Engineering

Penn State

The Magazine of the Penn State College of Engineering Summer 2000

Penn State

Engineering Conferences

Corrosion Short Course
July 25-30, University Park
Co-sponsored by the College of Earth and Mineral Sciences, the Penn State Corrosion Center, Gamry Instruments, and MPM Technologies, this course features morning lectures on the fundamentals of corrosion and afternoon, hands-on laboratory sessions that highlight the most commonly used experiments to assess corrosion. See www.esm.psu.edu/htmls/corrosion

Modern Bearing Technology Advanced Course for Scientists and Engineers
July 24-28, University Park
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. See www.abma-dc.org/education/

Cosires 2000—5th International Conference on Computer Simulation of Radiation Effects in Solids
July 24–28, University Park
This conference addresses the application of computer simulation techniques to the study of the interaction of radiation with materials. It provides a forum for presentations of the latest results and technique developments in this growing research field.

Condition-Based Maintenance
July 24-26, University Park
This Center for Acoustics and Vibration short course will introduce participants to the reasons for and principles of condition-based maintenance. Participants will also learn about sensors, modeling, and data interpretation.

Medical Ultrasonic Transducer Engineering Conference
August 2–4, University Park
The conference provides a forum for in-depth discussions of the current status of medical ultrasonic transducer/array engineering. The program includes tutorial papers, invited papers, and contributed papers. This year's tutorials will focus on array design, piezoelectric materials, materials property measurements, and modeling. Paper topics will include: novel piezoelectric materials, diagnostic and therapeutic transducer/array fabrication and design, multidimensional arrays, array interconnection, beam forming, modeling, and FDA regulations and standards. See www.cde.psu.edu/C&I/UltrasonicTransducer/

Rotary Wing Technology
August 9-13, University Park
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 Protective Structures
August 14-18, University Park
This course, by internationally-renowned experts in the field, will give engineers, architects, and safety and security managers fundamental background information on potential threats and relate it to the performance and latest design requirements for hardened facilities.

Modern Bearing Technology Introductory Course for Engineers
August 14-16, University Park
This course is designed for engineers and others with a technical background who have little history in bearings and who need to either adapt their technical training to bearings or would like to upgrade their technical knowledge. See www.abma-dc.org/education/

Modern Bearing Technology Overview of Bearing Technology
August 17-18, University Park
This course is intended for managers and staff who want to have a better understanding of bearings in general and bearing technology. This is an ideal course for individuals in sales, marketing, finance, human resources, and other positions at bearing companies and their suppliers or distributors. See www.abma-dc.org/education/

Smoke School
September 19-20, McKeesport, PA
September 26-27, Allentown, PA
October 3-4, University Park
(Also at the same sites in the Spring)
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.

Wastewater Biology
Various times and locations in the United States and Canada
Call or e-mail for dates.
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.

Electric Power Engineering Programs
The 2000 Advanced School in Power Engineering will be held September 6–December 7, in Monroeville, PA.
The school provides participants with a comprehensive education in power systems engineering. Specialized training modules are also available for delivery at customer sites anywhere in the world. See www.cde.psu.edu/Engineering/PowerEngineering/

Review for the Fundamentals of Engineering Examination
The College of Engineering supports review courses for engineers planning to take the Fundamentals of Engineering, FE/EIT examination. These include campus-based courses in Pennsylvania and an independent learning course offered through Penn State's World Campus. All courses provide an excellent review of undergraduate math, science, and engineering topics.

NEW! ***Antenna Engineering - EE 538***
Offered through the Penn State World Campus
Dr. A. Ferraro
This graduate-level, Internet-based, independent-learning course covers state-of-the-art techniques for analysis, synthesis, and design of antenna configurations and the latest, sophisticated codes for accurate computation of antenna characteristics. See www.worldcampus.psu.edu/pub/programs/ee/EE538_detail.shtml

For more information

Additional information about these and other engineering conferences can be found on the World Wide Web at the College's Continuing Education Web site:

www.cde.psu.edu/C%26I/0Clists/Engineering.html

You may also contact Engineering Continuing Education directly at:
Phone: (814) 865-7643
Fax: (814) 865-3969
E-mail: tjr10@psu.edu/cde/

Engineering Continuing & Distance Education
410 Rider Building II
227 W. Beaver Avenue
University Park, PA 16801-4819

Customized Programs —
Do you have a special need for an educational program, at your company or in your area, but don't know where to start? The College's Continuing and Distance Education office can probably help. Please contact us at the address or numbers above. We will be happy to work with you to design a program that meets your lifelong learning needs and goals.

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Features

COVER STORY

Editor's Note

This issue marks a beginning and an ending for us in the College. This spring, Magazine Editor and Coordinator of College Relations Lani Clark departed Penn State. In her time here, she has taken Engineering Penn State and turned it into one of the best alumni magazines you'll find anywhere. She leaves behind a legacy of strong reporting and wonderful storytelling in these pages and takes with her the gratitude of alumni, students, faculty, staff, and friends of Engineering.

This issue also marks my first time at the helm as magazine editor and coordinator for college relations. With each issue, we will continue the tradition Lani set, telling you about the breakthrough research our faculty are conducting, the activities our students are involved in, the impact our alumni are having—in short, what's happening with Penn State Engineering.

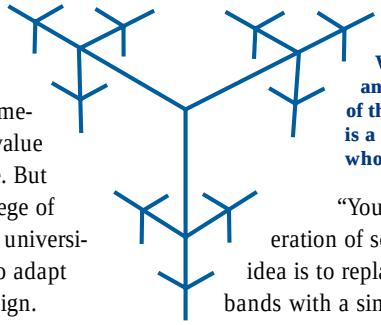
Please join me in wishing Lani the best in her endeavors. I'm looking forward to the stories we'll be telling in these pages in the months and years to come and invite your comments by e-mailing me at cchan@engr.psu.edu.

Curtis Chan
Editor

An array of possibilities

Fractals offer new directions in antenna design

To the untrained eye, fractals might appear to be simple geometric patterns, something more of artistic value than of scientific value. But researchers at the College of Engineering and other universities are finding ways to adapt fractals to antenna design.



Shown here is the configuration for one of Werner's original fractal antennas. Note how each of the antenna's "branches" is a miniature version of the whole antenna.

Antenna technology has changed little since the first simple wire antennas were developed a hundred years ago.

"The limitation of a normal antenna is its characteristic narrow band," says **Doug Werner**, associate professor of electrical engineering. "They work well at the frequency they were designed for, but once you change your frequency, for example, they don't work as well."

Werner, as well as a few other researchers around the world, has been hard at work creating antennas that can pick up multiple bands. The key to doing this, he says, lies in applying fractals—simple, self-replicating geometric forms.

"The fractal notion comes in where the object has self-similar copies of itself at many scale sizes," Werner explains. Fractals are both naturally occurring and man-made. In nature, the black spleenwort fern is a perfect example. Each leaflet looks like a miniaturized version of the frond, which in turn looks like a mini-version of the entire plant.

The advantage to designing antennas that integrate fractals is that the different sizes can pick up multiple bands. Then each time the fractal shape miniaturizes itself, the antenna can detect a higher frequency. Thus, a fractal antenna with self-similar shapes can detect a wide range of frequencies.

"You get rid of the proliferation of so many antennas. The idea is to replace all those frequency bands with a single antenna that can cover those bands," he says.

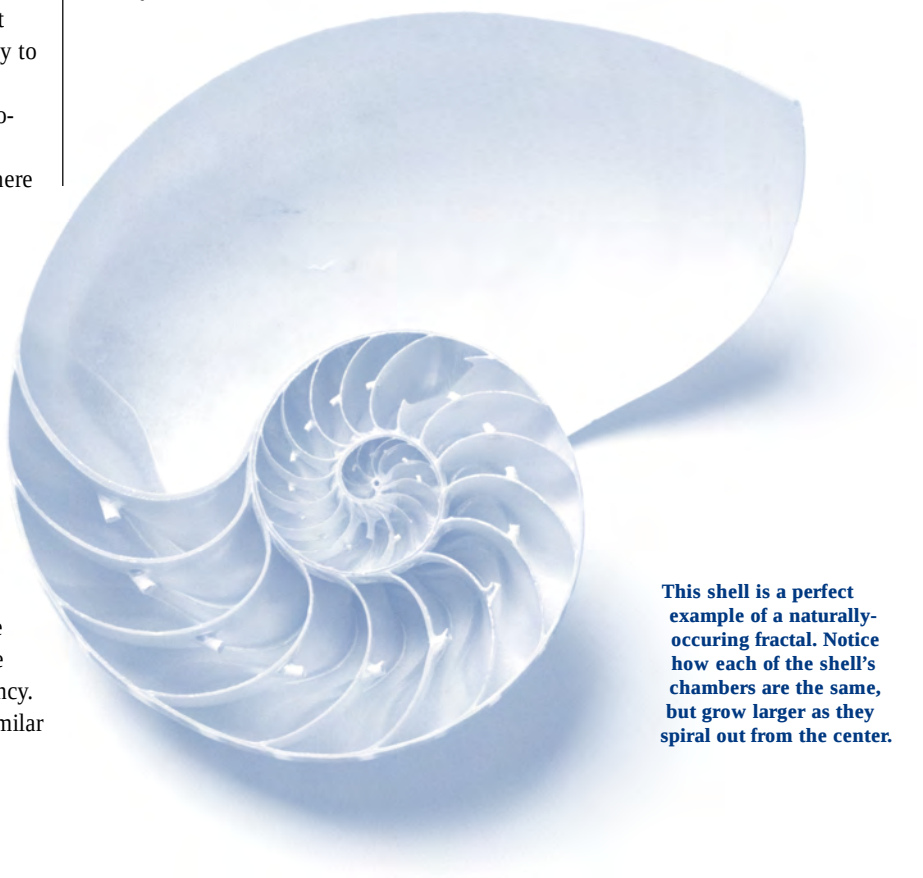
The technology is already in commercial use. Many consumers will notice that newer cordless telephones no longer have the rubbery, long stalk-like antennas built into the handsets. Instead, many phones now have the antennas embedded completely inside the units. That's because a fractal patch antenna has been built into the handset, eliminating the need for an unwieldy antenna.

"We did some early work in it and now it's exploded," Werner says of the impact of fractals. Werner is already hard at work on the next stage of fractal antenna evolution—developing fractal antenna array concepts that lead to multi-band and broadband designs.

The potential of the technology is incredible, he says. A broadband, multi-band antenna could be used for radars, communications systems, and the Global Positioning System. No longer would there be a need to have a forest of metal antennas on top of buildings or ships.

"We could replace antennas that cover different bands with a single one."

Dr. Werner can be reached at (814) 863-2946 or by e-mail at dhw@psu.edu. ■



This shell is a perfect example of a naturally-occuring fractal. Notice how each of the shell's chambers are the same, but grow larger as they spiral out from the center.

Engineering better teachers

New course inspires students about teaching engineering

For **Akhlesh Lakhtakia**, the need for effective science and technical education in schools literally hit home while watching his daughter attend elementary school.

"When my daughter started going to school, I noticed she wasn't being challenged in science," says Lakhtakia, a professor of engineering science and mechanics. He says he became concerned his daughter would rule out a career in science and engineering at a very young age.

"When a child is eight or nine years old, that's when decisions take place," he says. "A child is ready to receive complicated ideas, so long as they feel involved."

Lakhtakia's concerns prompted him to collaborate with the College of Education, teaming up with **Tom Dana**, associate professor of science education, **Vince Lunetta**, professor of science education, **Mehmet Tasar**, doctoral candidate in science education, **Johanna Ramos**, graduate assistant in the College of Engineering, and **Joe Taylor**, a doctoral candidate in science education.

Together they developed a new course, ENGR/SCIED 497F, designed to teach education majors about engineering before they get to the classroom. According to Lakhtakia, the class is supposed help these students become comfortable with engineering principles and practices, give them confidence in teaching their own students, and allow them to cultivate children's curiosity of the natural world.

"It's a long-term investment," says Taylor. "We expect to make an impact with this course over the next 30 to 35 years. The future teachers who take this course will teach thousands of kids in that time."

The 497F course departs from the lecture-style of teaching and instead takes a project-oriented approach to teaching education students. Each module contains activities that culminate in a final project. For example, students learn about the strength of polygons in structures by building objects with Legos.

Photo credit: College of Education

Future elementary school teachers gain content knowledge and confidence in science and engineering through a special program designed in a collaboration between the Colleges of Engineering and Education. Students apply engineering principles and practices and construct their own projects using materials they can use to teach elementary school children.

"I liked the hands-on activities," says **Wade Wooley**, a first-year education major from Mansfield, PA. "Those are things I remember learning in elementary school myself. We used Legos and K-NEX to build simple machines. I can incorporate this into my own lessons when I become a teacher, because we used practical materials.

I felt much more confident with all the tools. I'm more excited now that I understand it clearly. I won't be second-guessing myself on the material."

And that, Lakhtakia says, is the key to effective science education—getting the teachers excited through engineering about the science they're teaching and passing on that enthusiasm and curiosity to their own students.

"Engineering and science provide a way for us to make sense of our universe, our surroundings, and a way to make our lives better," he says.

Lunetta says, "Educating our citizenry is an important mission of universities—not just educating experts. We need to establish both a depth and a breadth of science experience in our society. This course is one of many things we should do to make our citizens well-informed, rational consumers, and to give those with interests in science the foundation that can take them, and us, to new frontiers."

Dr. Lakhtakia can be reached at (814) 863-4319 or by e-mail at axl4@psu.edu. Special thanks to Jeff Deitrich at the College of Education for his contributions to this story. ■

Built to last

New grouts may enhance safety and extend concrete bridge life

Post-tensioned construction can be a quick way to build beautiful bridges, and with new, improved grout mixtures, it can be a safer, longer-lasting option, too, says a Penn State engineer.

Andrea J. Schokker, the Henderson professor of civil and environmental engineering, is the lead author of a new study that has identified the best grouts for bonded post-tensioning applications.

With the use of these grouts in new construction, it may be possible to significantly increase the service life of a bridge, she says. For example, in a coastal environment where structural elements are exposed to seawater or spray or on inland bridges exposed to deicing salts, corrosion could cause problems before the end of the expected service life of the bridge. With the new grouts, the same structure may last up to twice as long depending on circumstances.

In post-tensioned construction, a portland cement grout acts as a "last line of defense" to prevent deicing salt or seawater chlorides from reaching a structure's reinforcing strands, composed of seven twisted steel wires, and causing corrosion.

At the construction site, the strands are inserted into plastic or galvanized steel ducts or tubular channels that run the length of each precast concrete segment such as a beam or block. After insertion, the strands are stretched to put them under tension and anchored at the ends, forcing the concrete into compression. The ducts are then filled with portland cement grout. The grout not only protects the steel strands from corrosion but also distributes the bond with the strand along its full length.

Recently, problems with corrosion, due to voids in the grout, have been noted in some structures. Schokker says there have also been three confirmed post-tensioned structure collapses in Europe which have caused the British to re-evaluate their grouting procedures. She cautions that, while corrosion of post-tensioned bridges does not appear to be a major U.S. problem at this point because many post-tensioned structures are less than 30 years old, it is prudent to adopt high-performance grouts and grouting methods in new construction.

In experiments at the University of Texas at Austin where Schokker earned her doctorate, she tested more than 30 grout designs. Fresh property tests were conducted to determine which grouts, when freshly mixed, were fluid enough to be workable but still provide good corrosion protection for the reinforcing strand when hardened. Some grout mixtures, while workable when fresh, had a tendency to separate into individual pockets of water and grout. The pockets of separated water eventually evaporate, leaving voids when the grout hardens. The tendency of water to separate, called bleed, is especially significant in tall structures and was determined for each of the 30 grout mixtures.

With the grouts that passed the fresh property tests, Schokker conducted an accelerated corrosion test.

Finally, the grouts that passed the corrosion test were subjected to a large-scale duct test that simulated field conditions. In the field simulation, a duct containing a bundle of reinforcing strands was arranged in a horizontal serpentine pattern and grout was pumped in to investigate flow and the formation of water pockets due to changes in duct elevation.

Photo courtesy Andrea Schokker

Andrea Schokker and civil engineering student Edwin Salcedo take bleed water readings from a grouted test duct.

Two grouts emerged from the testing as recommended: for horizontal applications a 0.35 water-cement ratio grout with 30 percent cement weight replacement fly ash (Class C) and for vertical applications (such as tall bridge piers) a 0.33 water-cement ratio grout containing anti-bleed admixture.

Schokker is continuing her investigations of grout bleed characteristics in laboratory and large-scale testing at Penn State.

—A'ndrea Messer

Dr. Schokker can be reached at (814) 863-2786 or by e-mail at ajs19@psu.edu. ■

Keep on truckin'

Penn State's 'Power Lion' may revolutionize sport utility vehicles by offering a lean, green alternative to today's gas guzzlers

On the outside, it's like any other sport utility vehicle—large, powerful, and fearless. Sunlight dances off the new 2000 Chevrolet Suburban's silvery finish, its metallic skin unblemished by the pummeling rock salt of winter or the punishing mud, dust, and rain of summer.

But on the inside, it's an entirely different vehicle. Underneath the hood, a gaping hole exists where the SUV's massive Vortec V-8 engine once sat. Large battery packs line the cargo area. This is the work-in-progress interior of the "Power Lion," a conventional SUV modified into a hybrid electric vehicle that is a sneak peek at the next generation of sport utilities.

The Power Lion is Penn State's entry in the FutureTruck 2000 competition, a two-year contest sponsored by the U.S. Department of Energy and General Motors. Fifteen North American universities are in a neck-and-neck race to do the best job converting their SUVs from gasoline power to alternative propulsion systems.

Last December, each university received a brand-new 2000 Chevy Suburban from GM, plus $10,000 in seed money to finance their initial work. Each team is modifying the existing powertrain to dramatically increase the fuel economy (energy efficiency) as measured by the total greenhouse gas impact of the vehicle.

All teams chose a hybrid (more than one fuel) powertrain, but the design and choice of fuels vary widely. Fuels include ethanol, gasoline, and diesel, while strategies include weight reduction, improved powertrain efficiency, better aerodynamics, computer-based energy management, and advanced energy storage devices.

But there's an important catch to the competition. Students are allowed to make major modifications to the SUVs, but they need to maintain the comfort, safety, and performance consumers expect in this class of vehicles. This means the Power Lion team cannot strip down the vehicle and permanently remove any of the amenities and features that make SUVs so popular.

What comes out of the competition could be a boon for both automakers and consumers. The wildly popular vehicles are often criticized for their low fuel efficiency, and the recent spike in prices at the pump only adds more fuel to the raging debate.

"Customers expect a vehicle like the Chevrolet Suburban to be a workhorse," says **Mark Maher**, the engineer spearheading GM's involvement in the program. "The real challenge is to increase fuel efficiency but still maintain the load-pulling and cargo-carrying capabilities, as well as the other performance features consumers want."

Continued on next page

Photo credit: Cramer Studio

Battery power offers a cleaner alternative to conventional engines. The battery packs pictured here are only temporary in the trunk.

Photo credit: Cramer Studio

Graduate student Cindy Shirey works where the Power Lion's massive Vortec V-8 engine once sat.

The Competitors

Concordia University
Cornell University
George Washington University
Georgia Tech
Michigan Technological University
Ohio State University
Penn State University
Texas Tech University
University of California, Davis
University of Idaho
University of Maryland
University of Tennessee
University of Wisconsin-Madison
Virginia Tech
West Virginia University

Keep on truckin', continued

Long track record

It may seem a daunting task, converting a gas-guzzling truck to an energy-efficient vehicle, but the Penn State team has a long history of success in this area. Before winning the right to compete in FutureTruck 2000, Penn State engineering students were already winning contests and awards with their first hybrid electric vehicle, the "Electric Lion."

The Electric Lion, a blue 1992 Ford Escort station wagon, was developed as a prototype HEV through a joint effort between the University's Pennsylvania Transportation Institute (PTI) and the student chapter of the Society of Automotive Engineers. The Electric Lion won top honors at the 1999 SunDay Challenge (sponsored by the Florida Solar Energy Center) and the 1999 American Tour de Sol (a 250-mile long road rally hosted by the Northeast Sustainable Energy Association) before ending its racing career last year.

Powered by batteries and propane, the Electric Lion is twenty years ahead of technology found in today's automotive showrooms. And although its racing days are over, the car now serves as a test bed for graduate research in the Department of Energy-directed Penn State Graduate Automotive Technology Education (GATE) program.

U.S. Congressman John Peterson appeared at the Power Lion's official unveiling this spring and offered encourgement to the team members. "The little oil crisis we just went through shows us we need more efficient, cleaner products," he said, promising to do all he can to help fund the program. Pictured also is Associate Dean for Research and Graduate Studies John Mason, left.

Rising to the challenge

But even with so much experience on their side, Penn State team members admit converting their 2000 Chevy Suburban is a formidable task.

Cindy Shirey (ESM '99, MS '00), a former team member, says one of the biggest initial obstacles the students confronted wasn't even mechanical.

"Working on a project of this magnitude, it's a huge organizational challenge," Shirey says. "We're set up like a small company with a management hierarchy.

It's very good experience because we learned a lot of practical skills that are directly transferable to the workplace, such as teamwork, specifying a budget, writing skills, and presentation skills. It gives you a good idea of how to drive an idea from concept to finish."

Team members were divided up into component groups charged with deciding their own budgets. And like in the corporate world, the teams had to give weekly presentations, chronicling their progress to date and what they planned to accomplish the following week.

When it came down to working with the vehicle itself, the students found the Chevy to be a small world after all.

"Most of the problems encountered were space constraints and getting all the components to fit," recalls **Brandon Thomas**, a graduate student in mechanical engineering. "You would think that there is a lot of space in a Suburban—absolutely not true. When you start adding batteries, motors, cooling systems, and big generators, you run out of space really fast. We also had a problem with vehicle weight. Suburbans are already heavy, and we were adding a lot of heavy components. There was an attempt to lightweight them, but it proved to be very expensive."

Power Lion Vital Statistics

Configuration:	Series Hybrid
Passengers:	9
Cargo capacity:	> 2,000 lbs.
Range:	400 miles
Acceleration:	0-100 kph < 10 sec.
Towing capacity:	7,000 lbs.
Fuel economy goal:	35/45 gasoline equivalents
Engine:	Perkins 4.01, 4-cycle TDI
Alternator:	120 kW Fisher, two speed
Batteries:	312 V nominal PbA
Drive motors:	Three 70 kW (95 hp) Solectria Motors
Transmission:	GM Powerglide two-speed automatic rear, single-speed front
Controller:	Allen-Bradley SLC 500 with PC

Team members said the Power Lion project presented constant challenges. As they resolved one issue, they found themselves confronted with new ones.

"Finding an engine that fit in the Suburban that operated at the peak efficiencies the generators ran was difficult," says **Ryan Noss**, a senior in mechanical engineering. "We had to find an engine that worked well at both speeds, 1,200 rpms and 2,400 rpms."

After installing the new engine, the team had to adapt the Suburban's power steering and air conditioning to a different power system. The students also had to build a new computer that controls the generator, motors, brakes, transmission, and other systems—a task requiring a great deal of time and programming.

To the desert

The Power Lion team will get its first test in mid-June when it heads to General Motors Desert Proving Ground in Mesa, AZ. Competitors will be judged on on-road energy efficiency, greenhouse gas impact, exhaust emissions, acceleration, trailer-towing capability, engineering design, consumer acceptability, and cost/manufacturability.

Don Streit, the team's adviser and professor of mechanical engineering, is confident of the team's ability to do well in Arizona.

"Finishing the vehicle itself is a huge challenge," explains Streit. "We've been competing in hybrid electric vehicle competitions since 1992. Our team knows what it's doing. We have student experts directing the component areas. I think we have a good chance of winning—I'll be surprised if we don't finish in the top three!" ■

—Curtis Chan

More information on the competition can be found on the FutureTruck 2000 website at www.futuretruck.org

Judging Targets for FutureTruck 2000 Competitors

Greenhouse gas impact:
Reduction of two-thirds from stock

Emissions:
Equivalent to California's LEV II (low emission vehicle) standard

Acceleration:
0-60 mph in 12 seconds

Towing capacity:
7,000 lbs.

Range:
325 miles

Luggage space:
70.6 cu. ft.

Interior climate control (HVAC):
Equal to current production standards

Photo credit: Cramer Studio

The tip of the iceberg

Little did a Penn State aerospace engineering professor know that a simple phone call would change the face of sailplanes—and more

Whether it's yachting, NASCAR, or bicycling, racing is a sport where victors often separate themselves from losers by a hair.

The same can be said of sailplane racing. Though they may seem quiet and majestic from the ground, sailplanes race as fast and fierce as any competition found on the track or water.

Looking for a competitive edge, one sailplane enthusiast turned to a friend and aerospace engineering faculty member to revisit an old aviation idea to try and improve his glider's performance. What they got was a product that helped win races, set a new standard for gliders, and may have set off an aviation trend.

In the beginning

In 1987, sailplane enthusiast and mechanical engineer **Peter Masak** called on **Mark Maughmer**, an associate professor of aerospace engineering, about adding winglets to the tips of his sailplane wing to improve performance.

"The idea of putting some kind of endplate on the wings to reduce the drag due to lift has been around for a hundred years," Maughmer explains. "The problem was that these endplates have to be huge in order to dissipate this drag. So, you'd get rid of one drag only to get another. The idea of the winglet is to trick a wing into thinking that there's an endplate there. It effectively makes the wing feel like it has a much bigger span."

Work on winglets dates back to the late 1960s. Engineers found that the little triangular structures would greatly improve performance when a sailplane was climbing, but cause a decrease in performance when it was cruising.

Maughmer told his friend that it had already been tried, and said winglets would provide little to no benefit to his sailplane's performance. "The changes you're looking for are in small percentages. There weren't good enough methods to predict drag in the small percentages we were looking for."

Masak said he wanted to develop the winglets anyway, and would appreciate any help his aerospace engineering friend could provide.

"He had been trying things and thought he could make it work," Maughmer recalls. Maughmer eventually agreed and began collaborating with Masak. "And so we went through this trial-and-error process. We'd go through things on the phone."

Masak would try an idea on his glider in Texas and then call Maughmer in Pennsylvania. Maughmer then listened to Masak's description of the problem and suggested different solutions and tactics to try on the winglets.

"The frustrating thing was developing these by trial and error rather than by conventional means," Maughmer says. His work on the winglets also had an educational component. The winglets research yielded four master's theses and was tied in with the College's sailplane course.

Made of carbon fibers with a gelcoat surface, the winglets only add a few pounds to the overall weight of the sailplane. "Oddly, weight isn't important," Maughmer explains. "In fact, most gliders add 300 lbs. of water ballast. It's like racing sleds in the winter. The more people you have on, the faster it goes."

Over the years, the duo developed a winglet that allowed the glider to execute its racing functions effectively—climbing (low speeds) and gliding (high speeds)—without one adversely affecting the other.

"We were very lucky we stumbled on the right designs," he says. "Others didn't."

Once a rarity on sailplanes, winglets have become standard equipment on the aircraft.

Winning acceptance

Just because Maughmer and Masak developed a winglet that actually worked didn't mean the sailplane racing community embraced it right away.

"We're chasing fractions of a percent. We put them in the hands of people who were receptive to any gain in performance they could get," recalls Maughmer, who says the competitive spirit is similar to Indianapolis or the America's Cup.

"People looked at them and said, 'That's going to hurt you.' It took several years of the right people using them and beating the right people, who then realized what it was that was beating them. They'd get left behind in the dust and they would say, 'I gotta get a set of those.'"

Winglets began winning—big. Each U.S. nationals competition this past racing season was won by a sailplane equipped with winglets. On Maughmer's desk sits a list of races and the top finishers for each competition. Marked in red are Penn State winglet users. Very uncoincidentally, red also marks the top finishers.

Catching on

Today, winglets have become so accepted among sailplane enthusiasts that few gliders leave the factory without them.

Winglets are so popular, in fact, that they're being utilized on commercial aircraft.

"I can't say for certain what influence we had, but about the same time we were having our success, they started showing up in other places," Maughmer says.

The idea of sailplanes serving as a test bed for new aviation technologies goes back quite a ways. "There are a lot of innovations from sailplanes that have made it into other types of aircraft. Sailplanes are kind of like the canary in the coal mine. Aerodynamicists know that there's nothing that goes on a racing sailplane that doesn't work."

Innovations such as composite materials, active boundary layer control, and laminar flow aerodynamics are all ideas that originated with sailplanes and have been incorporated into powered airplanes.

Already companies from Cessna to Boeing are considering making winglets standard equipment on the aircraft they build.

Maughmer says that the growing acceptance of winglets goes beyond simply racing.

"We're finding that winglets improve handling qualities so much, particularly near stall, that perhaps they should be used not only for performance gains on racing sailplanes, but possibly for safety enhancement on all gliders, even trainers," he says.

Winglets help prevent stalling, when there is not enough airspeed to provide lift for an aircraft.

"Technical innovations such as these are driven by competition," Maughmer explains. As for what's next, Maughmer himself isn't even sure. "I don't know where we'll go, but we're certainly not done yet." ■

—Curtis Chan

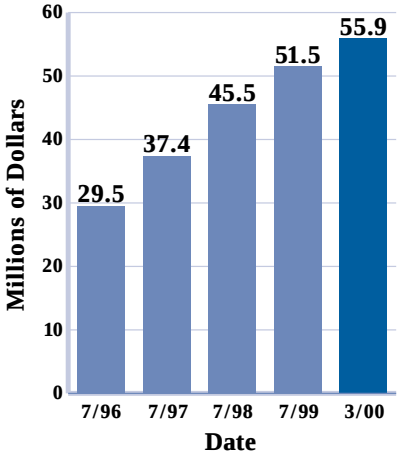
Dr. Maughmer can be reached at (814) 863-4485 or by e-mail at mdm@psu.edu.

a GRAND DESTINY

THE PENN STATE CAMPAIGN

PROGRESS UPDATE

Engineering Endowment



Engineering endowment increases dramatically

Since July 1996, Penn State and the College of Engineering have sought to increase the endowments supporting our students, faculty, staff, and programs through the Campaign for Penn State, A Grand Destiny. Thanks to the generosity of our alumni and friends, the College's endowment has nearly doubled in that time, as shown in the chart at the bottom left.

Endowment investment income provides a dependable revenue stream to help reduce reliance on external funding sources, and keep tuition as low as possible. It also increases our competitive edge in recruiting the nation's best students and faculty. These are vital to our ability to produce world-class engineers and leaders for the next millennium.

Endowment Objectives

Scholarships
The College seeks endowed support for 1,000 new undergraduate scholarships—both merit and need-based—to help bring the brightest and most deserving undergraduates to Penn State Engineering.

Fellowships
The College seeks endowed support for 100 new graduate fellowships, which are often pivotal in attracting high-achieving students.

Faculty Support
The College seeks endowed support for 10 new chairs and 10 professorships to recruit and sustain faculty excellence. These endowments will increase our College's competitiveness for the nation's best engineering faculty.

Program Support
The College seeks to establish Departmental Academic Excellence Endowments for each department in the College, and for the Women in Engineering Program (WEP) and Minority Engineering Program (MEP). Such endowments will support lecture series; meet staff and equipment needs; bring outstanding engineering professionals into the College; and provide opportunities for students to develop relationships with important leaders and professionals from business, industry, and government. ■

Engineering Total
Goal: $100 million
Current Progress:* $79.9 million (80%)

Scholarships
Goal: $30 million
Current Progress: $25.2 million (84%)

Fellowships
Goal: $10 million
Current Progress: $6.9 million (69%)

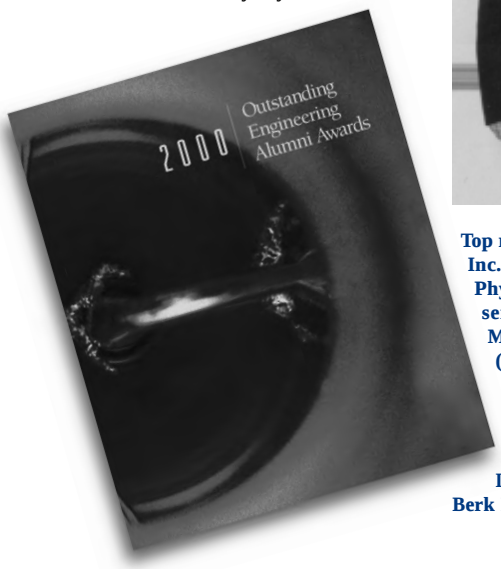
Faculty Support
Goal: $20 million
Current Progress: $13 million (65%)

Program Support
Goal: $9 million
Current Progress: $8.3 million (92%)

**As of March 31, 2000*

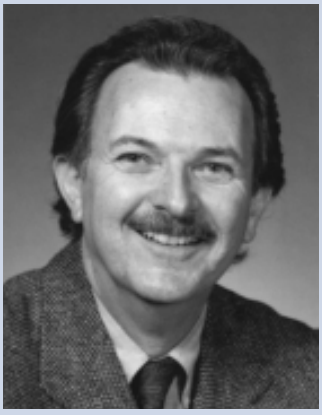
Honoring our best

The College's 2000 Outstanding Engineering Alumni returned to campus in April to share their expertise with students and receive their awards. They join a select group of 200 who have been honored since the award was established in 1966. We congratulate them on their exceptional careers and achievements, and value their dedication and loyalty. ■



Top row (from left): Stephen F. Homcha (ME '74), executive vice president, Mack Trucks, Inc., Product Development and Truck Programs; Edward M. Frymoyer (ESM '59, PhD Physics '67), chief executive officer, Infinity I/O, Inc.; Suzanne L. Keenan (NucE '86), senior vice president, customer service, Comcast Cable; Middle row (from left): James M. Morgan (ChE '69), president and CEO, Equilon Enterprises LLC; Joseph R. Borda (AE '67), president, Borda Engineers & Energy Consultants and Gulf Landings Development Corporation; Lou Borges (Aero '44), former assistant chief engineer, U.S. Army Material Command, Washington, D.C.; Front row (from left): Byron F. Wetmore (CE '57), president and CEO, Lane Industries and the Lane Construction Corporation; Benjamin A. Pontano (EE MS '67, PhD '70), president, COMSAT Laboratories; Norbert P. Gaelen (IE '47), chairman, O. Berk Company, president, O. Berk International; David A. Woodle (CSE '77), president and CEO, C-COR.net.

Miller wins advising award



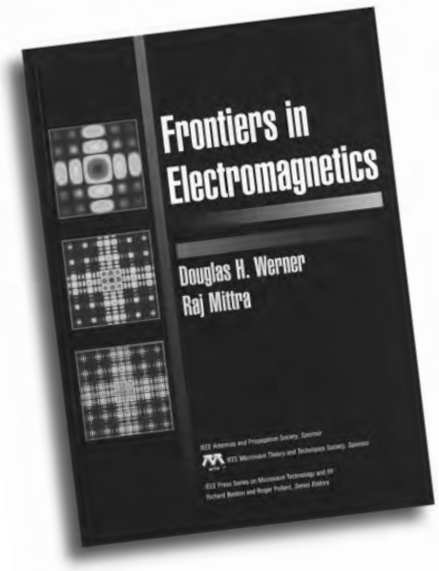
Arthur Miller, professor of civil and environmental engineering, was named Zone I Outstanding Student Chapter Faculty Advisor for the Penn State American Society of Civil Engineers Student Chapter. Miller was chosen out of 59 eligible candidates within the zone, and was selected for his outstanding work and dedication.

Miller served as faculty advisor for the group from 1972-1976 and from 1987 to the present. He has also been actively advising other student groups throughout his career at Penn State and was a recipient of the Penn State Engineering Society's 1999 Premier Teaching Award.

College Update

Bookshelf

New book collects cutting-edge electromagnetics information into comprehensive volume



Two Penn State faculty members have published a new book on electromagnetics covering research in the field.

The book, *Frontiers in Electromagnetics*, was edited by **Doug Werner**, associate professor of electrical engineering, and **Raj Mittra**, professor of electrical engineering. *Frontiers in Electromagnetics* is a unique collection of chapters written by top experts in the electromagnetics field. The chapters discuss some of the hottest research in the field today as well as major advances in long-standing electromagnetics problems.

The 787-page book features color inserts and was written for industry professionals, faculty, and graduate-level students. Topics covered include fractal antennas and arrays, scattering from fractally rough surfaces, knot electrodynamics, group theory, genetic algorithms and neural networks, model-based parameter estimation, wavelets, fractional calculus, Lommel and multipole expansion techniques, recent advances in finite-difference time-domain technique, perfectly matched absorbers, and wave propagation in complex media.

The hardcover volume, sponsored by the IEEE Antennas and Propagation Society and IEEE Microwave Theory and Techniques Society, is available from the Institute of Electrical and Electronics Engineers. The cost is $85 for IEEE members and $99.95 for non-members. It can be ordered by calling (800) 678-IEEE (4333) or (732) 981-0060. It may also be ordered online at http://www.ieee.org/products/shop.html

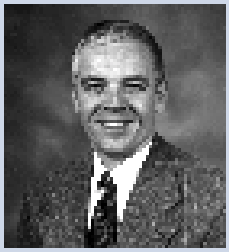
Dr. Werner can be contacted at (814) 863-2946 or by e-mail at dhw@psu.edu. ■

Engineering faculty members receive Fulbrights

A number of engineering faculty received Fulbright Senior Scholar grants this year to conduct research or lecture abroad.

Of eight grants Penn State received, half of them went to engineering faculty. They are: **Thomas Boothby**, associate professor of architectural engineering; **Steven Garrett**, professor in acoustics; **Konstadinos G. Goulias**, program director of the Pennsylvania Transportation Institute; and **Rangachar Kasturi**, professor in computer science and engineering.

In the United States, 750 faculty and professionals annually receive grants through the program, which is sponsored and funded by the Bureau of Educational and Cultural Affairs of the U.S. State Department.



From your president

Tom Skibinski

Tom Skibinski

Dear Alumni and Friends,

It is hard to believe that my tenure as president of PSES is over. In the last two years, our Society has accomplished a lot, especially with respect to alumni/faculty/student interaction. This interaction is fostered through our annual golf tournament, the faculty and staff awards, the student service award, and the programs we have instituted for the students, our future PSES members.

PSES and the College of Engineering are poised for tremendous strides in the new millennium. With the development of the West Campus, the College of Engineering will be expanding its teaching and research resources to meet the needs of students, faculty, alumni, and the public. This, in conjunction with Penn State's World Campus, will put us at the forefront of engineering education and leadership.

Being president of PSES is not a one-person operation. I would like to thank the committee chairs for an outstanding job of keeping the committees focused and motivated. Also, hats off to our affiliate program group presidents who keep PSES informed on their activities. Last, but not least, a heartfelt thanks to **Cindy Jones**, her assistant **Jane Harris**, and to all of the staff in the College of Engineering for their tremendous help to both me and PSES.

In closing, it has been my honor and pleasure to serve Penn State's engineering alumni over the last two years. Together, we have energized PSES and have made it one of the best college constituent societies at the University. Best of luck to my successor, **Willard Kresge**, P.E., EE '66, whom I am confident will continue the energy and motivation of PSES into the future.

Congratulations to our recent graduates, the newest members of PSES! Get involved! The success of PSES depends on you! Reinvest some of your time and energy into your alma mater. The rewards of doing so will be significant. ■

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

PSES Student Service Award

On May 12, before the Spring graduation ceremony for the College of Engineering, PSES President **Tom Skibinski** presented the Society's 2000 Student Service Award to **Julie L. Arbuckle**.

Arbuckle, a senior in the electrical engineering department, was selected for her exceptional service to the College and outside community. During her undergrad years at Penn State, Arbuckle was a leader in both the Women in Engineering Program (WEP) as president of WEPO (the WEP orientation program) and as chairperson of the regional SWE (Society of Women Engineers) conference. She also was elected representative of 27 universities at the National SWE Conference.

Arbuckle served on the Engineering Round Table (ERT) as chair and on the EE Student Advisory Committee. She also coordinated community service activities for 60 General Electric co-ops in Louisville, KY.

The Penn State Engineering Society established the Student Service Award

in 1997 to recognize undergraduate students who exemplify outstanding qualities of leadership and public service. These activities bring distinction, not only to the students, but to the College of Engineering and Penn State.

Each recipient receives a certificate and a $500 cash award.

Previous recipients are: 1999: **Tracy A. Frost**, engineering science and mechanics, and **John P. McCarty**, electrical engineering; 1998: **Jason Spiegler**, mechanical engineering; 1997: **Shannon Isovitsch**, civil engineering. ■

Class Notes

1960s

Frank L. Chelko (AS EET '69, MS QMM '00) is director of quality and reliability assurance at C-COR.net in State College. Chelko is a recent graduate of the Quality and Manufacturing Management Master's program cosponsored by the Colleges of Engineering and Business. His son Christopher has just completed his freshman year at Penn State's University Park campus.

Suey (Knapp) Irvine (EE '66) practices energy healing and feng shui in Aptos, CA. She has written a book, *Healing Quest: A Mother's Intuitive Search*. Irvine's book chronicles her journey from mainstream Western medicine to acupuncture and Chinese herbs as she sought a cure for her son's cerebral palsy and asthma.

1970s

Rodney E. Holderbaum (CE '76) is vice president of Gannett Fleming, an international consulting engineering and construction management firm based in Harrisburg. Holderbaum manages the firm's dams and hydraulic structures section and major dam projects. He is also responsible for many areas of water resources engineering, including dam design and inspection, flood control and flood insurance studies, stormwater management, navigation studies, inspection of port and harbor facilities, water intake structure design, and pipeline design.

Alfred R. Mangus, P.E. (AE '76) coauthored a chapter on orthotropic deck bridges in *The Bridge Engineering Handbook*, published by CRC Press in 1999. Mangus is a transportation engineer with the California Department of Transportation. He lives in Sacramento.

Antonio Sebastian (ME '78) is co-owner and president of Avanti Engineering & Manufacturing, Inc., in Greensburg. Founded in 1999, Avanti offers services in general machining, mechanical design, engineering, and testing.

1980s

Kurt R. Hammerbeck (ChemE '89) is a senior engineer at Freeport Sulphur Company's Main Pass 299 Sulphur Mine, 30 miles off the Louisiana coast in the Gulf of Mexico. Hammerbeck is responsible for drilling high-angle, extended-reach wells from two drilling platforms. His duties include well design, job planning, and supervision of drilling.

Lisa M. Veneziano (IE '86) brought an AC Delco facility on line recently in Groveport, OH. The new AC Delco plant is part of General Motors' service parts operations division, and Veneziano serves as the facility's plant manager. In February, Veneziano ran the Las Vegas Marathon with a time of 2:50:40. She received an MBA from the University of Michigan in 1995.

Teressa E. Watts (EE '89) and her husband Mark opened their second boat dealership in Orlando, FL. Liquid Sports Marine specializes in

Alumna oversees global e-business

Priscilla E. Guthrie (EE '70) has been named vice president, e-business, for TRW. She reports directly to David Cote, president and chief operating officer of TRW, Inc., and is responsible for directing TRW's global e-business strategy.

Prior to this, Guthrie was vice president and general manager of the Commercial Market Area for TRW's Systems & Information Technology Group. The Commercial Market Area, headquartered in Reston, VA, provides IT-based business solutions to a worldwide client base of state, local, and international government and commercial clients.

Since joining TRW in 1972, Guthrie has held a series of positions in general, program, and technical management in TRW's defense, intelligence, civil, automotive, and commercial IT businesses.

In addition to her B.S. in electrical engineering from Penn State, Guthrie holds an M.B.A. from Marymount University.

Since 1990, Guthrie has served as a mentor for the Scholarships-in-Escrow program. She supports several activities at Penn State: Penn State Engineering Society board member, the Dean's advisory board for the Women in Engineering Program (former chair), the Enterprise Integration Industry Advisory Board, and the Leonhard Center Advisory Board. She also serves on the boards of the Northern Virginia Technology Council and the Fairfax Symphony Orchestra.

Most recently, Guthrie served as the keynote speaker at the College of Engineering's Spring 2000 commencement exercises. ■

MasterCraft, Maristar, and Bryant boats. In 1998, Watts and her husband sold a division of their business, ZeroFlexFlyer, a wakeboard tower company.

Kirk A. Weaver (CE '87) is a senior systems analyst with Michael Baker Jr., Inc., in Princeton, NJ. Weaver develops engineering-based database applications for state transportation departments and other public agencies. Prior to joining Michael Baker Jr., Weaver spent eleven years with the New Jersey Department of Transportation. He resides in Ewing, NJ, with his wife **Maren (Wright) Weaver** (Bus '88), their daughter Casey, and their son Connor.

1990s

Geoffrey M. Cohick (IE '95) and **Amy E. Stoner** (IE '96) married on November 27, 1999. Cohick is a senior industrial engineer at NTN-BCA in Lititz, and Stoner is a manufacturing engineer at Harley-Davidson Motor Company in York. The couple met at Penn State in the industrial engineering department's Junior/Senior Buddy/Mentor Program. They reside in Landisville.

Patricia (Behun) Coopersmith (IE '90) and her husband Joshua announce the birth of their second child, Emma, on November 18, 1999. The Coopersmiths have another daughter, Alexa, and reside in Woodbridge, VA. They are both management consultants at PriceWaterhouseCoopers in the Washington, DC, area.

Scott D. Klunk (Aero '93) and his wife Jacqueline announce the birth of their son, Jason, on November 8, 1999. Klunk and his family reside in New Oxford.

Theodore L. Moon (MS ChemE '96, PhD '99) is a visiting research fellow at the Paul Sabatier University in Toulouse, France. During the past 18 months, he has traveled extensively and presented research papers in Paris and Barcelona.

Kathleen M. Scholz (AE '95) is a project engineer at High Concrete Structures, Inc., near Harrisburg. Scholz designed the precast concrete panels and connections for the new Earth & Engineering Sciences Building on Penn State's West Campus at University Park.

Adam J. Sprankle (ME '95) is a project engineer/production supervisor at the World Kitchen's PYREX manufacturing plant in Charleroi. His wife **Lauren E. Sprankle** (CE '96) is a municipal engineer with EADS Group in North Huntingdon. The couple resides in the Pittsburgh area.

Theodore R. Stodgell (ME '99) is a staff engineer with United Space Alliance Corporation at the Johnson Space Center in Houston, TX. United Space Alliance is the primary contractor for the space shuttle.

Channing J. Strom (AE '94) is a project engineer with PCL Constructors Canada in their Toronto office. Strom and his wife **Amy Susan (Goetz) Strom** (HHD '92) live in Guelph, Ontario, with their sons, Lucas and Evan.

Jeffrey D. Swanson (ME '91) works for General Electric Transportation Systems in supplier development in Europe, Africa, and Asia. He is also team leader of GE's Penn State Recruiting Team, supervising approximately 100 recruiters who are responsible for recruiting Penn State students from all majors and campuses for all GE locations.

Philip Tsang (Aero '96) is an aerospace engineer at GRC International in Vienna, VA. He is pursuing both an MBA and an MS in engineering management at the University of Maryland. Tsang also serves as a Penn State alumni admissions volunteer and is a member of the DC Metro Chapter of the Penn State Alumni Association.

Marie E. Yingling (EE '99) will marry **Timothy L. Risser** (FdSc '00) in October. Yingling is a telecommunications consultant with Booz, Allen & Hamilton in Falls Church, VA. ■

Got news?

We'll be the first to admit that campus hasn't been the same since you graduated and went out into the real world. We're dying to know what you've been up to. Have you gotten a new job, a promotion perhaps, or even married?

Now telling us your news is easier than ever. Just go online to our website at www.engr.psu.edu/alumni and fill out the handy dandy alumni news form! We'll make sure your news 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 a return address if you wish the photos to be sent back to you.

Looking forward to hearing from you!

In Memorium

Harry L. Kinsel (SE '28) died February 25, 2000. He was 93. Kinsel was a longtime partner, president, and former chairman of Metcalf & Eddy, a Boston-based environmental engineering firm. He is survived by his wife, Elizabeth, and a daughter.

Bruce R. Tegge (ChE '38, MS '40, PhD '42) passed away in 1999 at the age of 82. Tegge spent his entire career with Exxon Chemical Company, retiring as a senior engineering associate in 1987. He is survived by his wife, Lillian, and their four children. ■

Dancing for life

Former Four Diamonds child dances at Thon

Every year at the Interfraternity Council/Panhellenic Dance Marathon, hundreds of children from the Four Diamonds Fund are helped by hundreds of Penn State students who participate in the philanthropy.

When he was 10 years old, **James Neumyer**, a senior in computer science, was one of those Four Diamonds children, but in his last semester at Penn State, he became one of many Penn Staters helping the kids.

Neumyer, along with his roommate **Michael Schultz**, a senior in earth science, represented the Shotokan Karate Club as dancers in this year's dance marathon. Through Neumyer and Schultz's guidance, the club raised $1,500.

"I want to give back what other people gave me," Neumyer said.

What he was given was support.

Neumyer was diagnosed with cancer in July 1989 and was set up with a social worker from the Four Diamonds Fund right away. Four Diamonds, along with his doctors, continually kept him informed about

Photo credit: Megan K. Morr

James Neumyer, a senior in computer science, prepares to dance in the 2000 Interfraternity Council/Panhellenic Dance Marathon.

what was going on with his treatment, which came to an end in December of that year.

Mary, Neumyer's mother, said the help given to them through Four Diamonds was phenomenal. James Neumyer's chemotherapy cost $12,000, and his radiation a couple thousand dollars. The family's insurance did not cover it all.

"Four Diamonds picked up what the insurance did not cover," Neumyer's mother said.

From picnics to Christmas parties, the organization always had get-togethers for the children, she added.

"They are always there to talk to when you need to, which is wonderful," Mary Neumyer said.

What the Four Diamonds Fund means to James Neumyer is quite simple: "The saving of lives," he said.

As a patient, Neumyer knew about Penn State's Thon, but was never able to attend.

"I was never able to attend Thon, but I now wish that I would have gone," Neumyer said.

J-D Swanson, a graduate student in integrative biosciences, adviser and instructor at the Shotokan Karate Club, said when Neumyer came to him with the idea, he and the club supported him.

"I am tremendously proud that someone like him is dancing and representing us, karate, and what we do," Swanson said.

Swanson added there are five parts to karate: character, etiquette, truthfulness, effort, and self-control, and

Continued on next page

Photo credits: Penn State Department of Public Information

Students in charge of Thon's various operations are introduced to spectators at the event.

Two-year-old Alex Miller makes his first trip to the Dance Marathon from Millersville.

"Doin' it straight for 48"

Since the Penn State Dance Marathon was started in 1973, the annual event has raised more than $11 million for the Four Diamonds Fund.

More than 650 students dance in the 48-hour marathon to raise money for children with cancer.

In addition to the dancers, more than 1,800 participate in Thon-related committees, serving as marketers, organizers, security personnel, and morale boosters.

The Penn State Dance Marathon has grown from a small event of 39 dancers raising $2,000 to the largest student-run philanthropy in the nation.

More information about the Penn State Dance Marathon can be found on the Internet at www.thon.org.

Dancing for life, continued

Neumyer personifies what he and the club strive for.

"Thon is a perfect example of the amount of character portrayed by James in his everyday training and everyday life," Swanson said.

The fact that James danced in Thon does not surprise James' friend **Chris Taylor**, a senior in computer science, at all.

"What he went through as a child changed his life," Taylor said. "He was helped when he was younger and it is great that he is giving back to Thon the way he is."

Mary Neumyer, who has attended dance marathons in the past, was in town for the weekend's events.

"I just enjoy the energy in that building no matter what time it is—2 a.m., 3 a.m., 7 a.m.—the energy is amazing," she said.

Mary Neumyer is not surprised at all that her son is dancing in Thon, especially because he's been wanting to do it since last year, but she did have one hope for him.

"I just want him to make it through." ■

—Colleen Hyland
Story and photograph reprinted with permission by the Daily Collegian.

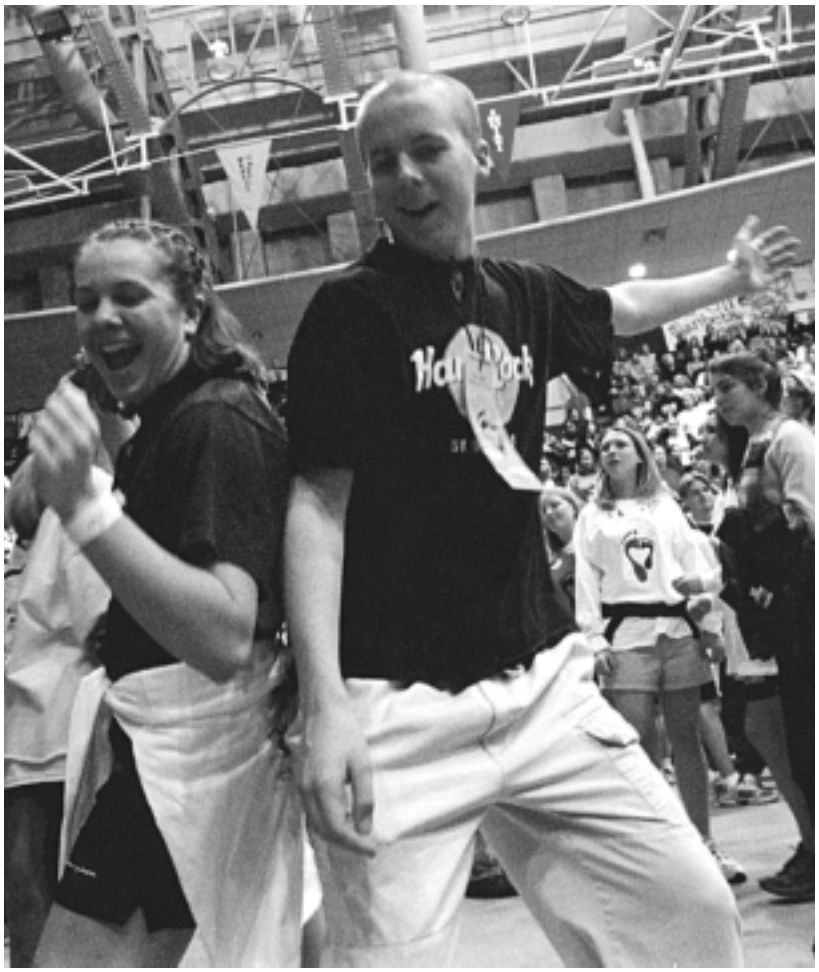


Photo credit: Penn State Department of Public Information

Brandon Baumbach of State College, whose cancer is in remission, dances with his sister Bethany at this year's Thon.

That Christmas Spirit

This past holiday season, the Department of Architectural Engineering, the Student Society of Architectural Engineers, and the AE Graduate Student Association worked with the Second Mile local charity to donate $2,481 in toys, clothing, food, and cash to two Centre County "adopted" families. Former Nittany Lion assistant football coach Jerry Sandusky (right), who founded the Second Mile, and Second Mile official Kim Plummer (second from right), presented AE graduate student Jonathan Dougherty and SSAE president Shannon Appleby with a token of appreciation from the families.

Photo courtesy Shannon Appleby

For one student, her pen is as mighty as her sword

Natural talent only begins to describe **Carla Esteva** as an industrial engineering student and a member of the Penn State women's fencing team. The two-time captain from Mexico City, Mexico, garnered All-American honors four years in a row, hopes to compete in the Olympics, and might even give the legendary Zorro a run for his money.

Esteva, who competes in foil, has been one of Penn State's best fencers since arriving in State College in 1996. She has a phenomenal 134 wins against just 17 defeats in dual bouts through her first three seasons—good for an 88.7 win percentage.

But her life as a world-class fencer and engineer would never have come to pass if it weren't for her family. Many family members are engineers, including her father and sister, who are both industrial engineers, and her uncle, who attended Penn State and studied mechanical engineering.

"I've always known Penn State is a good engineering school," says Esteva, whose first language is English. She recalls how excited her sister Maggie was about her classes and that in turn got young Carla excited about engineering.

Her sister was also integral in Esteva's choice of fencing as a sport. "It's not very popular in Mexico," she says. "Soccer, tennis, and volleyball are the sports that are popular." Esteva picked up fencing at age eleven when she started tagging along with her sister, who was a fencer.

"I did it sporadically, but it was fun," Esteva recalls. She began competing seriously by age sixteen and continued fencing when she headed north of the border to attend Penn State. Esteva helped the Nittany Lions continue their winning tradition.

"It's pretty challenging, but it's rewarding," she says on being a student athlete. "I've been juggling both since junior high school—it's all about managing time. You have to give up things. For example, I can't go out as much, but I still have fun."

Esteva admits that she doesn't get home to Mexico City much during holidays, and instead spends those times practicing and competing.

But all that hard work will pay off after graduating in May 2000. She plans to go to work for Microstrategy, a company specializing in data mining software that is based in Vienna, VA. Esteva also hopes to pursue an MBA one day and move to Chicago, where her boyfriend is currently attending law school.

Before then, however, she has some fencing left to do. After graduation, Esteva will head back to Mexico to begin practicing for the Olympic qualifier that will be held in Argentina. An agreement with her company allows her to delay starting work until she qualifies and competes in the 2000 Summer Olympics in Sydney, Australia.

"I've seen fencers try to quit, but they can't because it's a part of your life," Esteva laughs. ■

Photo credits: Penn State Sports Information

Carla Esteva, right, has been an important part of the Penn State women's fencing team. Last season when the Lady Lions faced a tough Columbia women's foil squad, Esteva flourished, winning three of her four bouts.

2000 Student Marshals

Each spring at the College of Engineering's commencement ceremony, 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 student marshals from the spring 2000 graduation ceremony are our best—and we're proud to introduce them to you.

Aerospace Engineering

Jane Marie Rydzewski
of Telford, PA
Employed by Lockheed Martin Corporation in Valley Forge, PA

Agricultural & Biological Engineering

Michele A. Aukerman
of Lewisburg, PA
Employed by Uni-Tec Consulting Engineers, Inc., in State College, PA

Architectural Engineering

James W. Hostetter, Jr.
of Holtwood, PA
Employed by Keystone Custom Homes of Willow Street, PA

Chemical Engineering

Sara E. Leister
of Lancaster, PA
Employed by the Vaccine Technology and Engineering Group of Merck & Company, Inc.

Civil Engineering

Amanda Fry
of New Bloomfield, PA
Employed by Orth-Rodgers & Associates, Inc., in Mechanicsburg, PA

Computer Engineering

Jan Patrick Schmidt
of Houston, TX
Employed by Lucent Technologies

Computer Science

Eric D. Cook
of Occoquan, VA
Employed by MIT Lincoln Labs in the Ballistic Missile Defense Technology Division

Electrical Engineering

Michael Remmel
of Allentown, PA
Employed by Lucent Technologies in Reading, PA

Engineering Science

Edward S. Slatt
of Hummelstown, PA
Employed by Prediction Systems, Inc., in Spring Lake, NJ, and attending graduate school at the Steven's Institute of Technology

Industrial Engineering

Eric R. Mellott
of Big Cove Tannery, PA
Employed as an industrial engineer in the manufacturing industry

Mechanical Engineering

Robert Iera
of Pittsburgh, PA
Attending graduate school at Penn State

Nuclear Engineering

Michael T. Wenner
of St. Johns, PA
Attending graduate school at Penn State

ROTC

Steve Poleskey
of Beavercreek, OH
Attending Naval Nuclear Power School in Charleston, SC

Building on success

It was a great spring semester for civil engineering students this year:

—The Penn State American Society of Civil Engineers won the regional competition for the steel bridge and the concrete canoe team placed second in their regional contest.

—At the 10th annual Environmental Design Contest held by the Waste-management Education & Research Consortium, Penn State was only one of six universities to capture a first-place finish. Teams were allowed to select at least one environmental task to solve and presented their solutions this past April at New Mexico State University. Penn State's task, metal recovery from an open pit mine, won the team a $3,500 prize. ■

The Last Word—

Graduation–"With all of the rights and privileges thereunto appertaining..."

by David N. Wormley, Dean

This May, the College of Engineering graduated more than 600 new engineers and 175 students with advanced degrees. These students represent a measurable fraction of the total number of engineers graduating from U.S. universities this spring.

They enter a world that is becoming smaller and more tightly knit—a world in which an e-mail virus can move from continent to continent in seconds, disrupting government and industry across the globe. The speed at which communication takes place and the coupling of citizens of every nation provide not only challenges, but unlimited opportunities for our students graduating today—opportunities to enter a remarkable economic climate and also to make significant contributions to society on both professional and personal levels.

Considering the future, it is appropriate to ask the question: What has the College of Engineering done to prepare graduates for their place in the world? When we consider this, we know our curriculum has changed significantly in even the past few years and is evolving to emphasize those qualities we believe are important to success, including a solid technical foundation, teamwork, communication skills, a strong sense of ethics, and personal and professional leadership.

Today's students also have research experience in technologies that will define the future. They have employed research processes ranging across the scale, from retrieval of Internet information to major experimental endeavors. Our students have engaged in activities with peers from other disciplines, from other countries—and in many cases from other cultures—and have learned to work with a variety of people. They also have had opportunities to participate in educational programs such as co-ops, internships, student professional societies, and activities such as the Dance Marathon, the largest student-run philanthropy in the country.

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Increasingly, our engineering students are benefiting from the support of our alumni and industry leaders, who come to campus to help us define future curricula and learn that fundamental personal characteristics and traits, no matter how rapidly technology advances, will remain important in all of our future endeavors.

During this period, our faculty have also engaged students to develop a sense of the coupling of "rights and privileges," of an education with the implicit responsibilities that revolve around both a professional and personal commitment to contribute to society.

Thus, as we celebrate commencement, it is a time not only to look to the future, but also to bear in mind the important things from the past that have brought us to this point, so the College and its graduates can continue making significant contributions to our society.

Earth and Engineering Sciences Building opens

This spring, construction on the new Earth and Engineering Sciences Building was completed. The building is the second new engineering structure to open on what will be the West Campus. Last year, the College celebrated the opening of the Leonhard Building, which houses the Harold and Inge Marcus Department of Industrial and Manufacturing Engineering. The West Campus is located between North Atherton Street and the University Golf Course, behind the Garfield Water Tunnel.

The new building is shared jointly with the College of Earth and Mineral Sciences and will serve as home to the Department of Engineering Science and Mechanics. Like the Leonhard Building, it features a multimedia classroom to allow students to learn using the full range of modern information and communication technologies.

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