts were built in basically a week," explains **Peter James Graffeo** (ME '97), member of the student chapter of the American Society of Mechanical Engineers. Referring to their third-place finish in the race, he continues "Our car did pretty well considering we were still adding some finishing touches the morning of the race."

"The Peeler"

Friends, family members, and Open House visitors made a human chain along the racetrack—usually a sidewalk—from Old Main to College Avenue, rooting for their favorite cars.

Each car represented a different engineering society, which built and raced their car during the two-hour event. Two cars raced at once, and their times were posted on a student-run scoreboard. Each car had several chances to race before slower ones were eliminated from the competition.

Envisioneer **Chris Sandvig** (IE '97) served as a lively MC for the event, keeping the crowd entertained between races with an extemporaneous comedy routine that even included the auctioning of various buildings on campus. (Bids to buy the Hammond Building went as high as $1.50, and the purchaser was instructed to "pick-up" the building after the race!)

The race was also sponsored by the American Society of Mechanical Engineers and the Engineering Coalition of Schools for Excellence in Education and Leadership. Cash prizes were awarded to each member of the winning teams, as well as to the student society which their team represented. ■

Second place in the race went to the student chapter of the American Nuclear Society, with University Scholar Ai Morii as the driver (above). She is a third semester student with a dual major in nuclear engineering and music.

Team members from the student chapter of the Institute of Industrial Engineers put the finishing touches on their car near the starting line before their turn to race. The car finished in first place.

The Last Word—
A Curriculum for the 21st Century

by David N. Wormley, dean

As we prepare for the 21st century, we have devoted considerable effort to determining the characteristics of an engineering curriculum that will best prepare our students for their careers and lives in the 21st century. Guiding these curriculum revisions is the Advisory Board for The Leonhard Center for the Enhancement of Engineering Education, as well as extensive discussions with and surveys of our alumni, current students, and our various advisory boards. We believe our curriculum should prepare our students to be "world-class engineers" who possess the abilities to make significant contributions to society.

The attributes required of a "world-class engineer" include being aware of the world, solidly grounded in a discipline but with broad-based technical skills, effective in group operations, versatile, and customer oriented. Additional abilities that engineers must possess to be effective include: strong communication skills, the ability to work productively in teams, an understanding of engineering practice in the global economy, and the ability to continue to learn.

Teaching these skills and attributes is fundamentally changing our courses, both the ways we teach students, and the content as well. For example, in many engineering courses, projects and assignments are now group oriented, so that students begin developing teamwork skills from their first year. And the rapid increase in computer technology—with the Internet and distance learning technology—is providing opportunities for collaboration on projects and assignments between schools and universities to an extent never before possible.

In the last few years, we have established a number of new programs as we develop our new curriculum. In cooperation with the Department of Electrical Engineering, The Leonhard Center for the Enhancement of Engineering Education has established an Engineering Leadership Development Minor which introduces students to fundamental elements in leadership and to the relationship between engineering and business. Introduced last fall, the minor has already drawn significant student interest, with thirty-five students from eight majors enrolled the first year.

Additionally, to provide students with the depth of understanding and experience in team work, we established The Learning Factory in 1995 to support student-oriented design and manufacturing activities associated with senior design projects, national student competitions, and core subjects in design and manufacturing. This "factory" utilizes the very strong support and advice of an industrial advisory board which not only provides financial support, but more importantly, presents current industry-based problems for student projects each semester. The projects provide students an understanding of the multitude of constraints and issues to be addressed when developing effective solutions to real-world problems.

In a third effort, we have undertaken a major study of the overall curriculum with an emphasis on the introductory courses. This study has led to a revamping of the freshmen introduction to engineering course (see the photographs on the back cover). Furthermore, a group of our faculty are now working in concert with faculty from physics and mathematics to develop courses that will provide students with a strong fundamental basis in physics and mathematics while relating these subjects to their engineering applications (see the related story on the GE Curriculum Development Grant on page 13).

In addition to such fundamental changes in the curriculum content, groups of faculty are developing ways to utilize multimedia technology and the World Wide Web to provide more effective teaching techniques. Students can gain an increased understanding of concepts from the demonstrations, the visualizations, and their interactions with peers in projects and homework by using multimedia and World Wide Web technologies. In fact, several of our faculty who utilize these techniques and who have developed other effective classroom techniques were recognized with University-wide teaching awards this year including Steve Turns and John Cimbala (see page 15).

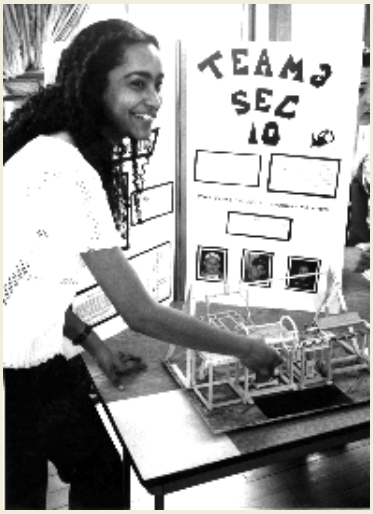
Thus, as we look forward to entering the 21st century, the commitment of our faculty and the support of our alumni and industrial partners in developing curricula which can truly prepare our students to make effective contributions is a continuing strength of the College. We in the College, eagerly look forward to these transformations that will continue to build upon our strengths, but also fully utilize the improvements and technology and in our understanding of the needs of engineering education for the future.

As we continue our efforts in these areas, we welcome comments from our alumni and friends who have always provided salient and focused comments to help us provide an education which serves our students well. ■

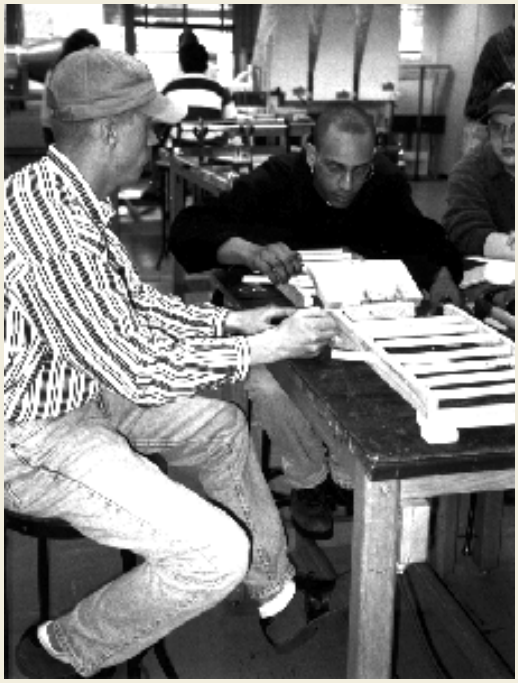
First-year students redesign a Corning workspace

This spring, first-year engineering students from the engineering design and graphics 100 class (ED&G 100) were challenged to redesign a workspace unit in the production line of the Corning factory here in State College. Students built scaled, working prototypes of the workspace to accommodate a new product line which is not manageable in the factory's current workspace.

This was the first time first-year engineering students had been assigned an industry-sponsored project and the results were very successful. (Watch for a longer story on this award-winning course in the fall issue of *Engineering Penn State*!)



At the end of the semester, first-year students demonstrated and explained their team's prototype of a new workspace unit during The Learning Factory Project Showcase in the HUB Ballroom. One student (above left) shows Associate Dean Rob Pangborn and Corning representative Mike Dillon the prototype later chosen as "Best Engineering Design." Nada Al-Samhan (above right) smiles as her team's prototype is awarded "Most Creative Design."



In the lab, students begin the task of building their prototypes after problem analysis and a visit to the Corning factory.

The Association for Educational Communications and Technology presented their 1997 Outstanding Practice Instructional Development Award to Penn State's ED&G 100 course—taken by most first-year engineering students.

PENNSTATE

College of Engineering
The Pennsylvania State University
101 Hammond Building
University Park, PA 16802-1400

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