

Engineering

The Magazine

of the Penn State College of Engineering

P E N N
S T A T E

Summer 2002



Merging
IT and Industry

Barbara Bogue, director of the Women in Engineering Program, received the Rosemary Schraer Mentor Award from the Commission for Women. The honor is given to University employees who have a record of outstanding mentoring service going beyond the requirements of their employment.

Ronald Foflygen, an engineer with the Penn State Facilities Engineering Institute, was recognized by a resolution from the Pennsylvania Historical and Museum Commission. The resolution praised Foflygen's consulting efforts in installing and maintaining the commission's fire and security systems throughout its historic sites and museums.

Mohsen Kavehrad, W. L. Weiss Chair Professor of Electrical Engineering, was awarded the Neal Shepherd Best Propagation Paper Award by the Institute of Electrical and Electronics Engineers Vehicular Technology Society. He co-authored "Indoor Wireless Infrared Channel Characterizing by Measurements," with Mohammad R. Pakravan, who received his Ph.D. under Kavehrad's supervision, and Homayoon Hashemi, professor of electrical engineering at Sharif University of Technology, Tehran, Iran.

Soundar R. T. Kumara, professor of industrial and manufacturing engineering, received the University's Faculty Scholar Medal for Outstanding Achievement. Kumara was honored by Penn State for his fundamental contributions to the field of intelligent systems; for developing novel signal representation and fusion techniques in process monitoring and diagnosis; for proving the existence of chaos in machining processes; and for his work in multi-agent systems for logistics and information warfare.

Akhlesh Lakhtakia, professor of engineering science and mechanics, was listed as one of the top 25 authors in optoelectronics by ISI, a company that provides access to high-value, essential information for researchers and scholars worldwide. From 1991 to 1999, Lakhtakia authored 89 papers in

the field, earning 7th place on the list. His papers were cited 488 times during the same period, for an average of 5.48 citations per paper.

Eric Mockensturm, assistant professor of mechanical engineering, received a five-year, \$375,000 grant from the National Science Foundation's Faculty Early Career Development (CAREER) program. Mockensturm's NSF research will center on the mechanics of a manufacturing process known as web handling.

Gerson (Gus) Rosenberg, Jane A. Fetter Professor of Surgery, professor of bioengineering, and chief of artificial organs at the Penn State Milton S. Hershey Medical Center and College of Medicine, was named 2002 "Engineer of the Year" by the readers of *Design News* magazine. Rosenberg was cited for his pioneering efforts in the design and development of pumps to assist or replace failing hearts. *Design News* is read twice monthly by 335,000 engineers who design products ranging from autos to spacecraft.



Ed Smith, associate professor of aerospace engineering, won the 2002 American Institute of Aeronautics and Astronautics Sperry Award. This award recognizes outstanding contributions to aeronautics or astronautics by an AIAA member under 35 years of age.

H. Joseph Sommer, professor of mechanical engineering, was presented with the Milton S. Eisenhower Award for Distinguished Teaching. The award recognizes outstanding efforts among Penn State's tenured faculty, employed full-time for at least five years, with undergraduate teaching as a major portion of their duties.

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4 Engineering the new economy

A special look at how research at the College of Engineering is shaping the merger of information technology and manufacturing.

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On the cover



Current and future students studying to become industrial and manufacturing engineers are being taught to use a variety of the latest technologies, including this robot supplied to the College by ABB Robotics. Engineers will learn how to program these machines to execute specific tasks, just like on a factory floor.

Engineering the new economy

The Industrial Age
and Information
Age are melding to
forge new, exciting
possibilities



Monika Lozinska-Lee



Foreward

Faster. Smaller. Customized. Integrated. They are enduring trends that have shaped the history of the manufacturing enterprise since its inception. While technological innovations have brought continued incremental improvements, it is a rare occasion when new technology has such impact that existing assumptions no longer apply.

Today industry and manufacturing are at a unique point in history as we experience the confluence of two major technological innovations. These include nanotechnology, as described in the last issue of *Engineering Penn State*, and information technology. IT enables intelligent integration and control at a level unprecedented in history. From shop floor machines to supplier networks, computing capability has produced an infrastructure that seamlessly integrates vast arrays of information. Rather than viewing the organization as a collection of individual entities, the dream of understanding and controlling the complex enterprise as a fully integrated system is now within reach.

In the following pages, you will read about how Penn State researchers are establishing the core knowledge and defining the future of industrial and manufacturing engineering. These innovations are being rapidly deployed within the industrial arena and throughout the educational curriculum.

Penn State engineering students hone their skills in the Factory for Advanced Manufacturing Education (FAME) Laboratory, which boasts some of the most advanced technology in the country. More on the FAME Lab can be found on page 8.



—**Richard Koubek**, head
*Harold and Inge Marcus
Department of Industrial and
Manufacturing Engineering*

Today's factory floor is a far cry from the manufacturing plants of the past. Computer-controlled robots have propelled productivity. Networks have forged new avenues of communication between suppliers, manufacturers, and customers. Consumers can customize, order products, and monitor the progress of their order through the Internet.

And that's just for starters.

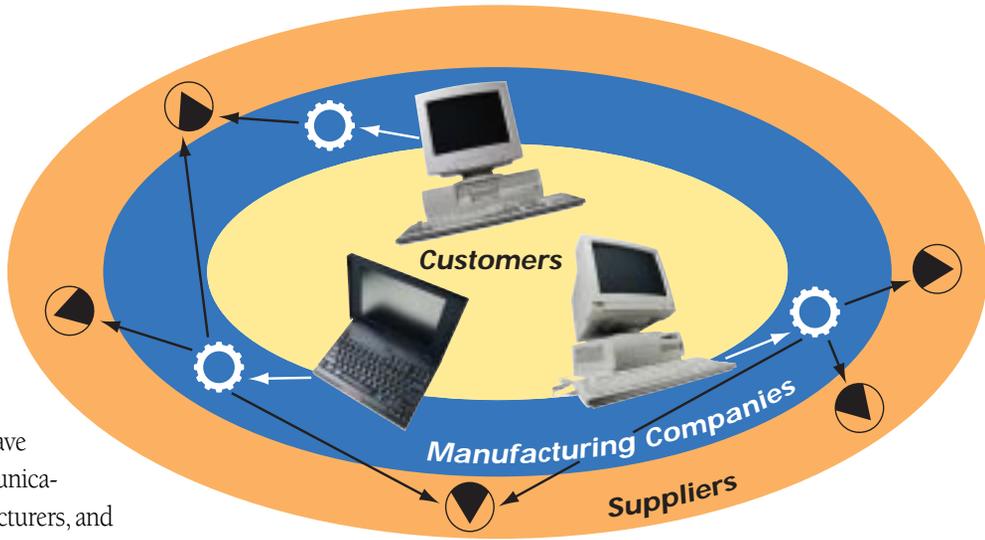
The new economy is constantly evolving as engineers devise innovative ways of fusing information technology (IT) with manufacturing. In this emerging field, Penn State engineers are pioneering new territory in extended enterprise, customization, sensors, and survivability.

A more perfect union

In the old days, individual components were manufactured in several locations before being shipped to another locale for final assembly. Factories didn't communicate with each other regularly. Breakdowns or shortages in one area crippled an entire operation. But that is shifting as businesses utilize IT to make whole the sum of their parts.

"Next to e-business, enterprise integration is the biggest thing going on," says **Ravi Ravindran**, professor of industrial engineering. "It's happening big in companies now. The way things used to be, units operated independently with their own databases and such. There was no central way to access information."

Critical data wasn't shared in a timely manner between areas such as marketing, manufacturing, and accounting, Ravindran explains. Today's businesses face volatile demand,



shorter production cycles, and information overload. By fostering interconnectivity between units, entrepreneurs can achieve quicker time to market, reduce inventory levels, raise quality, lower costs, and increase customer satisfaction, he says.

This value net illustrates the relationship between suppliers, manufacturers, and customers.

"In the digital world, the supply chain is called a value net, where the physical supply chain is connected to the information market infrastructure," says **Soundar Kumara**, professor of industrial engineering. "Everything is connected, so what happens on the factory floor also impacts the supplier two or three levels below."

Kumara is working with General Motors' Enterprise Systems Laboratory to develop an Order to Delivery (OTD) simulator system. As the name implies, the OTD monitors the time it takes between order placement and delivery.

"We collected data on how long it takes to put a car out, how long it takes to get to a dealer, and when customers can get it," Kumara states. He and GM's Jeff Tew included factors such as machine utilization and the time taken to create specific car configurations.

"We made the OTD system Web-based so that many people at GM could access it. Each decision maker needs a different type of data," Kumara says. For example, one person

might need to know about machine use, another breakdown statistics.

He says the next phase involves optimizing the way cars are delivered. Kumara envisions that finished cars waiting for shipment might be equipped with electronic tags. The vehicles can then be more easily organized for transport.

“We want to maximize utilization of the trucks and trains used to get these cars to dealers while still satisfying the deadlines to get them there,” he says.

Optimization is also the focus of research by **Vittal Prabhu**, assistant professor of industrial engineering. Prabhu is exploring methods to optimize the decision-making process for manufacturers by researching algorithms and hardware architectures to model man-made systems. His research is similar to the way meteorologists use mathematical equations and super-computers to model weather patterns.

“There are so many options and combinations possible that supercomputing is absolutely necessary. If you buy the fastest supercomputer today, you can’t harness the algorithms we’ve devised to take advantage. What we’re researching is putting together the speed *and* the smarts,” he says.

Buying a supercomputer also was not practical because of the size (“It’s about the size of seventeen adult elephants—you couldn’t put it on a factory floor,” Prabhu states) or the cost (about \$110 million, according to him). Instead, his team constructed their own supercomputer called PRIDE, or Parallel Recon-figurable Intelligent Decision Engine, to run the algorithms. “We built a pro-

Irene Petrick, assistant professor of industrial engineering, and Paul Cohen, distinguished professor of industrial engineering, are working on a ‘digital roadmap’ to aid manufacturers in new product development and process technology selection.

totype for about \$30,000 or \$40,000 in the lab using off-the-shelf components,” smiles Prabhu.

Ideally, these computers could be networked to provide a constant stream of data. “It scales up from a shop floor to a plant to an entire chain. It’ll propagate relevant information and let all decision makers adapt simultaneously,” he says. “For example, as market conditions change, Ford or GM can decide the amount of supplies each tier needs to keep up with production and keep customers happy.”

Irene Petrick, assistant professor of industrial engineering, and **Paul Cohen**, distinguished professor of industrial engineering, are developing what they call a ‘digitized roadmap’ that will aid manufacturers in new product development and process technology selection.

“Industry sectors and companies have been doing some form of roadmapping for years,” Petrick states. “What new technologies are needed to create the next product family? What *continued on page 9*



Momika Lozinska-Lee

Engineering's factory floor

The Leonhard Building's October 1999 opening marked a turning point in the way Penn State engineers are trained in manufacturing. At the building's core sits the 10,210 sq. ft. Factory for Advanced Manufacturing Education (FAME) Laboratory.

The FAME Lab is equipped with the latest production technologies, including computer-integrated manufacturing (CIM) cells, robotics, and rapid prototyping machines.

"It's gigantic," marvels **Ed De Meter**, associate professor of industrial engineering and one of the many instructors who uses the facility. "The biggest difference was when we were in the Engineering Units, we didn't have the space to have these computer numerical control (CNC) machines. Everything was done on paper."

The new FAME Lab changes all that by giving students the experience of what it is like to work on a modern integrated factory floor, equipped with state-of-the-art CNC machines, robots, and automated guided vehicles for moving materials. Human operators control the lab's robots from the second-floor CIM and Robotics Laboratory overlooking the factory floor.

"The inclusion of computer controls and computer monitoring is a lot different than the old machines, observes **Joe Sanfilippo**, an industrial engineering junior.

Engineering students train on the same state-of-the-art equipment used in industry in the College's FAME Laboratory.

De Meter's course in production engineering is just one of the many classes that utilizes the lab. "I give them a part print, and the students carry out the design process," De Meter explains. "I give them a blank, and the students go from machine to machine. I then inspect the part to see if it meets the specifications I originally gave."

Use of the FAME Lab isn't restricted to class time only. De Meter says students have the option of signing up to use the lab's machines on nights to work on projects. He adds that the facility is always staffed with expert technicians who answer students' questions and troubleshoot.

Andrew Cassel, an industrial engineering senior, believes the FAME lab training gives students an advantage when job

"You can come out of school and go to Ford or GM and say, 'We've already done these things.'"

hunting. "They're trying to set up the system to mirror what companies do, so we can just hop in on the job," he explains. "You can come out of school and go to Ford or GM and say, 'We've already done these things.'"

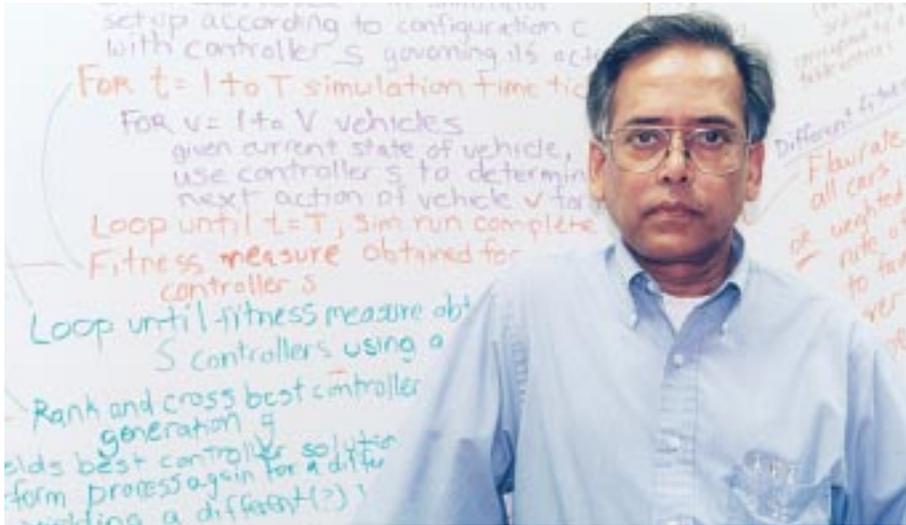
Despite its high-tech aspirations, the FAME Lab hasn't forgotten its roots. The facility is also equipped with elements of a traditional manufacturing plant: casting, welding, machining, forming, injection molding, and assembly.

"I think it's tremendous," Cassel says, adding that the lab is the object of envy for engineering friends who don't attend Penn State. "I have a friend from Pittsburgh, and I showed him the lab, and he said the newest equipment they have is twenty years old!"

—Curtis Chan



Momika Lozinska-Lee



According to Soundar Kumara, connectivity and customization share a “chicken-and-egg” relationship. The professor of industrial engineering says greater connectivity fosters greater customization. Greater customization, in turn, demands more connectivity.

R&D projects should be mounted to support next generation products? We’ve been asking and answering these questions, often employing white boards or PowerPoint software to graphically represent the linkages between R&D, technology evolution, and product development.”

The problem with the traditional roadmap is that it’s a snapshot in time. Moreover, it’s not in a format that is easily shared, reconfigured, searched, or updated. Petrick and Cohen envision the digitized roadmap as a dynamic document accessible to everyone, updated constantly to reflect the latest information. Once digitized, roadmaps can be evaluated across industry sectors or across companies.

“By capturing the elements (the technologies, the R&D projects, and the planned products) instead of just the linkages, the digital roadmap becomes the basis for company planning and for integrating R&D investments across the supply chain,” she explains. “Now information can be used to plan forward and time developments of future products or plan backwards and invest in R&D to create new product opportunities.”

The digital roadmap also would be an indispensable tool for displaying options on how to manufacture an item, otherwise known as process technology selection.

“For example, if I am an automobile manufacturer, and I want to build a tire rod with specialized features, the digital

roadmap would tell me I can forge it, cast it, or use powdered metals. I can even look at technologies that are forecasted and plan for them,” Petrick says. “Industry sector roadmaps will help companies identify processing technologies and sensors on the horizon, showing promising developments that can be incorporated into company manufacturing plans. They’ll also identify the capabilities that aren’t out there, thus guiding additional R&D planning.”

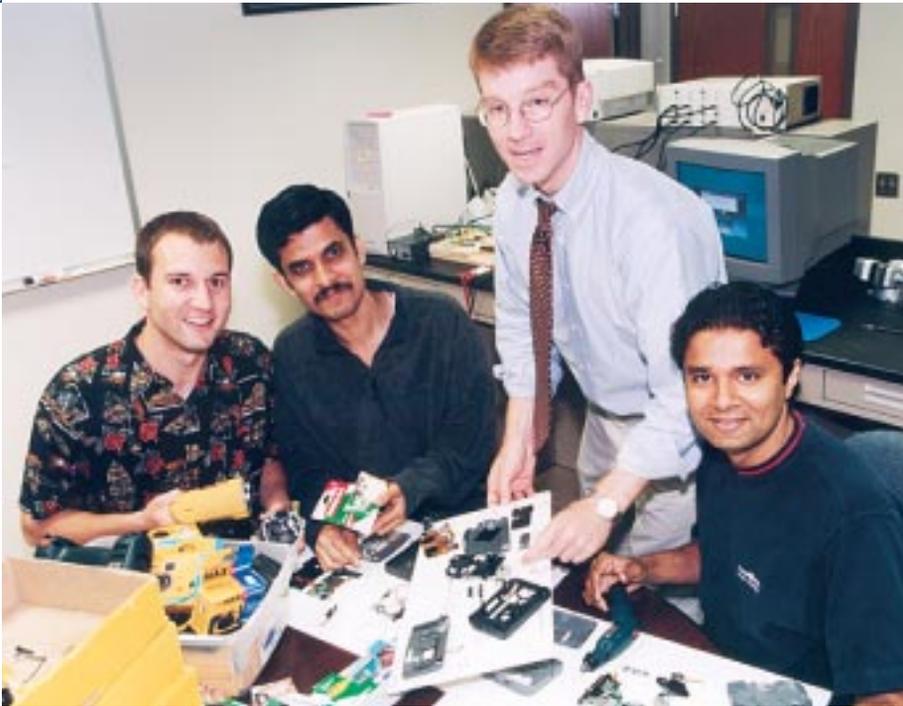
Your way, right away

The marriage of IT and manufacturing is driving customization to new levels. Today’s shoppers can not only choose the color of a shirt ordered online, they can monogram their own backpacks or design their own athletic shoes from scratch.

“There used to be no interaction between customers, designers, and manufacturers,” Kumara states. “IT put into place the infrastructure for all these people to interact. Soon people will have a choice of customizing almost every product.”

Ravindran agrees manufacturers will be offering higher levels of customization. “We may not be making thousands of units, but hundreds or maybe just even one.”

A research team led by **Tim Simpson**, assistant professor of mechanical and industrial engineering, is examining



Momika Lozinska-Lee

Tim Simpson, assistant professor of mechanical and industrial engineering (standing), and his team of graduate students disassembles families of products to isolate common elements in customization. Pictured from left to right are students Gary Stump, Jyotirmaya Nanda, and Bryan D'Souza.

For example, when a customer orders a computer, every machine might utilize the same motherboard and

exterior case. Consumers can then customize these base machines by choosing more memory, a larger hard drive, or a faster graphics card.

By studying the variety of products that are available over the Web, Simpson hopes to develop a set of guidelines on how to tailor products and new software that will help companies design their product offerings for easy customization on the Web.

“These are design tools for engineers that won't be for just one industry,” Simpson states. He has already received a National Science Foundation Career Award grant for his research and is working with three companies—Flowserve, Ivalo Lighting, and Durametal Corp.—to understand the nature of the products they customize and the corresponding manufacturing capability needed to produce those products.

Because of the work's strong commercial component, Simpson has also teamed with **Jennifer Chang-Coupland**, assistant professor of marketing, and **Arvind Rangaswamy**, Anchel Professor of Marketing, to study the role the Internet plays in product design and customization.

customization's impact on a manufacturer's underlying product realization processes.

As part of his design optimization research, Simpson studies how customers interact with Web sites to customize products, how that interaction impacts a product's underlying architecture, and how companies can optimize sets of products that can be quickly reconfigured by customers.

Simpson says, “The Internet is such a rich medium—you can get very detailed on what you want to customize, like the size of your hard drive or speed of the processor of your new computer. As a company, you don't want to overwhelm your customers with choices, but you want to provide enough options so that they can satisfy their individual needs.”

Simpson's laboratory is filled with dissected products such as personal stereos, drills, coffee makers, and electronics. “We're trying to understand the complexity of the product itself and the manufacturing process involved,” he explains. “For instance, we are asking the question, ‘For this particular family of products being offered, what is the common platform from which all of these are derived?’”

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What's wrong with this picture?

Making sure things go smoothly throughout the manufacturing process will also become easier with IT. For years, Penn State engineers have been working on sensor technology with a multitude of applications. Work in machine vision, for example, could easily be applied to the factory floor.

Rangachar Kasturi, professor of computer science and engineering, believes machine vision is capable of capturing images and conducting analyses. He says machine vision can be used to find defects in manufacturing parts or ensure proper assembly.

Kasturi has already used his machine vision research for other applications, including automatic conversion of paper-based engineering drawings to electronic form for utilities such as telephone companies. With the help of **Rajeev Sharma**, associate professor of computer science and engineering, he developed a fuel gauge using computer sensors instead of wires to measure a tank's contents. He also teamed with **Octavia Camps**, associate professor of electrical engineering, to design a prototype obstacle avoidance system with NASA for airplane pilots.

Camps says many obstacles remain before an advanced form of computer vision will appear on factory floors, however. "When I first started, I tried to get the computer to recognize a stationary object," she recalls.

But as computers have grown faster and more powerful, Camps says her own research has moved on to getting machines to track moving objects in real-time. She envisions using not one sensor, but a network of sensors to track objects.

Camps is hard at work trying to get computers to understand how objects change shape as they move, as well as reconciling the data coming in from different sensors on a network.

continued on page 12

Graduate degree in manufacturing management integrates engineering, business

As more and more factory jobs leave the United States in search of cheaper labor, the need for manufacturing professionals who can work across traditional boundaries keeps growing.

Penn State's Quality and Manufacturing Management (QMM) Program—a one-year graduate program that leads to a master's degree in manufacturing management—is helping to address this critical problem.

"As a society, we must produce things that other people want," explains **Clayton O. Ruud**, co-director of the QMM Program and professor of industrial engineering. "We can't sell hamburgers to the whole world and expect to maintain our present quality of life. We have to continue manufacturing. We just have to do it smarter and better than anyone else."

In the QMM Program, students learn to integrate engineering and business principles in a unique collaboration between the College of Engineering and the Smeal College of Business Administration. Jointly taught by faculty from both colleges, the QMM Program takes an interdisciplinary approach to educating world-class manufacturing managers.

"Almost every class touches on both engineering and business issues. There's a dual focus," says QMM alumna **Ashley Barnes Basilio** (ESci '98, MMM '99). Basilio is a manufacturing assembly engineer for Harley-Davidson Motor Company in York, PA.

The QMM program emphasizes a team-based approach to a wide array of manufacturing management issues, including product design, process development, plant design, capacity management, product distribution, product costing, quality management, workforce organization, strategic planning, and supply chain management.

Often referred to as "QMM Boot Camp," the program is highly competitive and rigorous.

"The intensity prepares our students very well for the manufacturing environment," explains Ruud. "It's very high pressure. They have to combine what they're learning about business and engineering with interpersonal and communication skills in order to do well in the program."

Basilio concurs with that assessment. "In manufacturing, emotional intelligence is equally as important as technical expertise," she says. "The QMM Program really drives that point home."

—Jane Harris

To learn more about Penn State's QMM Program, call 814-863-5802 or check the Web at www.qmm.psu.edu.

“We are in a
knowledge economy
where we need to
learn more quickly
and effectively.
The link between
data and action
is knowledge.”

“We humans are very good at seeing with our eyes and understanding. It’s teaching the computers that’s hard,” she laughs.

Teaching the computer is a trick that Kumara is also trying to accomplish. In his case, he wants self-adapting machines to use sensor data for their own health monitoring.

“It’s like our bodies—we sense things and the immune system takes action,” Kumara says. “But how do you process and represent these sensor signals?”

Kumara teamed up with **Akhlesh Lakhtakia**, professor of engineering science and mechanics, to tackle the problem of machine reliability. They devised what Lakhtakia calls a “boundary of acceptable limits” where a part or machine can no longer be considered stable enough for use.

Using Lakhtakia’s expertise in fractals, the two engineers were able to analyze sensor signals to determine the dimensionality of a system.

“Instead of saying we need to replace a tool every 20 days, we already know when to replace it,” Lakhtakia says.

Wireless technology may also be employed to help cope with equipment failure. “If a machine is going to fail, it can automatically send a signal to a part supplier for the replacement part or schedule maintenance—all in real time,” Kumara states.

A more dangerous world

Even more vexing to engineers is how to maintain an IT infrastructure in the face of catastrophic failure. In the wake of last year’s terrorist attacks, safeguarding this infrastructure has suddenly become a major priority.

“Looking at a value net, it’s a big network with several nodes and links. All of these are networked together. Given what happened on 9/11, a lot of people are concerned about security,” Kumara explains. “There can be physical attacks—people can bomb your plant—or information attacks—people can destroy your data. The question is, how survivable is your network?”

Through a project funded by the government’s Defense Advanced Research Projects Agency, a team including Kumara, **Gautum Natarajan**, assistant professor of industrial engineering, and **C. R. Rao**, professor emeritus of statistics, is investigating the survivability of military supply chains using complexity theory and pattern recognition.

“We simulate a large network and see what happens under various conditions. We introduce corrupt data, change the available central processing unit, break off nodes, and see the changes of the agents on various networks,” Kumara says. “By observing the resulting pattern of emergent complex behavior, we are trying to predict the level of survivability of a network.”

The team defines survivability as getting a particular response under threat. “Given the threats now,” he continues, “how can we secure the network infrastructure and content? Conceptually, this is a very simple problem. But from a theoretical and implementation view, this problem is a real nightmare.”

The final piece of the puzzle

The most important component of all in the IT-manufacturing equation, the engineers say, remains the human decision makers. These tools, they say, merely facilitate better decision-making for manufacturers.

“We are in a knowledge economy where we need to learn more quickly and effectively,” Petrick explains. “The link between data and action is knowledge.”

—Curtis Chan



Going the distance

In a typical engineering design class, students come up with a concept, build a prototype, and that's where it ends.

But a two-semester course in industrial engineering takes the process a step further. Not only must students in IE 4971: IME Inc. design a new product, they must also produce it in volume.

"We want students to experience what it takes to go from prototype to production—and all the costs associated with it," says **Sanjay B. Joshi**, professor of industrial and manufacturing engineering.

Taught by a team that includes industrial and manufacturing engineering faculty members **E. Amine Lehtihet**, professor; **Deborah J. Medeiros**, associate professor; **Timothy W. Simpson**, assistant professor; **Richard A. Wysk**, professor; and Joshi, and **Gregory R. Pierce**, instructor in finance, IME Inc. integrates the traditional capstone design class with hands-on experience in volume manufacturing.

During the first semester, student teams design a marketable product. In the second, they use the facilities of the Factory for Advanced Manufacturing Education (FAME) Lab to conduct a production run of 100 units. "We like the same students to

go through the whole year together," explains Joshi. "We want them to see the impact of the decisions they make during the design stage."

Although students are given free rein in deciding on a product to manufacture, most concentrate on the Penn State memorabilia market. Items produced so far include a "paws" desk set, a wind-powered football player lawn ornament, and a replica of Old Main that doubles as a mantle clock.

"It's up to them to figure out what they want to make," says Joshi. "They have to do market research to find out if it's something that people would actually buy. The idea is to make a product that could be sold—that way they are forced to consider costs."

After selecting and developing a concept, students spend the remainder of the first semester producing a detailed design and prototype, developing cost estimates, and creating an initial manufacturing process plan. The following semester they refine their process plan, conduct a pilot production run, modify the design and process as needed, purchase materials and supplies, and complete the final production run.

Along the way, however, there are plenty of challenges.

Jeremy Miknis (IE '01), **Nicole Szekeres** (IE '02), and **Diane Foose** (IE '02) were part of a team that manufactured a Nittany Lion coin bank. "The main problem we had was deciding what material to use for the lion and how to make it hollow," says Foose. "It took hours of research to find a material that was durable enough to hold coins, yet cost effective and simple enough to produce."

Gregory Hofmann (IE '02), a member of the Old Main clock team, explains. "Our first prototype included a mechanical lion that moved in and out of the front doors. But we had to make it cheaper and easier to manufacture, so we eliminated the moving components and reduced the weight and size. If we had to do it over again, we would consider the manufacturing process from day one."

"Time was the biggest constraint," adds teammate **Joshua Colombo** (ME '01). "We literally finished machining our prototype five minutes before our presentation."

Additionally, students learn to make decisions under uncertainty—and when to give up on a bad idea. "They have to learn to keep four or five viable options floating at any given time and not lock in on one thing," says Joshi.

Nicholas Tracy (IE '01), whose team manufactured a Penn State desk clock, agrees. "When we set it up on paper, it looked like it was going to work. But when we went to actually do it, it was a completely different story. We had to change some of our processes to speed it up."

Even so, Tracy says he enjoyed the experience. "It was great to see everything through to the end. I was quite proud of our product."

—Jane Harris

■ Bookshelf

Text focuses on microsensor technologies

Microsensors and micro-electro-mechanical systems (MEMS) are revolutionizing the semiconductor industry, factoring in the development of smart devices such as the electronic nose and the intelligent ear.

Microsensors, MEMS and Smart Devices, a new book by **Vijay Varadan**, distinguished professor of engineering science, **Osama Awadelkarim**, professor of engineering science, and Julian Gardner of the University of Warwick, presents a complete overview of microsensor technologies.

The text reviews traditional and emerging fabrication processes and covers the latest applications in smart devices. It is written for advanced students and researchers in microelectronics, as well as engineers and developers of microsensor systems, and may be purchased online at www.wiley.com for \$79.95.

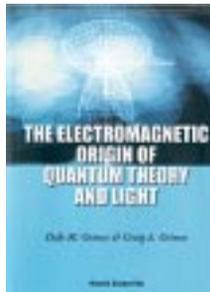
Book combines electromagnetics with atomic theory

The Electromagnetic Origin of Quantum Theory and Light, a new text by **Dale M. Grimes**, professor emeritus of electrical engineering, and **Craig A. Grimes**, associate professor of electrical engineering, presents a rigorous application of modern electromagnetic field theory to atomic theory.

The historical view of quantum theory was developed before the following major physical principles were known, or understood: (1) the standing energy that accompanies and encompasses electromagnetically active, electrically small volumes; (2) the power-frequency relationships in nonlinear systems; (3) the possible directivity of modal fields; and (4) electron nonlocality.

The authors show that quantum theory is a consequence of Maxwell's equations and conservation of energy properly applied. The analysis leads to atomic stability and causality in the sense that the status of physical phenomena completely specifies the status an instant later. Quantized radiation and its kinematic properties are completely described using Maxwell's equations, and a full solution of a photon radiation exchange is obtained.

The book is suited for graduate students and researchers in electrical and electronic engineering, quantum physics, theoretical physics, physical chemistry, plasma physics, statistical physics, thermodynamics and atomic physics. It retails for \$68 and can be purchased online at www.wspc.com.sg/books.



■ Aero student wins regional competition



Kelly Corfeld (Aero MS '02) won the American Helicopter Society's (AHS) regional Robert L. Lichten competition in January.

The award recognizes outstanding technical papers and research by an AHS member who has never presented a paper at a

technical meeting before.

Corfeld's presentation on "Computational Analysis of a Prototype Martian Rotorcraft Experiment" is helping to examine the feasibility of using helicopters to explore Mars.

"The NASA Ames Rotorcraft Division sees a Martian rotorcraft as a more versatile means of exploring Mars than other methods such as a Mars airplane or Mars rover," she explains.

For her award, Corfeld received a \$100 prize and competed in the national competition.

Civil engineering gets new department head



Andrew Scanlon, professor of civil engineering, is the new head of the Department of Civil and Environmental Engineering. Scanlon has been a member of the Penn State faculty for fifteen years.

Before coming to Penn State, he was a professor of civil engineering at the University of Alberta and

worked in a number of industry positions. Scanlon received his bachelor's degree from the University of Glasgow, Scotland, and his Ph.D. from the University of Alberta, Canada.

His awards and honors include the Canadian Society of Civil Engineering's P.L. Pratley Award and being elected a Fellow of the American Concrete Institute.

Minimotor could change the shape of micromedical applications

A tiny, inexpensive motor with simple circuitry and easy manufacture may become the motive force in micromedical applications in the near future.

The smallest of these ultrasonic, piezoelectric motors developed by researchers at Penn State's Materials Research Institute is about the size of a grain of rice. Tiny, but powerful, the smallest motor's rotation can just be stopped with the pressure of thumb and forefinger. Those only slightly larger, however, will tear the skin and draw blood.

"Initially, our applications for these motors are aimed at medical uses," says **Kenji Uchino**, professor of electrical engineering. "Because the motors are so small and can be manufactured so cheaply, they appear ideal for applications where small-diameter, disposable instruments are required."

The researchers fabricated the prototype motors from readily available materials because they want to be able to mass produce the motors inexpensively. Each motor consists of a hollow metal tube, two sides flattened at 90 or more degrees. Two strips of PZT, a lead zirconate titanate that is piezoelectric, are fastened to the flattened areas. This tube becomes the motor's stator. Inside the tube, the rotor consists of a rod held down with a spring or just a spring.

Piezoelectric materials deform when an electrical voltage is applied to them. By deforming the strips on the outside of the stator, the tube wobbles. This wobble causes the rotor to spin and the motor to move.

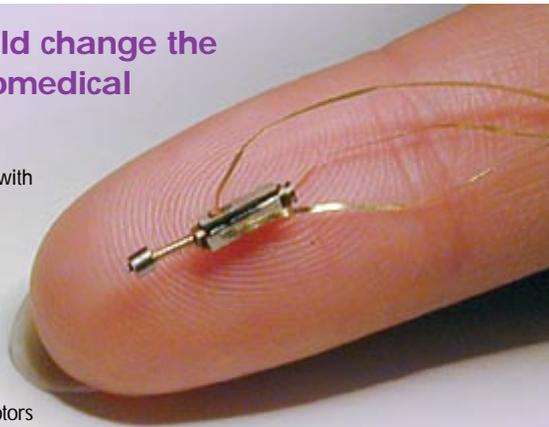


Photo courtesy of Kenji Uchino

Steadying floors too flexible for comfort

Floors that move when you don't want them to can be annoying or disruptive to those who walk, work, exercise, or dance on them.

Linda M. Hanagan, assistant professor of architectural engineering, has devised a method to dampen floor vibrations through the use of active control systems installed on the floor or in the ceiling cavity below it.

Stiffening or thickening the floors in an existing building to decrease excessive motion is costly and can take months to complete, disrupting the building's occupants, she says. However, Hanagan's new approach can be more effective than other structural retrofits and often takes less than a week to fix the problem.

Penn State has filed a provisional patent application for Hanagan's approach.

Engineers lend Fallingwater a helping hand

When it was discovered that the famed terraces of Frank Lloyd Wright's Fallingwater were sagging, an effort was launched to preserve the structure.

Robert Silman & Associates, the engineering firm helming the renovations, brought

in **Andrea Schokker**, Henderson Professor in Civil Engineering, and **Justin Brennan**, a civil engineering master's student, for their expertise in post-tensioning.

"Our job was to come in and monitor what was happening during the retrofit," Schokker says. She and Brennan installed a series of dial, vibrating-wire, and strain gauges to keep an eye on deflection and strain in the structure.

Through post-tensioning, engineers anchored high-strength strands on one end of the terrace. By adding tension to the other end of the strand, they reduced sagging in the terrace.

Visitors to the renovated Fallingwater won't notice any changes to Wright's masterpiece, however. The high-strength strands run under the lower terrace's stone floor, which was removed and replaced for the project.



Flyin' Lions: The sequel

A team of Penn State students traveled back to Houston this spring for another ride on NASA's KC-135 "Vomit Comet." The trip was a follow-up to the April 2001 outing where they tested a static Subject Load Device, an instrument that monitors the position of exercising astronauts in microgravity and compensates to allow for greater movement and exercise variation.

"One of the huge issues for NASA's space travel plans is bone loss—they can't send astronauts into space for long periods of time without solving this," explains **Dawn Noga**, an engineering science junior.

Noga says the eight-person team



Photo courtesy of NASA

devised an active version of the device that can exert a constant force on a person who is exercising—just like on earth. The previous static version didn't create a constant force.

"By doing deep knee bends with the device on board the plane in microgravity, we can test the system to its fullest," she says. "It was a proof of concept."



Girl Scout Saturday

This spring, a group of women majoring in engineering and science took time off from their studies to teach local Girl Scouts about automobiles. The scouts learned how engines work, how cars are assembled, and how to check engine fluids. At the end of the day, the participating scouts earned their "car care" badge. In the photo above, **Hilary Carr**, an industrial health and safety senior, shows a girl how to read the oil level on a dipstick.

■ Researchers capture unusual sprite-like blue jet

A team of researchers has captured an elusive blue jet on videotape and found the first evidence of a connection between the ionosphere and cloud top in these events.

Blue jets are a rare optical phenomenon emanating from the top of a thunderstorm's electrically active core regions. As their name implies, blue jets have a blue-ish color as they shoot out from the top of the storms.

The event was documented on Sep. 14, 2001, at the Arecibo Observatory in Puerto Rico. It was recorded using a monochrome low-light video system, but the researchers all agree the phenomenon was seen visually to be blue in color. The team included **Victor D. Pasko**, associate professor of electrical engineering, and **John D. Mathews**, professor of electrical engineering, as well as researchers from New Mexico Tech and Stanford.

The blue-jet findings were featured this spring as the cover story of the prestigious journal, *Nature*.

■ New software may make surgeons' jobs easier



Software developed by a team led by Mary Frecker, assistant professor of mechanical engineering, will be used to design multiple-function instruments for surgeons.

Penn State engineers have developed new design software and are using it, in cooperation with surgeons from the University's College of Medicine, to create new multi-task surgical tools that look like tiny jaws but will be able to bend around obstructions.

Mary Frecker, assistant professor of mechanical engineering and software team leader, says, "The new software doesn't replace a designer's intuition and experience but suggests a topology or layout based on the designer's specifications and the physical size constraints for the objective. Our software was specifically developed to aid in designing instruments that do more than one thing."

Working with **Randy S. Haluck**,

director of surgical simulation and minimally invasive surgery (MIS), and others at Penn State's Hershey Medical Center, the team has used the software to develop a design for a single MIS instrument that can grasp, cut, pivot, and bend around obstructions.

Haluck explains that since most existing MIS tools are single function instruments, the surgeon must constantly withdraw and re-insert new tools. Continually switching instruments can lengthen time in operation and compromise safety. Current tools also give surgeons limited tactile feedback and dexterity.

Frecker says, "The surgeons complain that using the existing tools is like doing surgery with chopsticks."

■ Engineering's McNair Scholar set for grad school

McNair Scholar **Mimi Abel** (EE '02) will head to the University of California, Los Angeles, this fall to pursue a doctorate in atmospheric sciences.

The McNair Scholars Program is designed to help talented undergraduate students prepare to enter graduate school and receive their doctoral degrees. The highly selective national program is named for Ronald E.

McNair, the astronaut/physicist who died in the space shuttle *Challenger* accident in 1986.

During her undergraduate career, Abel conducted research on the middle atmosphere. She designed and implemented the Rayleigh Light Detection and Ranging System to take temperature and density measurements of the stratosphere, mesosphere, and lower thermosphere. The research was conducted with **Timothy Kane**, professor of electrical engineering, for her honors thesis and the program.





Youngsters spend a week learning the ins and outs of Web page construction.

Kids head to ‘Web camp’ for spring break

To many, spring break means vacations and time off from school. But for a group of 17 youngsters, this year’s spring break meant the chance to earn the title of webmaster.

Through a week-long Web camp offered by the College’s Office of Continuing and Distance Education, the students

For these students, ‘tag’ means something completely different.

learned the fine art of computer coding and Web page construction.

David Decker, a systems consultant and Continuing Education instructor, says the camp gives kids a basic

understanding of the Internet by teaching them about the hypertext markup language (HTML) that drives it.

“The camp prepares kids for dealing with technology,” Decker explains. “They’ve been around the Web for most of their lives and they need to understand how it works.”

The students, ranging from 9 to 14 years of age, learn the history of the Web, basic HTML coding, and the Macromedia Web design program Dreamweaver.

“I really like computers and doing stuff on them. I thought it’d be really fun,” says **Emily Saylor**, 9, of State College. “We learned about tagging things, and I liked learning how to do that.”

For their final project, the would-be Web gurus create a site highlighting their favorite movie. For Saylor that meant constructing a site devoted to the animated feature, “Shrek.”

Decker says the youngsters took to the programming better than many adults do. “They were easier to teach than adults because they don’t have any preconceived notions. Because kids are so impressionable, it’s easy to mold them,” he says.

Alex Donahue, 13, of State College enrolled in the class to “do some stuff on the Web.”

“I thought it’d be neat to do my own Web page,” he explains as he puts the finishing touches on his “Billy Madison” site. “I understand the code now, and everything makes sense.”

In the end, the students receive a certificate and a Web address where they can show off their digital creation to family and friends.

“I was pleased with how it turned out,” Decker says. “A lot of parents said their kids liked it. We’re hearing a lot of positive things.”

According to Decker, plans are already under way for another camp. “We’re looking at offering this again in the next few months and hopefully getting more kids involved.” ■

—Curtis Chan

2002 student marshals

Each spring at the College of Engineering's commencement ceremony, one student from each major has the honor of being named student marshal. Student marshals are chosen on the basis of their academic achievement and contribu-

tions to the College. The following student marshals from the spring 2002 graduation ceremony are among our best—and we're proud to introduce them to you.

Aerospace Engineering

Thomas Michael Przybysz II of Wheeling, WV
Attending graduate school at the West Virginia University School of Medicine



Agricultural & Biological Engineering

Eric Steigman of Halifax, PA
Pursuing a career in equipment product design and manufacturing



Architectural Engineering

James Andrew Shipe of Murrysville, PA
Employed by U.R.S. Corporation, Washington, D.C.



Chemical Engineering

Dylan Kershner of Bernville, PA
Pursuing a graduate degree in chemical engineering



Civil Engineering

Shawn Edgar McFarland of Punxsutawney, PA
Pursuing a graduate degree in civil engineering



Computer Engineering

Rachel Marie Reynolds of Bethlehem, PA
Pursuing a Ph.D. at Carnegie Mellon University's Language Technology Institute



Computer Science

John O'Hara of Blue Bell, PA
Employed at the Applied Research Laboratory in State College, PA



Electrical Engineering

Robert D. Siegel of Easton, PA
Pursuing a graduate degree in space science



Engineering Science

David C. Denkenberger of Montrose, PA
Pursuing a graduate degree



Industrial Engineering

Jarrold James Sharpe of Wells Tannery, PA
Undecided



Mechanical Engineering

Brian Pandya of Ebensburg, PA
Pursuing a degree in law school with an interest in patent/intellectual property law



Nuclear Engineering

Mark B. Allen of Pittsburgh, PA
Employed in the U.S. Navy in naval nuclear propulsion



ROTC

Mark B. Allen of Pittsburgh, PA

Building the ‘ideal’ hovercraft

Students learn
fluid mechanics
in a new way

When mechanical engineering senior **Brett Walmsley** signed up for ME 497D, Integrated Design Engineering Analysis Laboratory (IDEALS), he thought he'd be building model cars like in past classes.

He was wrong.

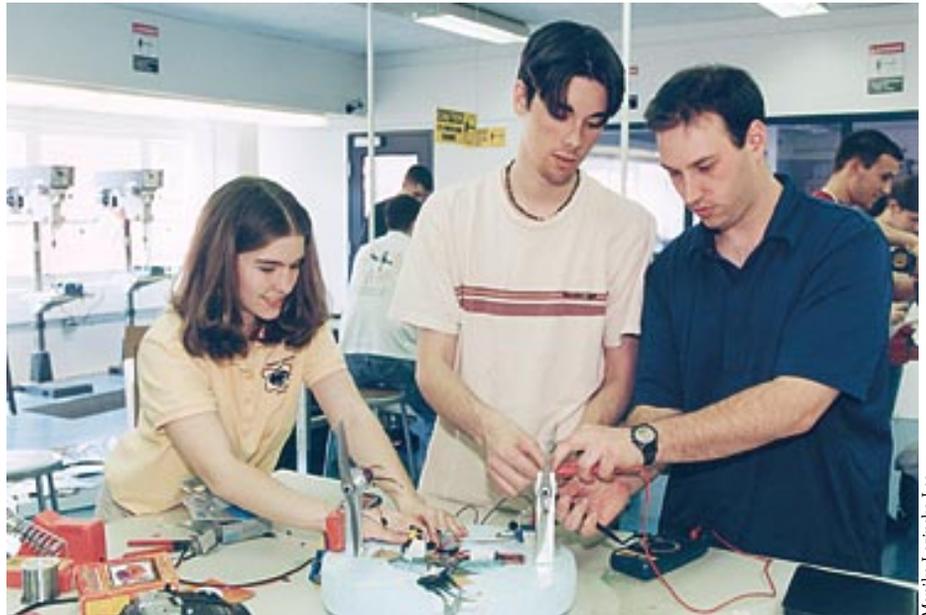
The course's instructor, **Anil Kulkarni**, professor of mechanical engineering, told Walmsley and his classmates they'd be building miniature hovercraft instead.

Kulkarni says the objective of the course is to teach students the principles behind fluid mechanics, but he also wanted to give the engineers a challenge.

Kulkarni believes the design of hovercrafts offers flexibility and freedom to the students.



Monika Lozinska-Lee



Monika Lozinska-Lee

“Hovercraft are still a novelty and making them do certain things is still a challenge,” he says. “I wanted them to learn about fluid mechanics and design on their own through trial and error.”

Teams' hovercrafts are judged on speed, maneuverability, and pulling strength.

At the outset of the semester, the engineers are divided into teams and given a basic hovercraft kit, along with a \$100 budget to modify their vehicle. They then spend much of their time building and modifying their crafts for a semester-end competition, where vehicles are judged on speed, maneuverability, and pulling strength.

Teams of engineers modify basic hovercraft kits and compete against each other at semester's end.

“People would see the hovercraft designs as we were walking around campus with them, and they'd want to know what they were about,” Walmsley recalls.

At the end of the semester, hovercraft teams faced off at the Hetzel Union Building's Alumni Hall in front of a crowd of spectators, faculty, and passersby.

Ultimately, Kulkarni says, the course is designed so that students can satisfy their laboratory requirements and enjoy themselves. “They're motivated because they have fun,” he observes.

Student Profile: Kelly Harvey

Aerospace engineering sophomore **Kelly Harvey** laughs when asked why she decided to return to college at this point in her life. "I finally figured out what I want to be when I grow up!" says the 45-year-old mother of four adult children.

On a more serious note, she continues, "In 1997, I lost my job as a field engineer repairing lottery machines. I was going on interviews and was told I was only worth \$6.50 an hour because I didn't have a college degree. So I said, 'OK, I'm going to get my degree and you *will* pay me!'"

Harvey first enrolled at Penn State more than twenty years ago. Although she was majoring in journalism at the time, she was more interested in serving in the military. "My father didn't want me to go in the service, so I tried school for a year," she explains.

She then joined the Army, where she was introduced to electronics. "That fascinated me, and it progressed from there," says Harvey, who is particularly interested in rocket propulsion. "Engineering seems to encompass all of my likes."

As a returning adult student, Harvey faced a few challenges, like learning how to study all over again—and adapting to residence hall life. In a move she describes as "economically smart," Harvey opted to live in a West Halls dorm reserved for mature students.

One of her biggest challenges, though, was adjusting to being by herself with no children to look after. "When you're used to taking care of your children, you think you are being selfish when you're doing something for yourself," she explains.

Fortunately, Harvey has had no problem relating to—or being accepted by—her younger classmates. "My engineering design class last summer was one-on-one," she says. "It felt so good to be treated as a peer rather than a mom!"

Not that her children aren't supportive of her educational goals. "My kids think this is the neatest thing since ice cream," she laughs. "All four of my children get the biggest kick out of asking me how my classes are going, if I'm getting my homework done, and if I'm studying hard. They're very proud of their mom."

—Jane Harris



Monika Lozinska-Lee

For Walmsley's team, getting the electronics working on board the hovercraft was one of the most difficult challenges. "There's a huge difference between what you read in the textbooks versus what is experienced in the lab class," he states.

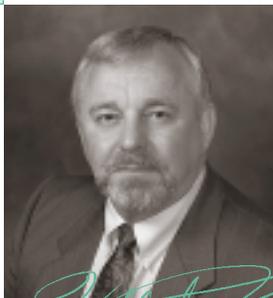
Although the course is primarily a lab class, Walmsley says there is a structured environment. Like engineers and designers in the real world, the students were required to

give updates, reports, and presentations on the progress of their hovercraft.

In the end, Walmsley says he enjoyed his experience. "I was a bit skeptical at first, but in the end, I think it was more challenging and fun than doing model cars." ■

—Curtis Chan

Dr. Kulkarni can be contacted at 814-865-7073 or akk@psu.edu.



Will Kresge
Will Kresge

From your president

Dear Engineering Alumni and Friends,

As I write this last column as your PSES president, I am reminded of how quickly time passes. It seems like only yesterday that I wrote in my first column of the need for more ACTIVE alumni participation in PSES. My goal for the past two years was to recruit active members willing to do committee work, recruit prospective students, participate in the selection of outstanding College of Engineering faculty and staff, and contribute time to other PSES activities.

My most recent “member-bring-a-member” program has brought new alums to campus and to our PSES meeting. I welcome these new members and hope they will stay involved and reach out to other engineering alumni to join in giving back some time to our College—not to mention the fact that they will get to come back to Happy Valley three times a year to reminisce! There are plenty of potential members out there! It may not surprise you to learn there are 35,560 engineering alumni currently living in Pennsylvania. But, did you know there are 487 alums in the state of Washington; 702 in Colorado; 1,484 in Texas; and 2,890 in California? Remember that, even in a crowd, we also have that unique method of determining who they are. Just call out as loud as you can, “WE ARE!”

I wish to thank the other members of the board for their hard work and commitment to PSES, and I also wish **Diane Delozier** good luck during her tenure as president. Of course, I will continue to be involved as the past president and chairman of special events. I hope you all have a happy summer, and I look forward to a busy and productive fall. ■

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: cjdo@enr.psu.edu
101 Hammond Building
University Park, PA 16802
Tel: 814-863-3384
Fax: 814-863-4749

CALENDAR OF EVENTS

August 3

Summer commencement

September 25-26

Alumni Fellows Program

Janet Cunningham (CE '80) and William Ward (ChE '61 MS '63 PhD '65) will be honored

October 4

PSES Board and Committee Meetings

October 5

10th Annual PSES Golf Classic
Tofrees Resort

PSES Awards celebrate excellence in advising, teaching, research, and service

The College honored outstanding faculty and staff at a special ceremony on Mar. 15 in the Kunkle Activities Center. **Dean David N. Wormley** and **PSES President Will Kresge**, along with graduate students **Michele Beachler** and **John Sustersic** participated in the program. Awards were given for exemplary advising, teaching, research, and service.

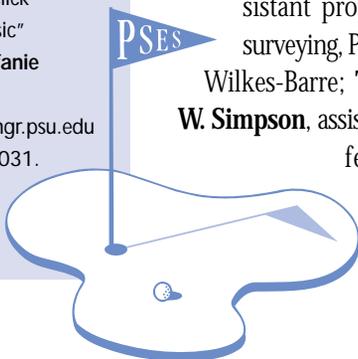
The PSES Outstanding Staff Award was presented to **Vicki G. Keller**, staff assistant, computer science and engineering, for exceptional service to the department.

Tee up with the 2002 PSES Golf Classic

The 10th annual PSES Golf Classic will be held at **Toftrees Resort and Conference Center** in State College, PA, on Oct. 5.

The 2002 Golf Classic, which provides scholarship support for undergraduate engineering students, will continue to hold the entry fee, which will include breakfast and lunch, at \$100 per player.

For information and registration please see our website at www.engr.psu.edu/alumni/ and click on "Golf Classic" or contact **Stefanie Tomlinson** at stomlinson@engr.psu.edu or 814-865-9031.



The PSES Outstanding Advising Award was presented to four faculty for their dedication to students, individually and in group settings. The awardees were: **Mary L. Frecker**, assistant professor of mechanical engineering; **John Hannan**, associate professor of computer science and engineering; **Sanjay B. Joshi**, professor of industrial engineering; and **Ronald Land**, associate professor of engineering, Penn State New Kensington.

The PSES Outstanding Teaching Award was given to **Thomas A. Seybert**, assistant professor of surveying, Penn State Wilkes-Barre; **Timothy W. Simpson**, assistant professor of

mechanical engineering and industrial and manufacturing engineering; and **Douglas Werner**, associate professor of electrical engineering, for excellence in teaching skills.

The PSES Outstanding Research Award was presented to **Bruce Logan**, Kappe Professor of Environmental Engineering; and **Edward C. Smith**, associate professor of aerospace engineering, for their notable contributions to scientific research.

Premier Awards for teaching and research were given to the following faculty: **Gary L. Gray**, associate professor of engineering science and mechanics; **Eric R. Marsh**, associate professor of mechanical engineering; and **Deborah J. Medeiros**, associate professor of industrial engineering.

Rangachar Kasturi, professor of computer science and engineering; **Asok Ray**, professor of mechanical engineering; and **Joseph L. Rose**, Paul Morrow Professor of Engineering, received Premier Research awards.

Premier Awards are given to faculty who previously received Outstanding Awards and continue to contribute exemplary and exceptional service to students and the College.

The PSES Distinguished Service Award was given to **Barnes W. McCormick**, Boeing Professor Emeritus of Aerospace Engineering, for his continued involvement and time spent in department activities after "retiring" in 1991. ■

Mason Walsh honored as distinguished alum

A Distinguished Alumnus Award, the University's highest honor to an individual, was presented to **Mason Walsh Jr.**, a 1957 bachelor's degree graduate in chemical engineering. Mason is executive vice president and general counsel of Richard K. Mellon & Sons. Walsh, one of only seven individuals to receive this award in 2002, was honored during the Penn State Traditional Reunion weekend in June.

Starr Foundation scholarship honors engineering alum, WTC victim

Ask anyone who knew **David Suarez** (IE '99) and they'll tell you the same thing: he cared.

Although the 24-year-old Suarez died during the World Trade Center attack on Sep. 11, 2001, a scholarship created with a \$50,000 gift from the Starr Foundation will continue Suarez's legacy of caring.

Called the "David S. Suarez Memorial Scholarship," the gift will benefit full-time Penn State students majoring in industrial and manufacturing engineering who are also active members of their communities. In addition to the Starr Foundation's gift, an additional \$1,760 was donated toward the scholarship through other donors.

Ted Suarez, David's father, said that his son always wanted to help those who were less fortunate. The *New York Times* quoted the elder Suarez as saying, "He reached out to people in a very warm and genuine way. Everyone remembered his smile. From a little boy, he had a smile that was very endearing."

David Suarez was born in Dover, NH, and graduated from

West Windsor-Plainsboro High School in New Jersey in 1995. Suarez's achievements included serving as co-captain of the wrestling team and attaining the rank of Eagle Scout.

As an industrial engineering student at Penn State, Suarez quickly impressed those he came in contact with. Faculty

"He reached out to people in a very warm and genuine way.

Everyone remembered his smile. From a little boy, he had a smile that was very endearing."

members admired his work ethic in the classroom, and friends recalled his enthusiasm and dedication. A member of Kappa Alpha fraternity, Suarez was credited for his key role in recruiting one of the fraternity's largest pledge classes in recent memory.

His efforts earned him an honorary Starr Foundation

Scholarship, which is given to students on the basis of academic ability and personal promise. Scholarship winners who do not have financial need, such as Suarez, are declared honorary grantees and receive no monetary award.

After graduation, Suarez went to work for Deloitte Consulting in Chadds Ford, PA. Considered a top performer by both his company and the clients he served, he was promoted to systems consultant.

Despite his dedication to his work, Suarez made time to help others. He volunteered for New York Cares, a nonprofit group, worked in soup kitchens, and tutored high school students to prepare them for the college entrance exams.

He was also planning to obtain his MBA and began working on applications to colleges with the hope of attending Harvard.

At the time of the attack, Suarez was working with client Marsh & McLennan on the 99th floor of the World Trade Center's north tower. ■

Parfitt wins Perez Advising Award

M. Kevin Parfitt, associate professor of architectural engineering, is the 2002 recipient of the Lawrence J. Perez Memorial



Student Advising Award. This award, created by the Perez family, recognizes a faculty member in the College who devotes significant time and effort to assist students with academic and/or personal concerns and, therefore, contributes to the welfare of students and enriches the College. Nominations are

submitted by students, and this year's winning essay was submitted by Jonathan Dougherty, an architectural engineering Ph.D. candidate. Lawrence Perez, deceased, for whom the award is named, was a professor of civil engineering and an associate dean of the College. His best-known accomplishment, however, may have been the establishment of a lake at Stone Valley, now known as Lake Perez.

1970s

Alan Beckwith (Aero '72) is a member of the Screen Actors Guild and the American Federation of Television and Radio Artists. He is currently with Sony Pictures for Columbia and Tri-Star distribution.



Ihor Bojcun P.E. (AE '77) is a senior project structural engineer at CUH2A Inc. in Princeton, NJ. His project experience includes the

design of poured-in-place concrete and structural steel framing systems for all types of buildings.

Priscilla Guthrie (EE '71) serves as the deputy assistant secretary of defense (deputy chief information officer) for the U.S. Department of Defense.

1980s

Ronald D. Joslin (Aero '86; MS '87; PhD '90) is a program officer for hydromechanics at the Office of Naval Research in Arlington, VA.

Robert A. Kershner (ME '85) is president



of Kershner Environmental Technologies. The firm markets engineered water and wastewater

treatment technologies manufactured by other companies to municipalities and businesses in the Mid-Atlantic region. Kershner resides in Owings Mills, MD, with his wife, Mona, and their two children, Daniel and Rachael.

1990s

Timothy Campbell (AE '92) is president of Cagley, Harman & Campbell Structural Engineering of Pittsburgh, PA. He and his wife Melissa (English '96) also welcomed the birth of their daughter, Hannah Fuller Campbell, on Dec. 13, 2001.

Susan McNulty (ABE '99) lives near Buffalo, NY, where she is a mechanical engineer for a pharmaceutical engineering firm that designs and fabricates major pharmaceutical processing plants worldwide. An avid runner, she is currently training for her next marathon in Duluth, MN.

In memoriam

Scott G. Daelhausen (CE '72; MS '77) died Feb. 9 after a year-long battle with cancer. He was 51. Daelhausen was active in a number of College of Engineering activities, including the Industrial and Professional Advisory

Council, the Penn State Civil and Environmental Engineering Society, and the Penn State Engineering Society.

Brenda Egli Eavey (IE '87) passed away Nov. 23, 2001.

John R. Kolski (EE '74) died Feb. 2 at the age of 49. Kolski was an employee of the Arizona Public Service Palo Verde Nuclear Generating Plant. He is survived by his wife, Colleen, and five children.

George R. Page (Aero '52) passed away Feb. 26 in Cocoa Beach, FL. He was 77. Page was former deputy director of the Kennedy Space Center and played a key role in the U.S. space program. He is survived by his wife, Lois, and three children.

H. Conrad Sonderegger (ME MS '53) passed away in February at the age of 81. Sonderegger was chairman of the board and principal owner of Kistler Instrument Corporation in Winterthur, Switzerland.

Got news?

We'll be the first to admit that campus hasn't been the same since you left Happy Valley. We'd love to know what you've been up to. Have you gotten a new job, a promotion perhaps, or even married?

Just go to our website at www.engr.psu.edu/alumni and follow the links to send us your news. We'll make sure it appears in an upcoming issue of *Engineering Penn State Magazine*. You may also send your news through regular mail to:

Jane Harris
Engineering Penn State Magazine
101 Hammond Building
University Park, PA 16802
jharris@engr.psu.edu

Photographs are also welcome. Pictures may be sent or e-mailed to us (please scan them at 300 dots per inch). Please include your address if you wish the photos to be returned to you.

We look forward to hearing from you!

Continuing Education

HEC-RAS River Analysis Program (Introductory Course)

Aug. 5-9—University Park

A. MILLER—This introductory course focuses on use of the HEC-RAS river flow analysis computer program to compute one-dimensional water surface profiles and to model bridges, culverts, and other structures in river systems. Participants will learn the theory and application of the HEC-RAS program through lectures supplemented with hands-on exercises in the computer laboratory. Engineers, planners, and land developers who deal with floodway management and measure floodway encroachments will find this course useful.

Water Works Operators' Association of Pennsylvania

Aug. 5-7—University Park

The WWOAP was established and organized in 1927 to improve and advance the public water supply industry across Pennsylvania. Each year, the WWOAP holds a statewide conference in August at the University Park campus. Conference sessions feature outstanding speakers and presenters on a wide variety of subjects pertaining to the profession. This year will mark the 75th year the WWOAP has held its annual meeting at Penn State.

Rotary Wing Technology

Aug. 19-23—University Park

B. MCCORMICK—This course, designed for engineers, presents a comprehensive introduction to rotorcraft 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.

HEC-HMS Short Course

Sep. 23-26—University Park

A. MILLER—Participants in this short course will learn about the HEC-HMS computer program for rainfall-runoff analysis. HEC-HMS uses a graphical user interface to specify watershed components. It also provides precipitation-runoff simulation and flow forecasting techniques that can use grid-based, spatially-distributed rainfall data. Lectures on the theory of the program will be supplemented with hands-on exercises in the computer laboratory.

Modern Bearing Technology: Essential Concepts of Bearing Technology

Sep. 30-Oct. 2—University Park

T. HARRIS—This course is designed for engineers and others with a technical background who have little history in bearings and need to either adapt their technical training to bearings or upgrade their technical knowledge. The curriculum includes both quantitative and conceptual materials.

Smoke School/Visible Emissions (Fall offerings)

Sep. 17-18—McKeesport, PA

Sep. 24-25—Allentown, PA

Oct. 1-2—University Park

V. IRWIN—This lecture/laboratory course covers the regulation and behavior of visible emissions (plumes) from industrial processes. Each individual's ability to evaluate plumes will be tested using a smoke generator. Those who pass the tests will be certified in accordance with EPA Method 9.

For more information

Additional information about these and other engineering conferences can be found on the Web at: www.engr.psu.edu/cde.

The Society of Engineering Science (39th annual meeting)

Oct. 13-16—University Park

N. SALAMON—Hosted this year by the Department of Engineering Science and Mechanics, this annual meeting provides a forum for the exchange of ideas, methods, and results among researchers and educators in all fields of engineering science and mechanics. The program will include symposia on: nano-structures, devices, and fabrication; biological and functional materials; damage mechanics; thermomechanical kinetics; nonlocal and interactive media; atomistic-continuum coupling; nondestructive evaluation; modeling of processes and dynamical systems; solid and fluid mechanics; and computational mechanics.

Annual Transportation Engineering and Safety Conference

Dec. 9-11—University Park

Presented in cooperation with PennDOT, the Mid-Atlantic Universities Transportation Center, LTAP, and the Federal Highway Administration, this conference aims to improve the skills of the transportation professional through training workshops and presentations by transportation experts. The conference is designed to foster discussion and debate and to encourage questions, so that attendees can maximize their learning experience.

You may also contact Engineering Continuing Education directly at:
Phone: 814-865-7643
Fax: 814-865-3969
E-mail: TJR10@psu.edu

Ethics in engineering

Recent newspaper headlines have cited several high profile corporations whose questionable ethics, and in some cases



Dean David Wormley

fraud, have led to significant layoffs, decreases in shareholder and employees' equity, and in some cases bankruptcies. These events have led to decreased confidence in the U.S. business model, particularly when viewed from abroad, and have in general created a climate of increased

mistrust and suspicion among employees, shareholders, and customers.

While very few of the corporate leaders in the headlines have an engineering background or engineering degree, our students, even as they begin their careers, need to be well grounded in professional (and personal) ethics. Students who have recently received their engineering degrees have increased responsibilities as they work in global teams with diverse cultures and backgrounds. In the demanding environment of today, new graduates will be involved in difficult ethical and professional decisions even before they have developed extensive professional experience.

The engineering profession has long been concerned about ethical practices, and both the Professional Engineer's Exam and the criteria required for engineering degree programs approved by the Accreditation Board for Engineering and Technology (ABET) have elements devoted to ethics. While many engineers do not take the Professional Engineer's Exam and become formal professional engineers, they do graduate from ABET-accredited engineering degree programs. Thus, the emphasis on engineering ethics in degree programs reaches almost every engineering graduate.

In the College, we have increased our emphasis on ethics in the curriculum in the last few years. A special task force has been appointed to identify ways in which ethical content can be incorporated into our core courses. Our faculty who teach students design and engineering fundamentals provide examples—often from their own experience—which emphasize the professional and ethical aspects of engineering. Also, our program in Science, Technology and Society (STS) has developed courses, course materials, and subject modules which illustrate essential features of engineering ethics. STS faculty have worked closely with our other faculty in incorporating and modifying these modules so they complement the courses in the eleven ABET-accredited engineering degree programs offered in the College.

Through a gift from Charles E. "Chick" and Joan F. Rolling of Helena, MT, we have also initiated a program to work with colleagues in the College of the Liberal Arts and the new Rock Ethics Institute to bring experienced professionals to campus to work with faculty and students in developing a deeper understanding of ethical issues related to the practice of engineering. This summer, fourteen faculty members will participate in a workshop, "Teaching Engineering Ethics," to learn how to integrate ethics content into the engineering courses they teach. We believe that this continuing collaboration between the College of Engineering and the Rock Ethics Institute shows great promise as it involves both faculty and students working together to develop course materials in critical ethical issues.

While we know that these efforts will not change today's headlines, we hope that our students will be better prepared to enter the profession of engineering, especially at a time when at the beginning of their careers they will have, along with their opportunities of increased responsibility, increased demand to address ethical and professional aspects of engineering.

David Wormley

WEPO prepares for fall



Upper-level engineering women prepare for the fall semester's Women in Engineering Orientation (WEPO) by hitting the State College YMCA. Before meeting the incoming class, the students hone their leadership, teamwork, and problem-solving skills.

WEPO is designed to recruit and retain first-year women engineers. In addition to participating in hands-on engineering activities, first-year students get the opportunity to network and interact with industry partners.



Photography: Monika Lozinska-Lee, WEP



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