ENGINEERING

insights

College of Engineering University of Notre Dame

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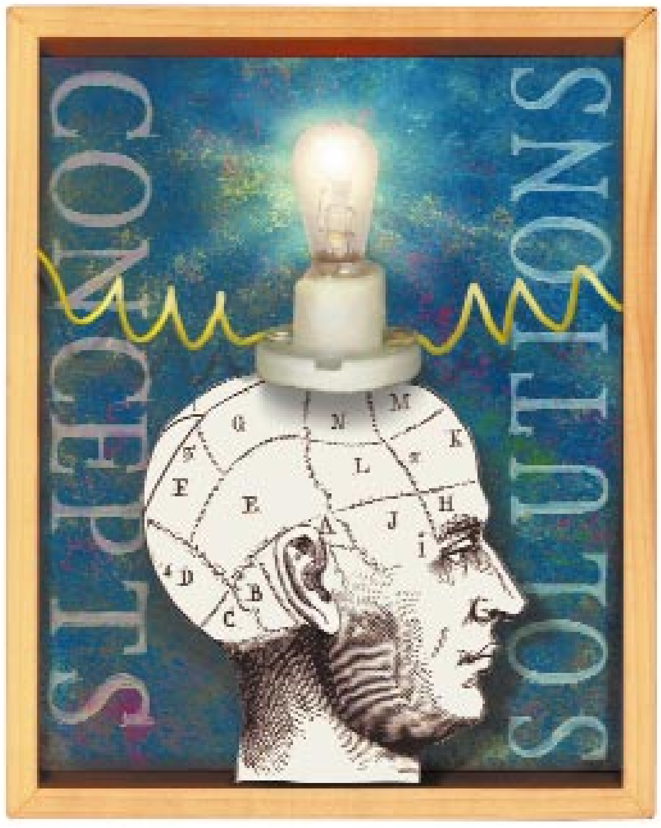
Undergraduate Researchers:

Looking for Solutions

When engineers, inventors, or scientists are successful in creating new products or refining old ideas so they work better, society wants to know why. How did they come up with the idea? What made them think of that particular solution? How long did it take? Reporters often question the researchers, and sometimes they are surprised by the answers. In fact, when Thomas Edison was asked about his genius — his ability to find solutions to the problems of humanity — he replied, "Genius is 99 percent perspiration and one percent inspiration." The students who have participated in Notre Dame's Research Experiences for Undergraduates (REU) program would probably agree with him.



College of Engineering research is not reserved for graduate students and faculty. For a number of years, undergraduates have had the opportunity to assist their professors in research, encountering the ups and downs of trial and error and the laboratory know-how that will be expected of them as they enter the work force. It is hard work, but according to the students, it is well worth the effort. Here is a glimpse of a few of the research opportunities engineering undergraduates experienced this past summer.

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inside insights

from the dean

Last year I indicated that my comments in this newsletter will generally deal with goals of the College and progress toward achieving these goals. However, I will occasionally digress to share my views on broader issues that both affect and transcend the College of Engineering. This is one of those occasions, and the issue concerns the perception and role of engineering in our society.

It is regrettable that, despite its profound effect on life in the 20th century, engineering is poorly understood. In a recent survey conducted by the Harris Poll, it was found that only two percent of the public associated engineering with creativity and three percent with innovation. The general misunderstanding of the nature and fruits of engineering was such that the pollsters termed it the "stealth profession." What then is engineering?

At every opportunity, I tell our students that engineering is *a discipline that combines an understanding of the natural world with the earth's resources to satisfy human needs and wants.* Engineers serve humanity by providing more efficient means of producing food, fiber, shelter, energy, transportation, communication, health care, a clean environment, and many other things that contribute to our well-being and self-realization. If dedication to God implies working for the betterment of humanity, then the engineering profession is certainly in God's service.

Engineering is not science. Science is a noble and important endeavor concerned with understanding the natural world, or in the words of William Wulf, president of the National Academy of Engineering, science is concerned with *what is.* In contrast, engineering is concerned with *what can be.*

As a creative process, engineering is strongly tied to innovation, which implies a new way of doing things. Innovation is much more than discovery. It is an activity with great potential for improving the use of natural resources, the health and welfare of people, their mobility, and how they communicate. During the 20th century the course of mankind has been more strongly influenced by innovation than any comparable period in history, and engineering has been its fountainhead.

Consider the field known as information technologies. In the first half century, electronics provided society with the vacuum tube, the telephone, radio, movies, and television. Then came the transistor and the ability to integrate millions of transistors on a tiny slice of silicon. That gave computers the power to process and store enormous amounts of information, a capability that greatly enhanced productivity, reduced the drudgery of work, and enabled many other activities. The progression from mainframes to minis to PCs to laptops to handheld computers typifies what has driven many 20th century technologies — the quest to make things faster and smaller, to diminish time and space.

Telephony has progressed from copper cable to optical fiber thinner than a human hair that can transmit thousands of times the amount of information. Cell phones and satellites for wireless communications are common. In less than ten years the Internet has reshaped how people live and work, and man can now exchange voice and data wirelessly between handheld devices and a network.

There are many other advances that could be cited, as in ground, air, and space transportation; biomedical engineering; energy conversion and utilization; and environmental protection. And the advances won't stop with the end of the millennium.

The 21st century will see powerful computers as small as a pinhead. Among their many applications, they will be linked to billions of sensors and actuators that will continuously and unobtrusively monitor and control the condition of anything of importance: human health; the flow of ground and air traffic; and the performance and safety of autos, planes, bridges, and buildings. The multimedia data will be connected to a global network. The 21st century will also witness realization of the ultimate goal of artificial intelligence, namely machines with intelligence approaching or exceeding the human brain, as well as the enormous potential of nascent biotechnologies. There will, of course, be many other important and, as yet, unforeseen developments. But, let's now consider an issue of concern.

With all due respect to the many technological contributions made by other nations, the 20th century has been an American century. But, will the 21st century also be marked by U.S. leadership in technology, and if not, does it matter?

I think it does matter. If we falter, it would mean a decline in economic strength and national security, and hence diminished opportunities for our children and grandchildren. It would also diminish our ability to have a positive effect on the rest of the world. Despite our shortcomings, it is hard to think of another nation that has done more to concurrently advance the causes of economic and political freedom and to promote social justice. There are few nations whose people are as committed to helping others. As a nation, our ability to do these things depends on maintaining a strong economy. What could cause us to falter?

One could identify many possibilities, such as erosion of our manufacturing base; mismanagement of energy and environmental resources; or restrictions on investments in new technologies imposed by the enormous personal, corporate, and federal debt we have incurred. But, it is in our system of education that I believe we are most vulnerable.

Although there are certainly exceptions, outcomes of K-12 education in the U.S. significantly lag those of many nations, producing a work force less able to deal with the requirements of a modern, technology-driven economy. The problem is particularly acute in grades 5 through 12, where our children's math and science skills progressively decline relative to their international peers.

It would be a mistake to invoke conventional wisdom, which views our universities and graduate schools as capable of maintaining a competitive advantage. Today world-class universities exist in many countries, including places like Taiwan, Korea, India, and even nations as small as Singapore. It may also be a mistake to say that we can succeed, despite limitations in our educational system, because of our economic freedom, our tolerance for risk, our spirit of innovation, and our ability to mobilize capital. The rest of the world is catching on.

I am particularly concerned about the migration of U.S. students away from engineering, the study of which is critical to sustaining technological leadership. Since 1986, the total number of bachelor's degrees granted annually in the U.S. increased by 18 percent, while the number of undergraduate degrees in engineering declined by 20 percent. Regions of the U.S. known for technological innovation have not been immune to this trend, with states like California, Massachusetts, and New York experiencing declines of 12, 37, and 30 percent, respectively. If one asks "why," I believe the most common answer will be that students increasingly view engineering as a demanding course of study they are reluctant to pursue.

The ranks of engineers in the U.S. are thinning, and if current trends continue, it is unreasonable to expect that the U.S. will maintain its technical leadership into the 21st century. Although the problem is national in scope, it is being addressed at Notre Dame.

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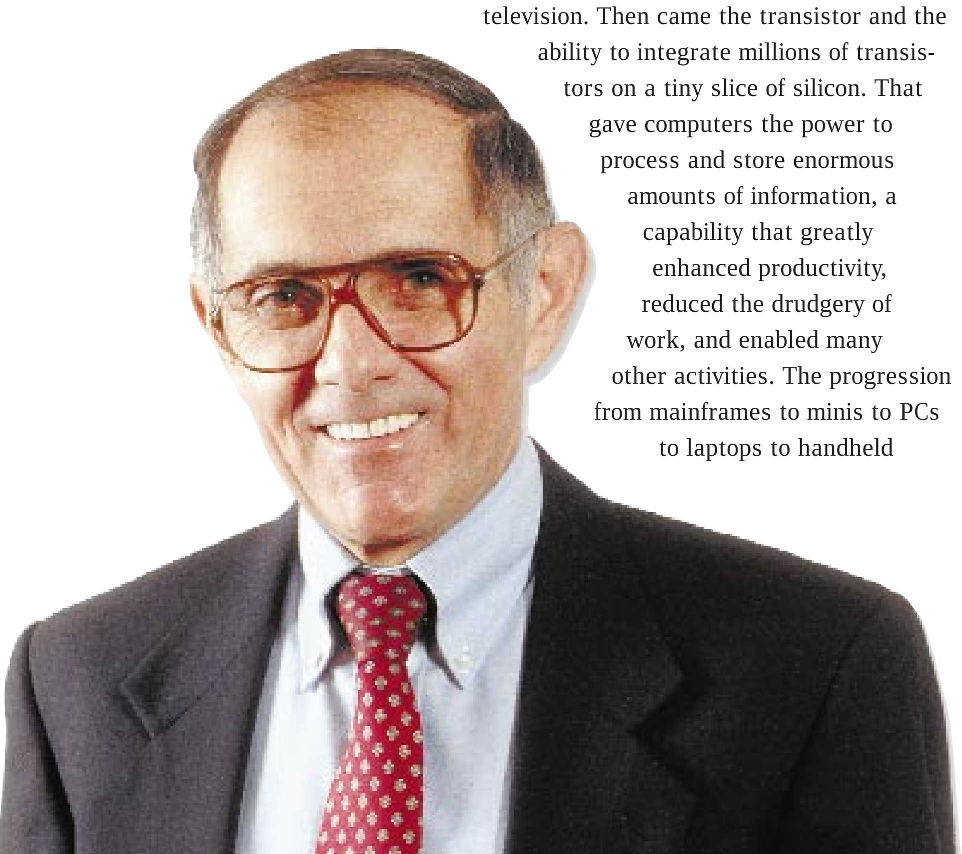
We are doing more to communicate the nature of engineering and the importance of study in mathematics and science to grade school children throughout Michiana and north central Indiana. With MIT, Georgia Tech, Carnegie Mellon, the University of Texas at Austin, and the University of California at Berkeley, we are co-sponsors of the newly initiated Siemens Westinghouse Science & Technology competition for high school students. We are also enhancing our summer engineering short course for high school students and doing more to market it nationally. We have become proactive in efforts to increase the number of high school students admitted to Notre Dame for study in engineering, and we have introduced several programs to improve communication of the nature of engineering to our first-year engineering intents. At every opportunity, we are communicating, to a broad university audience, the importance of having strong engineering education and research programs at Notre Dame.

If you've taken the time to read this epistle, I thank you. If you share my concerns, I encourage you to consider ways in which you can help to reverse current trends.

Best wishes and happy holidays to all,

Frank P. Incropera

Frank P. Incropera
McCloskey Dean of Engineering
Brosey Professor of Mechanical Engineering



Undergraduate Researchers: Looking for Solutions

REU

Department of Aerospace and Mechanical Engineering

At a weight of roughly 800 pounds, the 1903 Wright Flyer was the first heavier-than-air vehicle. Compare this to the largest airplane ever built — the An-225 Mriya, called the "Cossack" by NATO forces — with a maximum weight of over 1.3 million pounds. The fastest airplane, the SR 71, flies more than three times faster than the speed of sound at its cruising altitude; the Concorde travels only about twice the speed of sound. Until now the goals of aviation, aviators, and aerospace engineers have been to design and build larger, faster aircraft.

"I think this summer has been a terrific opportunity for me. I've learned about being creative and adaptable when it comes to design, skills which should serve me well in next year's senior design course."

— Lauren Murphy, aerospace engineering

The current tide in aircraft design is to create vehicles that are as small as possible for special, limited-duration missions, which could include urban warfare, hostage rescue, or border surveillance. These crafts are called "micro-air" vehicles and could eventually carry visual, acoustic, chemical, and biological sensors. Long-range goals of this project include the development of an aircraft that weighs less than one ounce, has about a three-inch wing span, and can fly up to 60 minutes at speeds up to 35 miles per hour. It is this micro-air vehicle that aerospace undergraduates Chiara Kruse, Margaret Foltz, and Lauren Murphy were working on this summer.

Beginning the first week of June in the Hessert Center for Aerospace Research and under the direction of Thomas J. Mueller, Roth professor of aerospace and mechanical engineering, these students started designing a series of ten wings for the micro-air vehicle. Next, the students tested their designs in wind and water tunnels, measuring the aerodynamic efficiency of various wing concepts. The tests were important because the aerodynamics that apply to larger, faster planes, are not scalable to smaller, slower vehicles.

REU students, left to right, Lauren Murphy, Margaret Foltz, Chiara Kruse, and Thomas J, Mueller, Roth professor of aerospace and mechanical engineering, review the results of flow tests to determine which wing will function best on the micro-air vehicles they're designing.

Department of Civil Engineering and Geological Sciences

Kruse, Foltz, and Murphy are all students at Notre Dame. However, the REU program is not limited to University students. The REU program is funded by the National Science Foundation. Each year departments in the College, like the Department of Civil Engineering and Geological Sciences, invite students from schools throughout the United States to participate. The announcement typically includes descriptions of projects and faculty advisors, and students return their applications with a ranking of project preferences. A group of college faculty then selects one or more students to come to Notre Dame for the eight-week program.

Participating in this summer's program at the Elkhart Environmental Center (EEC) were Tiffany Knapp, a senior from the University of New Hampshire; Brad Mills, a senior from Georgia Tech; and Beth Barbella, a senior from Catholic University. They were joined by Cindy Trujillo, a junior from New Mexico State University who worked for the City of Elkhart as a biologist this summer. Her sister is a Notre Dame student who recently defended her master's thesis in the Department of Civil Engineering and Geological Sciences.

Each student selected a project from a list of possibilities and met weekly to discuss and coordinate project activities with faculty, EEC staff, and other REU students. Knapp worked with an activated sludge system using sequencing batch reactors (SBR). Her research modeled the intermittent flow of waste to determine how best to operate the Elkhart Sewage Plant at peak flow, while maintaining suitable nutrient removal during normal conditions. Mills studied the use of constructed wetlands treatment to reduce river contamination from combined sewer overflow, a mixture of municipal sewage and storm water runoff. And, Barbella was involved with two projects, one of which concerned an economic assessment of using a new, high-efficiency illumination system in Elkhart's traffic lights. The second project involved remediation of a chemical storage area to create a city golf course.

Collectively, the students also participated in other activities, such as assisting one another with field studies; preparing an educational module for use by the EEC in its outreach programs; participating in training programs offered by Notre Dame's Office of Information Technology; attending seminars

Cindy Trujillo, a junior from New Mexico State University, spent the summer working with the REU students at the Elkhart Environmental Center. One of their projects focused on a newly created wetlands area.

Undergraduate Researchers: Looking for Solutions

REU

Weekly meetings at the Elkhart Environmental Center (EEC) helped students coordinate their activities with city planners. Shown here, left to right, are: Don Rosenbaum, EEC assistant director; Brad Mills, a senior from Georgia Tech; Ronda DeCaire, EEC director; Art Umble, wastewater treatment operations manager for the city of Elkhart; Eric Horvath, engineering services manager for the city; Beth Barbella, a senior from Catholic University; and Lloyd Ketchum, associate professor of civil engineering and geological services.

or other professional development programs; and presenting a talk on the REU experience at their home institutions.

Department of Computer Science and Engineering

Mary Corbett, a senior in the Department of Computer Science and Engineering, started work this summer as an undergraduate on a project with Nikos P. Chrisochoides, an assistant professor in the department. Her research was part of a National Science Foundation Challenge Project on visualization of initially unstructured meshes and subsequent simulation data. Corbett's future work will involve simulation and three-dimensional display of incipient failure due to crack propagation in a structural material, thereby providing engineers with "real-time" visualization of the failure mechanism.

"Campus summer research opportunities are, for many students, the perfect opportunity to gain a first experience in engineering research and development. What we do here will enhance our prospects for graduate school or getting a good engineering job after graduation."

— Margaret Foltz, aerospace engineering

Also working with Chrisochoides as REU students this summer were seniors Brian Holinka and Jeff Dobbelaere. Their project involved "Distributed Shared Memory Evaluation." The data Dobbelaere and Holinka produce through their research will allow application groups from the College to better understand distributed shared memory.

Dobbelaere also worked on another project during the summer which will continue through the year. This project focuses on the implementation of a software system that uses massively parallel processors for large-scale applications, like crack propagation. His work will become part of a soon-to-be-published journal paper.

Assistant professor Sharon Hu's students Patrick Mitsch, Raymond Ricordati, and Nate Huston worked on a project developing a graphical user interface for a software tool that explores system architectural configurations under the guidance of a designer's preference. Such an interface would provide a platform for users to specify input data, which can include system functionality and hardware components, as well as preference information. The students' main responsibilities were to design and implement the interface, for which they needed to understand the fundamental concepts of hardware and software codesign for embedded systems. In addition, they worked collaboratively with graduate students and used design examples to test the complete program. Mitsch worked on the project during the summer of 1998. He was supported by an REU supplement of Dr. Hu's CAREER grant from the National Science Foundation. Ricordati and Huston worked on the project during spring 1999.

These are just a few of the students who have participated in the REU program. They spent 99 percent of their time looking for answers, solving problems, and the research continues. Some of the theories they explored will not turn out as hoped. Others will be the one percent of inspiration Edison alluded to. Is that failure? Not according to Edison; he also said, "I have not failed. I've just found 10,000 ways that won't work." No effort is wasted, every bit of data and each measurement help move REU participants further along their career paths toward becoming successful and contributing members of the field of engineering. All in all, it's not a bad way to spend a summer.

Real-time visualization, distributed shared memory, and parallel experimental systems are often the topics when, left to right, seniors Jeff Dobbelaere and Mary Corbett; Nikos Chrisochoides, assistant professor of computer science and engineering; and senior Brian Holinka get together. Dobbelaere, Corbett, and Holinka have all worked as REU students; they also make up the Parallel Experimental Systems group, which is led by Chrisochoides.

industry and education

Working Together

Companies that have posted intern positions at the University or sponsored Notre Dame interns include:

- Andersen Consulting
- Bettis Atomic Power Laboratory
- Boeing
- Chatsworth Products, Inc.
- Cole & Associates
- Compaq Computer Corporation
- DaimlerChrysler
- Delphi Automotive Systems
- Eastman Kodak Company
- Ford Motor Company
- General Electric
- General Motors
- Great Lakes Protection Fund
- IBM
- Lockheed-Martin
- Meritor Automotive, Inc.
- Modine Manufacturing
- Navistar International
- NIBCO, Inc.
- Oak Ridge Institute for Science and Technology
- Packard Electric
- Procter & Gamble
- Rohm & Haas
- Scitor Corporation
- Siemens Corporation
- Sylvania/Osram
- Tellabs
- U.S. Department of Energy
- U.S. Department of Transportation
- Valley Forge Laboratories, Inc.
- Walt Disney Imagineering

Currently, internship opportunities are available in aerospace engineering, civil engineering, chemical engineering, computer science and engineering, electrical engineering, geological sciences, and mechanical engineering. Students interested in positions for Summer 2000 should contact the Career and Placement Center in Flanner Hall or Bob Cunningham at Cunningham.42@nd.edu. Companies wishing to hire interns can contact him via e-mail or through the Office of the Dean, College of Engineering, 257 Fitzpatrick Hall.

What do automotive and aerospace companies, medical equipment manufacturers, communications providers, and consulting companies have in common? They want to succeed, and to do that they have to be better than the other guy. That means better ideas, better products, better value, and better employees. Colleges and universities want the best opportunities for their students…while they're in school and after they graduate. Better employees, better opportunities for students — sounds like the basis for a very successful collaboration. And that's exactly what happens when universities like Notre Dame and corporations team up. It's not a new concept, education and industry often create mutually beneficial partnerships to address human resource issues: employment opportunities for students and a pool of well educated potential employees for the corporate sector. These collaborations are evident through the academic year, but they're particularly noticeable during the College of Engineering's annual industry day.

Industry Day '99 was organized by the Joint Engineering Council and the Society of Women Engineers, with leadership provided by students Kevin McCluskey and Sarah Disch. A total of 69 companies participated in this student-run event. Planning for next year's event will begin in the spring.

Industry Day '99

Sponsored by the Joint Engineering Council and the Society of Women Engineers, Industry Day is actually a student-run affair that begins with a reception and banquet. Students can mix and mingle with company representatives in an informal setting, and the representatives get to see the *whole* student, personality as well as technical ability. This year's banquet was held on September 21 in the Monogram Room of the Joyce Center.

"Our business is not only in big cities…In many cases, we're a major employer in small towns, and our people become the leaders in their communities. We look for the kinds of skills in people who are going to contribute to our corporation as well as the community."

The second part of Industry Day features a career fair. Companies can increase their recognition among engineering students, discuss internship opportunities, and schedule interviews with prospective employees. This year 69 companies participated in the career fair. Among those attending were General Electric, IBM, and Ford.

Thomas L. Fortener of GE Control Products attended Industry Day '98 and was back for another round of interviews and answering questions about the company. According to Fortener, General Electric had several opportunities for interns but was also interested in filling permanent positions. As with other companies recruiting engineers, technical ability is a must. Fortener indicated that the corporation was also interested in communities and paid very close attention to the service activities of its prospective employees…how involved they were in their communities. "Our business is not only in big cities…In many cases, we're a major employer in small towns, and our people become the leaders in their communities," said Fortener. "We look for the kinds of skills in people who are going to contribute to our corporation as well as the community."

Chris Hilal of the Microelectronics Division of IBM was busy showing students the newest semiconductor wafers produced by the company's Advanced Technology Center, talking about a new manufacturing process, and discussing IBM's contract with Nintendo to provide all the chips for the next Gameboy System. Why? Because the students want to know what's going on with these companies. They want to feel part of something new and exciting, and they're ready to contribute their ideas and energies to creating new technologies and refining existing technologies. Hilal said IBM was looking for engineers in all disciplines, interns and full-time employees.

According to Kevin Berch, a process reengineering specialist, Ford Motor Company is also looking for engineers in a variety of areas. For example, product development requires mechanical, aerospace, and electrical engineers, while related information technologies require computer science and computer engineering graduates. Berch, a Notre Dame computer engineering graduate, expects to return to campus in February to interview students for internship positions. It's a process that works, as he interviewed with Ford when he was a student here and was attracted to the company and the opportunities it offered in information technology.

Through internship programs companies get a qualified summer employee, they get a good look at a potential full-time employee, and they can save time and money on recruiting efforts. What do students get? They gain industry experience and the chance to link what they've learned with how best to use that knowledge. They gain a competitive edge over other engineering students who have not chosen to pursue internship options. Perhaps most important, they learn how to work with others and bring diverse experiences together to find solutions.

Can any student be an intern? Although more and more companies are hiring interns after their first year of studies, internship opportunities typically target students who have completed their sophomore or junior years within the College of Engineering. And, since internship positions span from eight to 12 weeks, many companies offer assistance with local housing, particularly if the job is somewhere other than the student's hometown.

Students who have interned for a summer or two know that this experience is as much a part of their education as is time spent in class.

Even for an intern technical experience and ability is vital. A position description, say for an electrical engineering student, might read: *Knowledge of circuit theory and programming*

Real-world Experience

Christopher Bailey, a senior in mechanical engineering from East Grand Rapids, Mich., says there's nothing like it. This summer Bailey interned at the Tech Center of DaimlerChrysler in Auburn Hills, Mich. He met with company representatives during Industry Day '98, interviewed for one of the three internship positions they were offering, and got the job. It was actually his second internship; he had interned at a metal stamping plant for General Motors after his sophomore year.

How did Bailey assess his summer experience at the Tech Center? "I had a good time and was able to do good work," he said. "I felt like I was able to contribute, working with actual parts of cars and improving designs." Bailey worked on large car platforms, focusing on a product replacement project.

In addition to the experience he gained, Bailey's internship has proven to be a valuable tool in the quest for full-time employment. "It helped in my job search this year because my resume looked good, and I was able to be more knowledgeable about industry in my interviews," he said. "It also helped in classes that applied fundamentals to industrial problems."

After graduation Bailey begins his career as a vehicle engineer for DaimlerChrysler.

The Career Fair portion of Industry Day gives students a chance to ask questions of the company representatives: about the company, about their products, and about the future of their particular field of engineering. Many of the recruiters who attend are Notre Dame graduates themselves; all are eager to help.

experience preferred. Intern will assist electrical engineers in the design and construction of high-speed automated equipment, including high-speed optical scanners, welders, servo motors/drivers, PLCs, and robotics. Work may include ordering parts, rendering components, and using computer-aided tools. The intern will work with several engineers on projects. May travel to other facilities as required.

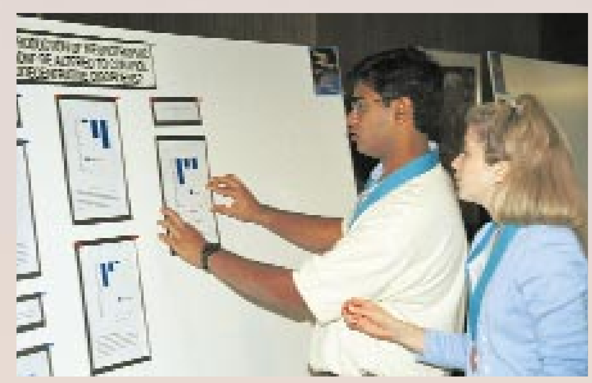
Students who have interned for a summer or two know that this experience is as much a part of their education as is time spent in class. They submit a cover letter and resume, as if they were applying for a full-time position. And, although students work closely with the University's Office of Career and Placement Services, the students finalize details of the internship themselves. Many of the students who intern during the summer between their sophomore and junior years will do another internship before they graduate.

Shannon Dolan, a senior computer engineering student from Elizabethtown, Pa., completed two internships. During the summer after her sophomore year, she worked in the Tech Support Group for a civil engineering company called Gannett Fleming in Harrisburg, Pa. Dolan enjoyed the experience, but determined that technical support was not where she wanted to focus. Her second internship was with TRW in Redondo Beach, Calif. This was still not as technical as she would have liked it to be, but she realized how much she enjoyed the atmosphere and the work. What was the most important thing to come out of her two experiences? "Both helped my communication skills and improved my ability to work with others," she said. "And, they really gave me an edge in interviews. At almost every interview, I have been asked something about my internships and what it was like or what I learned."

Internships provide real-world experience. They give students the opportunity to explore different parts of the country without actually committing to a full-time job. Living in an area for up to three months furnishes more insight on life in that particular community than an extended trip during an interview. Through internships students also come to realize what they want in a company and what type of work best fits their goals and strengths. They become better students, better thinkers, and better employees. Experience is definitely a very valuable teacher.

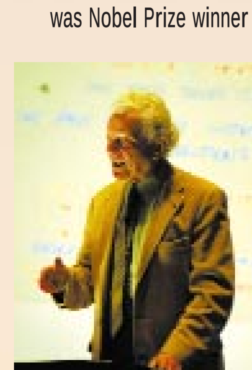
Siemens Competition Held at Notre Dame

In 1998 the nonprofit Siemens Foundation was established to cultivate innovation, research, and educational involvement in some of the most promising high school students across the nation. The Foundation is based on the belief that industry needs to make a continued effort to support education in the fields of math, science, and engineering. This year the organization will award a top individual scholarship of $100,000 to a high school student who has developed an independent research project in science, math, or technology. An additional $90,000 will be divided among the winners of the team portion of the competition.



Earlier this fall Notre Dame hosted one of the regional sections of the Siemens Westinghouse Science & Technology Competition. Other participating institutions were Carnegie Mellon University, Georgia Institute of Technology, Massachusetts Institute of Technology, the University of California – Berkeley, and the University of Texas – Austin.

Students competing in this regional final presented their projects to a panel of judges, consisting of Notre Dame faculty members Professor Paul Helquist, chemistry and biochemistry; Professor David Lodge, biological sciences; Assistant Professor David Bennett, physics; Associate Professor Sunny Boyd, biological sciences; Associate Professor Oliver Collins, electrical engineering; Professor Joseph O'Tousa, biological sciences; Associate Professor Michael Stanisic, aerospace and mechanical engineering; Professor Stephan Stolz, mathematics; and Associate Professional Faculty Michelle Whaley, biological sciences. These judges selected one individual and one team winner. Feng Zhang of Des Moines, Iowa, won the individual regional competition and received a $20,000 scholarship. Seetharam Chadalavada and Melinda Sloma, both of Battle Creek, Mich., won the team competition and received a total of $30,000. All of the competitors were recognized at a banquet on November 13; the keynote speaker was Nobel Prize winner and physicist Leon Lederman. According to John Tobin, executive vice president of the Siemens Foundation, the goal of the competition is to encourage students to "aim for the same high expectations in school work as we expect workers to demonstrate in our company: to reach beyond what's typically required." Assistant Provost for Academic Outreach Matthew Cullinan served as on-campus coordinator for the activities.



Engineering Experiences in London: one student´s perspective

Situated east of London on the banks of the River Thames, the tiny village of Greenwich has seen its share of history. This New Year's Eve Greenwich will sponsor one of the world's most hyped millennial celebrations, but the history behind the town goes far deeper than the novelty of a simple holiday party. It is rooted in scientific invention and achievement, which is what led our group of engineering students to Greenwich, the Royal Observatory, and the Prime Meridian. We were fascinated by the connection between the Observatory's work and global navigation; Greenwich is located at "zero degrees longitude."

The Royal Observatory in Greenwich was built partly as a result of a contest held by Parliament in 1714. At that time navigation on the open ocean was treacherous because there was no method for determining a ship's longitude. A ship's navigator could readily find the latitude — the North-South position — but was forced to guess how far the ship had traveled to the East or West. As a result accidents and delays were commonplace on many voyages that required leaving the sight of land. After a particularly bad shipwreck in 1707, in which 2,000 British sailors died, Parliament offered a reward for finding a method to determine precise longitude.

Only two of the theories presented during this "contest" proved to have any practical value. The first, which gave rise to a need for the Observatory, used the sky as a navigational aid. By measuring the distance between specific stars, each ship's navigator could determine the ship's position on the globe. As the ship moved across the sea, the perspective would change, resulting in different stellar measurements and corresponding to differences in longitude. Due to the Earth's rotation, the perspective from any given longitude shifted daily. Work to perfect this method continued at the Observatory for years.

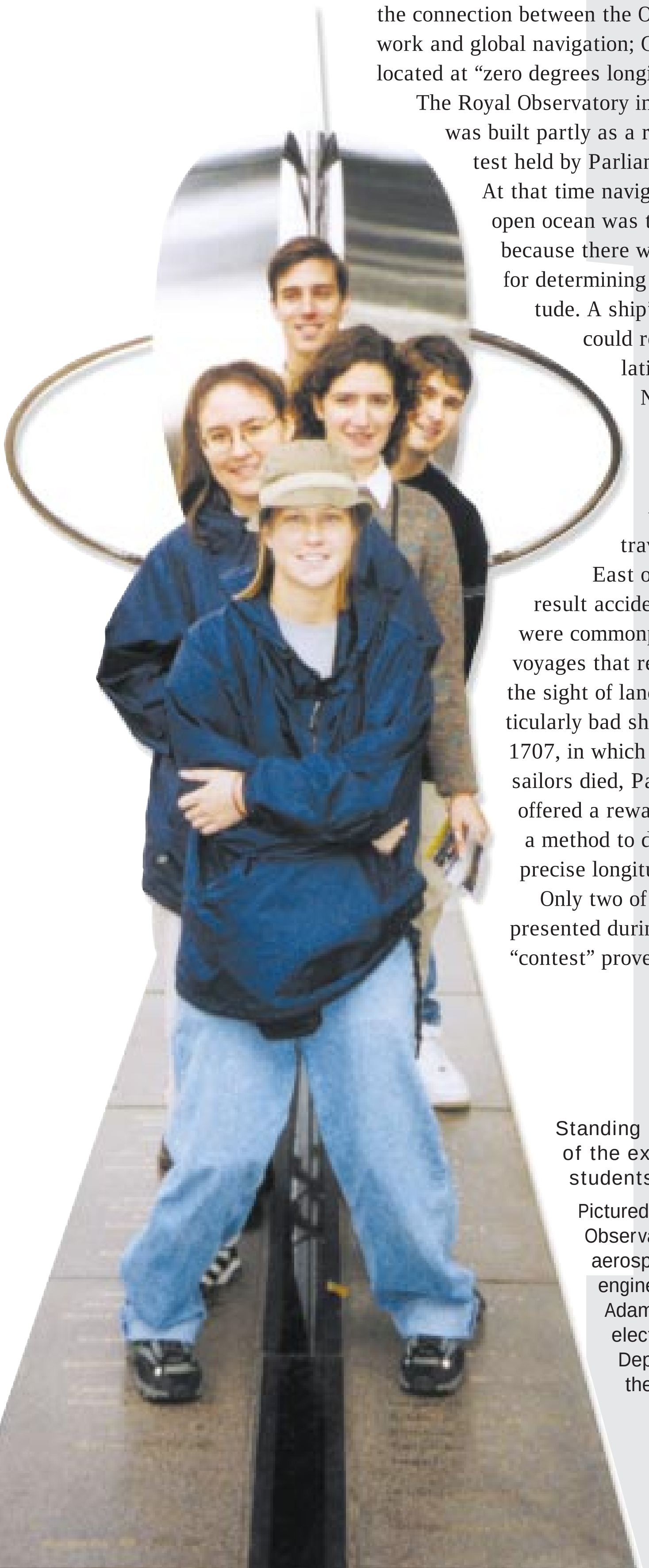
Another method of stellar navigation was also under study. It required a ship to carry a clock set to the time at its home port. This "home time" would then be used as a reference against the ship's position. If, for instance, the ship were in a location where the sun reached its highest point — the local noon — one hour after the ship's clock reached noon, the navigator could find the ship's longitude in respect to the home port. Unfortunately, clocks at the time were incapable of the precision required to be accurate, gaining or losing as much as five minutes each day.

Clockmaker John Harrison, a self-taught mechanical genius, was inspired by the monetary prize Parliament was offering. And, he began designing and building a series of super-accurate time pieces. His designs, which almost completely eliminated the effects of friction, temperature, and external vibrations on the performance of clocks, are still used in today's time pieces. In fact, they have been applied to all areas of scientific measuring instruments. Harrison spent the majority of his life working on the longitudinal problem. When the reward money was finally given to him in 1773, he had produced five clocks of varying sizes, known as "H-1" through "H-5." It was H-5, a near duplicate of H-4, that actually won him the prize money during a seaworthiness test.

In the years that followed Harrison's receipt of the prize, the astronomical method of longitude through star measurements being studied at the Observatory became a reality. This method, although effective, lacked the innovation of Harrison's revolutionary time pieces. As tribute to Harrison, his first four innovations are on display at the Observatory in Greenwich, the site where their accuracy was tested. H-1 through H-3 are still ticking away. They look more like antiques than machines capable of leading a voyage across the ocean. H-4 is the world's first precise naval chronometer; it sits silent and is not wound to better preserve its condition.

After touring the Observatory and having lunch, we spent the second half of the day in the National Maritime Museum. Displays in this museum recount Britain's long history on the ocean, including a look at Spanish galleons, the difficulties of deep-sea diving and submarines, and the transatlantic ocean liners of the early 20th century.

The Royal Observatory in Greenwich now serves as a testament to scientific advancements. There we were able to enjoy a scenic center of architecture and education, as well as the story of two centuries of progress.



Standing in two hemispheres at the same time is just one of the extracurricular activities Notre Dame engineering students experienced during their semester in England.

Pictured here at the Prime Meridian Line at the Royal Observatory in Greenwich, front to rear, are: Mary Clark, aerospace engineering; Margaret Foltz, aerospace engineering; Chiara Kruse, aerospace engineering; Adam Manella, aerospace engineering; and Paul Ratz, electrical engineering. Professor Patrick F. Dunn from the Department of Aerospace and Mechanical Engineering led the London Program this fall.

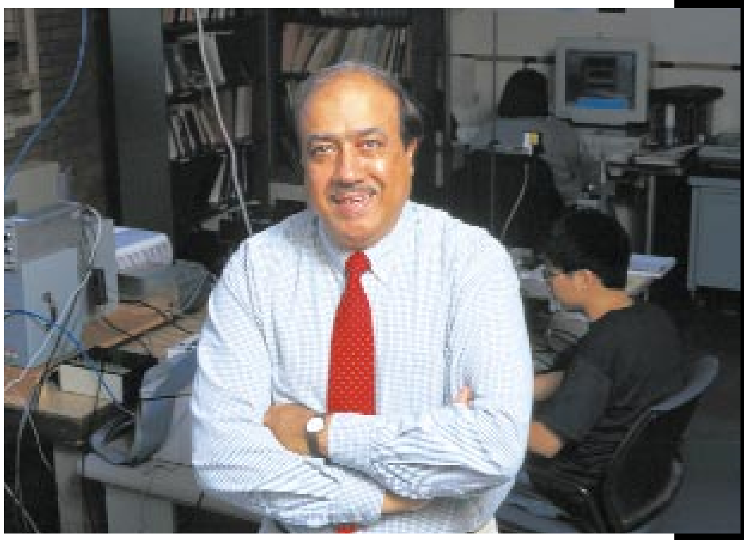
Editor's note: This perspective on Greenwich was provided by Adam Manella, junior, aerospace engineering. During this semester abroad, he and other engineering students have visited several sites, including the Rolls-Royce facilities, the Thames Barrier, the Mechanical and Civil Engineering Laboratories at Queen Mary and Westfield Colleges and several museums featuring engineering history. The students have written about these highlights; some of these perspectives are located on the College of Engineering's web site at www.nd.edu/~engineer/newweb/under/.

Civil Engineering and Geological Sciences Names New Chair

Professor Ahsan Kareem has been named chair of the Department of Civil Engineering and Geological Sciences. A leading researcher in probabilistic structural dynamics, fluid-structure interactions, structural safety, and the mitigation of natural hazards — specifically wind, waves, and earthquakes — Kareem has been a member of the College of Engineering faculty since 1990.

His research focuses on the environmental loads of wind, waves, and earthquakes on structures, the associated dynamic behavior of the structures, and risk assessment. He uses computer models as well as laboratory and full-scale experiments to better understand the impact of natural hazards on the constructed environment. His findings are used to develop models for predicting structural response to environmental hazards.

In addition to his duties within the department, Kareem will continue to serve as chief editor and associate editor for two major international journals and will remain on the editorial boards of five other journals dealing with wind, wave, and earthquake issues. He participates in several panels of the National Research Council of the National Academy of Sciences as well as the National Academy of Engineering. Kareem is the immediate past president of the American Association for Wind Engineering, which is responsible for national issues concerning wind related hazards like hurricanes and tornadoes, and has served as a senior consultant to major oil companies, insurance companies, engineering corporations, and the United Nations.

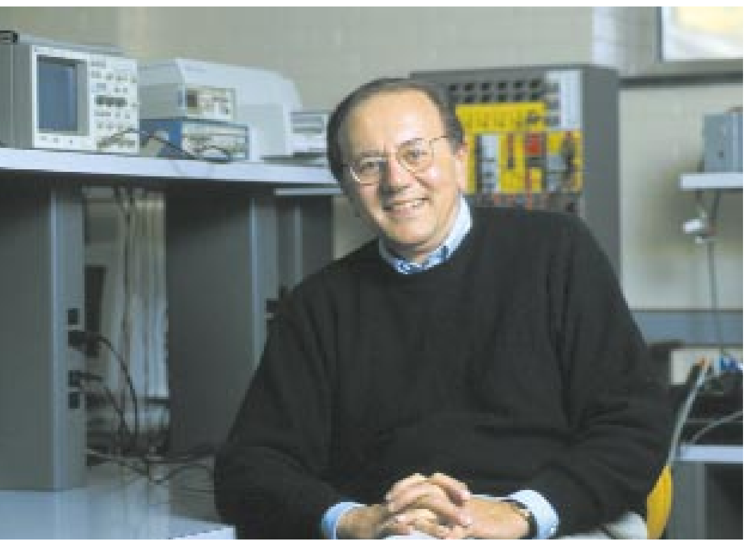


Throughout his career, Kareem has received numerous honors, including the 1984 Presidential Young Investigator Award from the National Science Foundation. He also received the 1997 Engineering Award from the National Hurricane Conference, honoring his contributions to the development of the ASCE7-95 Standard for Minimum Design Loads for Buildings and Other Structures, which has already led to safer, more hurricane-resistant construction in the United States and the Caribbean. Most recently, he was named Distinguished Alumnus of Colorado State University in recognition of his exceptional contributions to engineering through education, publication, leadership, and service.

Antsaklis Named Director of Center for Applied Mathematics

According to Dr. Panos J. Antsaklis, newly named director for the Center for Applied Mathematics (CAM), mathematics provides a common language, and mathematical models are often used to describe processes and design new products. In fact mathematics has been an important part of society since ancient times. Examples include predicting lunar and solar eclipses, calculating the timing of the annual floods of the Nile, or designing the Parthenon. Today, mathematics are used to describe not only Newton's laws or Einstein's theory of relativity, but also phenomena in economic and social sciences. "The most familiar statistical interpretations of data might be those gathered by political organizations during election campaigns or by the entertainment industry to determine the appeal of certain television shows," said Antsaklis.

The Center's aim is to enhance interdisciplinary use and teaching of applied mathematics — mathematics that solve practical problems in areas such as industrial, transportation, communication, and business applications. Established more than a decade ago, it fosters University-wide interaction and collaboration and provides support for faculty researchers using mathematics in a variety of disciplines — from engineering to social sciences. It also provides graduate fellowships and support for workshops, seminar series, and faculty visitors.



Future plans for CAM include placing emphasis on the collaborative aspects of the Center across disciplines. In addition to continuing research in traditional areas, CAM will focus on discrete and computational mathematics that support the role of today's computers and digital devices. This better reflects the fact that information technology will continue to be an important part of engineering, science, and business research and practice for years to come.

Antsaklis is a professor in the Department of Electrical Engineering. Prior to joining the faculty in 1980, he held regular and visiting appointments at Brown University, Rice University, the Massachusetts Institute of Technology, the Imperial College of the University of London, the National Technical University of Athens, and the National Aeronautics and Space Administration's Jet Propulsion Laboratory.

new faculty

Thomas C. Corke

Clark Professor of Aerospace and Mechanical Engineering

Teaching "Flight Mechanics and Introduction to Design" for the Department of Aerospace and Mechanical Engineering is Dr. Thomas C. Corke, Clark professor of aerospace and mechanical engineering, who comes from the Illinois Institute of Technology (IIT) in Chicago, where he was also a member of the IIT Fluid Dynamics Research Center. His initial research focused on experimental and numerical fluid mechanics, particularly instabilities, transition and turbulence in jets, and boundary layers and wakes in compressible and incompressible flows. His present research also includes the development of techniques to alter acoustics in jets, the measurement of fluid instabilities in boundary layers of hypersonic lifting bodies, the separation control of helicopter rotors, and the study of acoustic and vortical disturbances surrounding the flow at the leading edge of airfoils. He is a consultant for the Institute for Computational Applications in Science and Engineering (ICASE), an associate fellow in the American Institute of Aeronautics and Astronautics, and a member of the American Society of Mechanical Engineers, American Physical Society, and Society of Engineering Science. Corke also received the NASA Langley Achievement Award twice.

Anne L. Marsan

Assistant Professor of Aerospace and Mechanical Engineering

Dr. Anne L. Marsan joins the College of Engineering as an assistant professor. Marsan's research focuses on ways to better construct solid models from three-dimensional images and to perform process planning for layered manufacturing, including rapid prototyping systems. During her first semester, Dr. Marsan taught a course in computer aided design and manufacturing.

Center for Nano Science and Technology Established

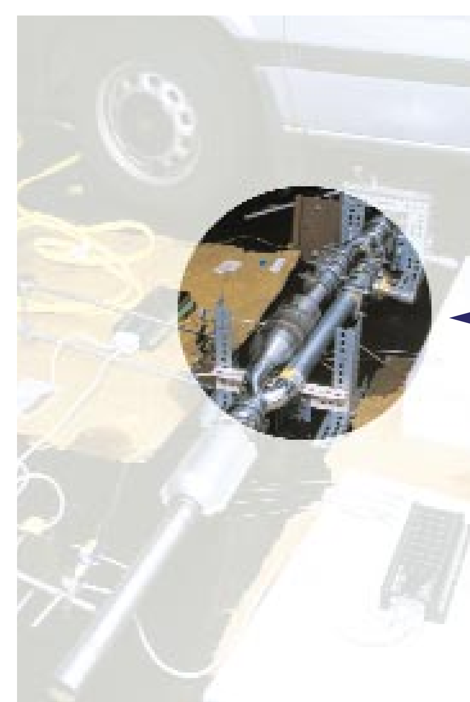
Culminating 15 years of faculty research and educational development, the University of Notre Dame recently established the Center for Nano Science and Technology. Its purpose is to explore the fundamental concepts of nanoscience and develop unique engineering applications using nanoprinciples. Although led by the College of Engineering's electrical engineering department, the Center will be comprised of a multidisciplinary task force of researchers from the departments of electrical engineering, computer science and engineering, chemistry and biochemistry, as well as physics.

Nanoscience and technology offers enormous potential for new applications and industries. Long-term economic forecasts estimate that the future growth of nanotechnology will parallel that of today's semiconductor industry. "Development of this facility," said Center Director Gerald J. Iafrate, professor of electrical engineering and associate dean for research in the College of Engineering, "assists the University in training students for immediate participation in nanoscience and technology, helping them to be productive and extremely competitive in the market of the future."

The new Center will focus on nanoelectronics, the study of molecule-sized elements. It will integrate research in molecular and semiconductor-based nanostructures, device concepts and modeling, nanofabrication and characterization, information processing architectures and design to address common application goals — like computing with quantum dots or producing high-speed nano-based circuits. "But a key goal of the new Center," said Iafrate, "is to serve as a national resource, a think tank, where technologists from industry can come to explore nanoconcepts for engineering applications. This will benefit students and provide industry with long-range opportunities." Over the years federal grants received to support research in nanoscience and technology have totaled approximately ten million dollars. This includes major grants from the National Science Foundation, the Air Force Office of Scientific Research, the Office of Naval Research, the Army Research Office, and the Defense Advanced Research Projects Agency (DARPA) of the Department of Defense.

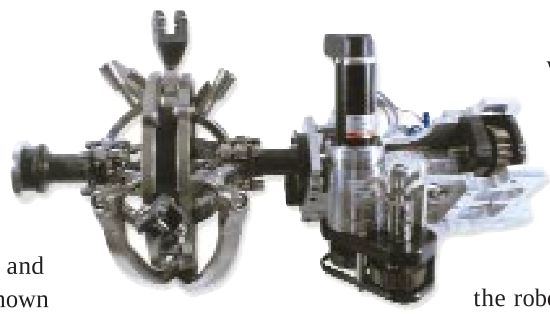
While nanoscience is a vital and exciting field for the next generation, it is also one of the best examples on the University level of research that has and will continue to involve engineers, physicists, chemists, and computer architects. Many of the faculty for the Center come from the electrical engineering department. They include: Center Director Gerald J. Iafrate; Center Associate Director Wolfgang Porod; and Thrust Leaders Yih-Fang Huang, Gary H. Bernstein, and Craig S. Lent. Other faculty members from the department include Douglas Hall, Patrick Fay, Thomas Kosel, Gregory Snider, and Arpad Csurgay, a visiting professor from Technical University of Budapest.

Additional faculty members come from different departments and colleges throughout the University. From the computer science and engineering department, also in the College of Engineering, are Thrust Leader Peter Kogge and Jay Brockman. College of Science Thrust Leader Thomas Fehlner, Gregory Hartland, Marya Lieberman, and Olaf Wiest are from the chemistry and biochemistry department. Coming from the physics department are Thrust Leader Jacek Furdyna, Albert-Laslo Barabasi, and Malgorzata Dobrowolska-Furnyna.



Members of the Center for Nano Science and Technology, left to right, include: Craig S. Lent, Center Director Gerald J. Iafrate, Center Associate Director Wolfgang Porod, Gary H. Bernstein, and Gregory Snider — all from the Department of Electrical Engineering. Additional faculty members come from electrical engineering, as well as different departments and colleges throughout the University. In addition to exploring nanoconcepts for engineering applications, plans for the Center encompass the development of new directions in nanoscience such as the design and fabrication of microelectromechanical systems (MEMS), the role of non-equilibrium thermodynamics in influencing the properties of nanodevices, and investigating how nanostructures interact with biological systems.

Mechanical Engineering Students Build Robot



Research, development, and working with new technology to create a better product takes time. The patented robotic wrist and forearm mechanism shown here is the outcome of a long-running project within the Department of Aerospace and Mechanical Engineering. It has a range of motion and level of dexterity approximately double that found in current robot manipulators. “We’re excited about the impact of this technology on the manufacturing process and our students,” said Michael M. Stanisic, associate professor of aerospace and mechanical engineering. “Several of our students have received national recognition for their participation in this project.”

Karl Etzel (B.S. ’94) first developed the critical portion of the wrist as part of his Senior Design project, which won him the B.F. Goodrich Collegiate Inventors Award. Three other undergraduates — Jared Wiitala (B.S. ’96), James Schmiedler (B.S. ’96), and Brad Rister (B.S. ’96) — developed the primary structure of the wrist and placed first in the American Society of Mechanical Engineers’ 1996 Old Guard Design Competition. Wiitala went on to design and build the wrist as a College of Engineering graduate student.

But the wrist is just part of this project; the forearm of the robot was designed last spring by John Rogers (B.S. ’99). Jack Feix, a current mechanical engineering graduate student, has modified the original design and integrated it with the forearm. He is also designing the upper arm and shoulder of the robot and will see to the final assembly of the whole machine.

Development of the complete manipulator is part of a National Science Foundation (NSF) grant in conjunction with the NSF’s Combined Research and Curriculum Development Program. The purpose of the program is to further research while also developing undergraduate courses that deal with a new form of technology or science. Running through July 2000, the grant is for the amount of $364,000, $70,000 of which is being used to build the manipulator.

As part of the educational aspect of the program, Stanisic has created a four-course sequence that teaches seniors and entry-level graduate students some of the mechanical aspects of robots. It also informs them about a new form of vision control — developed at Notre Dame by Professor Steven B. Skaar — known as Camera Space Manipulation. The entire course sequence will be in place by January 2000 and will be taught by Stanisic and Skaar. Students will use the wrist, and other parts of the robot, in the capstone course of the sequence to perform tasks assigned by a panel of engineers from industry. “The tasks assigned will be challenging, if not impossible with present technology and machinery,” said Stanisic. “They will stretch our students to be creative in their solutions and give them good experiences to draw from as they begin their careers.”

Professor Hsueh-Chia Chang, Associate Professor David T. Leighton Jr., and graduate student Jason Keith, all of the Department of Chemical Engineering, have been redesigning the automotive catalytic converter. Why? In the U.S., the average driving time per trip is 25 minutes. Unfortunately, current catalytic converters don’t reach a sufficient temperature for the reaction to be effective until about 15 minutes into a trip. The new “Y” design, shown here, is currently being tested to see if it can raise temperatures faster, leading to more rapid reactions and a more environmentally-friendly converter.

Electrochemistry Research Gets Boost from New Equipment

A Digital Instruments’ MultiMode atomic force microscope was recently installed in the Department of Chemical Engineering’s electrochemistry lab. Although the microscope portion of the machine is fairly standard, the ability to use the on-board potentiostat and associated software is unique. Now, not only can University researchers like Dr. Albert Miller, professor of chemical engineering, graduate student Michael M. Crouse, and others measure and image nano-sized objects, but the potentiostat enables faculty and students to examine surface reactions as they occur. “The ability to run reactions, watch the evolution of the surface and monitor surface characteristics is important,” said Crouse. “Most electrochemistry labs do not have this equipment and can’t determine what happens in real time.”

The focus of the electrochemistry group is two-fold: to develop a better understanding of the mechanisms of corrosion for various alloys and the prevention of corrosion, as well as to shape materials in a quick, efficient, and precise manner. For example, one of the on-going projects is a partnership with Purdue University, Cornell University, and the University of Nebraska. Notre Dame’s role is to shape metals to nano-sized patterns that can be used in semiconductors or other applications. Each partner institution is pursuing a different application for the nano-patterned materials. Researchers in the electrochemistry lab already have a considerable understanding of how to pattern aluminum. They are currently working to extend the patterns to other metals. “Gold is our next target because of its wide use in the electrical industry,” said Crouse.

◄ Graduate student Michael M. Crouse prepares the new atomic force microscope for the next round of readings. When in use, the tip of the device travels over the surface of the material as a laser is deflected off the back of the tip to provide a real-time image of the electrochemical reaction in process.

Agnes E. Ostafin

Assistant Professor of Chemical Engineering

The Department of Chemical Engineering welcomes Agnes E. Ostafin, assistant professor. A member of the American Chemical Society, American Physical Society, and American Association for the Advancement of Science, Ostafin comes from the University of Chicago, where she has been serving as a research associate in the Department of Chemistry. Areas of particular interest to Ostafin include the design and synthesis of novel materials for solar energy conversion, genetic engineering of photo-active enzymes and biologically based molecular devices, photo induced electron and energy transfer in organic/inorganic structures, and ionization processes in condensed phases. She taught Chemical Engineering Thermodynamics during the fall semester.

new faculty

new faculty

Jesùs A. Izaguirre

Assistant Professor of Computer Science and Engineering

Joining the Department of Computer Science and Engineering as an assistant professor is Jesùs A. Izaguirre. His research interests include high-performance computing, parallel numerical algorithms, web distributed computing, and bioinformatics. Currently, Izaguirre is developing numerical methods for faster biomolecular modeling and simulation. He has previously served as an instructor at Tecnologico de Monterrey and is a member of the Society for Industrial and Applied Mathematics, the Institute of Electrical and Electronics Engineers Computer Society, the Association for Computing Machinery, and the New York Academy of Sciences. He will be teaching Data Structures.

Notre Dame Engineers Travel to Capitol Hill

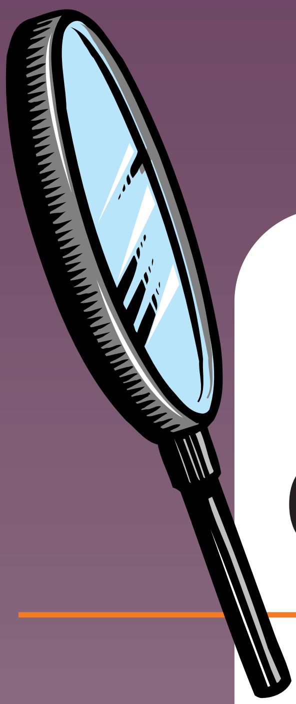
Research conducted in the Department of Civil Engineering's Structural Dynamics & Control Earthquake Engineering Laboratory was on display Wednesday, September 22, as part of a daylong summit on Capitol Hill. Sponsored by The Science Coalition, the event highlighted recent advances made by federally supported research projects at America's colleges and universities. Notre Dame was one of eight selected participants.

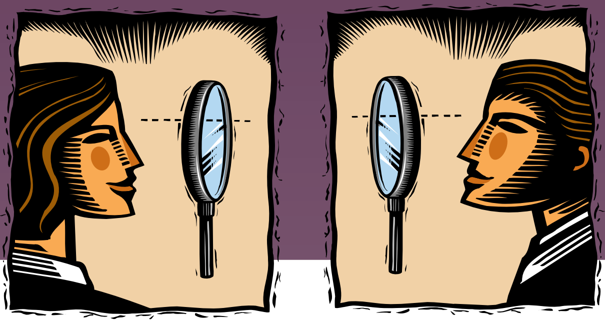
Dr. B. F. Spencer, professor of civil engineering and geological sciences, Dr. Michael K. Sain, Freimann professor of electrical engineering, and other researchers in the earthquake lab were showcasing the new buffering system they have developed. Their system, using magnetorheological (MR) fluid, acts like a shock absorber to protect structures — buildings, offshore platforms, bridges, and pipelines — from the shock waves associated with disasters such as earthquakes, hurricanes, waves, and even terrorist acts. MR fluid is a suspension of micron-sized iron particles in oil. Its normal viscosity is that of light motor oil, but when exposed to a magnetic force, it instantly thickens like pudding, allowing a structure to "ride" softly with the movements of the ground or air. Each shock absorber requires about 50 watts of power, so the entire system for one building could operate easily on batteries if power were interrupted.

Spencer and Sain's research has been supported by the National Science Foundation, and they are currently working with the Lord Corporation to develop the details of this technology.

Top photo, left to right: Current and former College of Engineering-affiliated researchers who traveled to Washington to man the display included Erik A. Johnson, visiting research assistant professor of civil engineering and geological sciences; Gang Jin, an electrical engineering graduate student; Richard E. Christensen, a graduate student in civil engineering; Michael K. Sain, Freimann professor of electrical engineering; Patrick Schneidau, a civil engineering undergraduate; Guangqiang Yang, a graduate student in civil engineering; B.F. Spencer, professor of civil engineering and geological sciences; and Lynn Yanyo and Dave Carlson, both of Lord Corporation.

Bottom photo, left to right: John D. Rockefeller IV, Democratic senator from West Virginia, experiments with a tube of magnetorheological fluid while Lynn Yanyo and Dr. Spencer look on.





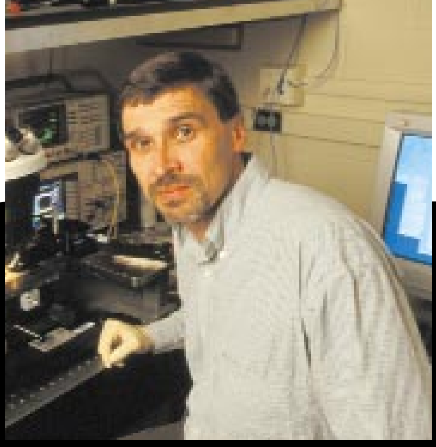
Engineering Open House

Last year the College of Engineering initiated an open house for first-year students who have indicated an interest in engineering.

This year more than 175 undergraduates visited the College during the open house. They heard first-hand from Dean Incropera; Troy Hershberger, director of product development at Biomet, Inc.; and Jami Meteer, a senior in the electrical engineering department, how students can shape the world as engineers. In addition several faculty, current students, and other College staff were on hand to answer questions as first-year students examined the many options a career in engineering offers. In fact, that's the whole objective of the open house — to show students the multitude of choices they have as engineers and to encourage their continued participation as part of the College of Engineering.

Each of the departments within the College opened their labs. Students were able to visit the Department of Aerospace and Mechanical Engineering's CAD/CAM, Robotics, and Design labs. Also on display was the Mini-Baja car project, which is maintained and raced by mechanical engineering students. Faculty from the Department of Chemical Engineering led a thorough tour of the Chemical Engineering Lab. In the Department of Civil Engineering and Geological Sciences, students experienced the Biogeochemistry and Earthquake Engineering labs. Those interested in computer science and engineering investigated the System Administration and Integrated Circuit Design labs. Along with the Photonics and Microwave Circuits labs, students exploring electrical engineering were able to check out the College's electric race car. The Minority Engineering Program and several student engineering organizations were also part of the event.

new faculty



Alan C. Seabaugh

Professor of Electrical Engineering

Professor Alan C. Seabaugh comes to the Department of Electrical Engineering from the Applied Research Laboratory of Raytheon Systems in Dallas, Texas. At Raytheon he was responsible for the development of resonant tunneling devices and circuit technology for digital and analog/mixed signal applications. Prior to working at Raytheon he held positions in Texas Instruments' Central Research Laboratory and the National Bureau of Standards' Electron Device Division. He has been manager and principal investigator for numerous government programs. In addition, he has served as a visiting lecturer at the University of Texas-Dallas, authored and co-authored more than 100 publications, and holds 16 U.S. patents. Seabaugh is a senior member of the Institute of Electrical and Electronics Engineers and a member of the American Physical Society. He taught Advanced Studies in Semiconductor Devices during the fall semester.

Out of this World

Two College of Engineering alumni have seen their research launched recently. Lt. Col. Michael Caylor ('93, aerospace engineering), Deputy for Labs and Research in the Department of Astronautics at the United States Air Force Academy (USAFA), has been heavily involved in the Academy's small satellite program. In October, they launched "FalconSat-1." It carries a space physics experiment and will be monitored from a new ground station at the Academy. Caylor is becoming more and more involved with the USAFA's advanced rocket engine research. He is currently focusing on hybrid propellant technology that uses a solid fuel and liquid oxidizer.

Cathy Pieronek ('83, aerospace engineering) worked on the Chandra X-Ray Observatory, launched earlier this year. Chandra is the third of the National Aeronautics & Space Administration's (NASA) four great observatories. Pieronek worked on this project when she was employed by TRW in Redondo Beach, Calif. She also worked on the second of the observatories, the Compton Gamma Ray Observatory, over a seven-year period at TRW. In 1995 Pieronek graduated from the Notre Dame Law School, and since 1996 has worked at the Law School in alumni relations and publications.

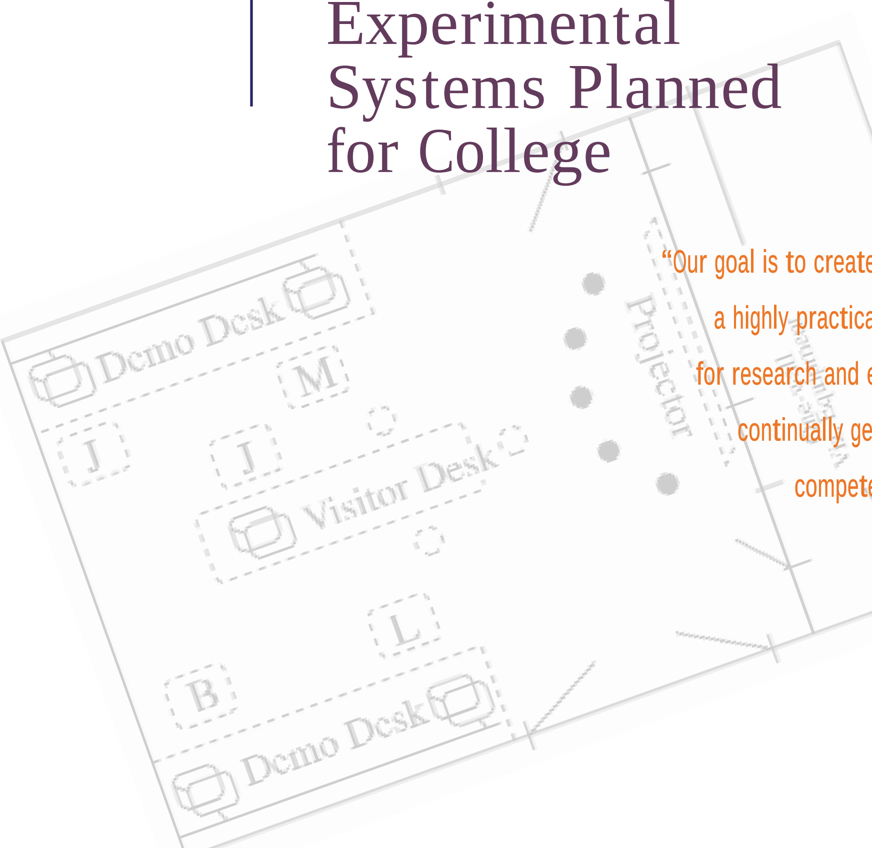
Notre Dame Hosts U.S.–China Protocol Meeting

Protocol Annex III, a joint meeting between delegations from the People's Republic of China and the United States, was held earlier this fall, at the University of Notre Dame. An annual event, the meeting emphasizes cooperative efforts between earthquake experts in both countries in order to decrease the amount of damage to civil structures and their occupants brought about by seismic disasters. This year's meeting reviewed past joint projects, identified future collaborations and determined focus areas for new and continuing research. Following a tour of the campus, College of Engineering facilities and the Department of Civil Engineering and Geological Sciences' Structural Dynamics & Control Earthquake Engineering Laboratory, delegates were honored at a College-sponsored banquet.

Members of the Chinese delegation were: Lin Xuancai, director of the Earthquake Resistance Office of the Ministry of Construction; Dr. Zhou Xiyuan, a researcher at the China Academy of Building Research and member of the China Academy of Science; Lu Yipeng, the division head of the Office of the State Commission for Organizational Setup; Dr. Qi Xiaozhai, a researcher and deputy director of the Mechanics Engineering Institute; Dr. Ye Liaoyuan, professor and deputy president of Yunnan Polytechnic University; and Jia Shu, senior engineer and deputy division head of the Earthquake Resistance Office of the Ministry of Construction.

The members of the U.S. delegation were: Dr. Shih-Chi Liu, director of the Earthquake Hazard Mitigation Program at the National Science Foundation; Dr. B. F. Spencer of the College of Engineering's Department of Civil Engineering and Geological Sciences; Dr. George C. Lee, the director of the Multidisciplinary Center for Earthquake Engineering Research; Dr. James Beavers of the Mid-America Earthquake Center; Fan Wu of Risk Management Solutions, Inc.; Dr. Weimin Dong, also of Risk Management Solutions; Dr. Ming L. Wang, a professor at the University of Illinois at Chicago; and Dr. Lawrence A. Bergman, a professor at the University of Illinois at Urbana — Champaign.

Virtual Laboratory for Parallel Experimental Systems Planned for College



"Our goal is to create and maintain a highly practical environment for research and education that continually generates highly competent students."

More than one million dollars of a three-million-dollar grant from the National Science Foundation and IBM is being used to create a virtual laboratory focusing on multiscale applications within the College of Engineering. "We're very excited about the Parallel Experimental Systems Lab," said Nikos P. Chrisochoides, director of the lab and assistant professor in the Department of Computer Science and Engineering. "Our goal is to create and maintain a highly practical environment for research and education that continually generates highly competent students. This facility represents another step toward that goal." The overall objective of the laboratory is to function as a research and educational environment for College of Engineering faculty, as well as current and prospective students. Specific activities will include software development for the implementation of time-dependent simulations of complex physical phenomena and providing feedback to parallel hardware architects in the department.

Two of the focus areas are computational fracture mechanics and computational molecular biology. Interest in these fields is growing rapidly. For computer scientists and engineers, like Dr. Chrisochoides, these fields offer a challenge due to the nature of multiscale applications, for which engineers need to develop new and more efficient parallel algorithms. In the near future teams of material scientists, biologists, and computer scientists will develop multiscale algorithms, implement codes, run simulations, and visualize results using the lab's facilities. Although Notre Dame cannot currently process large production runs, the Parallel Experimental Systems Lab gives the University the appropriate hardware diversity to accomplish prototyping systems and then send the computations to a supercomputing center for final production.

When complete, the laboratory will feature a high-performance visualization center, a cluster of approximately 30 computers, and a visitor's desk which will be used for outreach opportunities and sharing the exciting field of engineering with elementary, high school, and first-year University students.

The New Engineering Student Center Opens

For years engineering students have needed a space in the Cushing/Fitzpatrick complex to meet or simply to relax. Thanks to the generosity of Charles B. Kitz, an alumnus and member of the College of Engineering's Advisory Council, that space now exists.

Originally Room 217 in Cushing Hall was the engineering library. Over the years it was converted to a student center and used primarily as a meeting place and storage facility for different engineering student organizations. Later, Room 217 was needed for office space. Walls were erected, offices built, and several engineering emeriti faculty moved in. But that was not the end of the transformation. As the College of Engineering grew, the need for a student area became more pronounced. It was this need that Dean Incropera, Robert Cunningham, director of budgets and operations for the College, and the Engineering Student Advisory Council began to address in April. At this time alumnus Charles B. Kitz ('58, mechanical engineering) heard of the project and generously donated $75,000 for remodeling and development of a new engineering student center. Everything was in place for the renovation to begin.

Cunningham started working with Deborah Murray, a project coordinator in Facilities Operations, and Debra Durall, an interior designer also in Facilities Operations. Heating and air-conditioning contractors were brought in to review the situation and make suggestions, mainly because Room 217 had never been air-conditioned. Durall came up with some initial ideas for the décor and layout of the room. Then Murray and Durall met with Incropera, Cunningham, and the members of the student council. They discussed what kind of furniture would meet the needs of students, as well as the other items students would find useful in the center. In short, they discussed how the room should function — as a place of relaxation and socialization, a room where students could collaborate on group projects or commiserate over a final exam. After reviewing floor plans and swatches, the committee made its selection and remodeling began.

In June Cushing 217 was gutted; the conversion to a student center was under way.

Work was completed and carpet laid. A large-screen television was installed as was a small refrigerator and kitchen area, a stereo, and several very comfortable couches and chairs. The center was ready for occupancy.

On Thursday, November 18, the Charles B. Kitz Engineering Student Center was dedicated. Rev. Mark Poorman, C.S.C., vice president for student affairs, blessed the room. Kitz and his wife, Betty, cut the ribbon, and received a plaque acknowledging their gift. Several of the students present expressed their excitement over the center and their gratitude regarding the gift. The Engineering Advisory Council was also in attendance; the event was part of their annual fall meeting, which had begun earlier that morning.

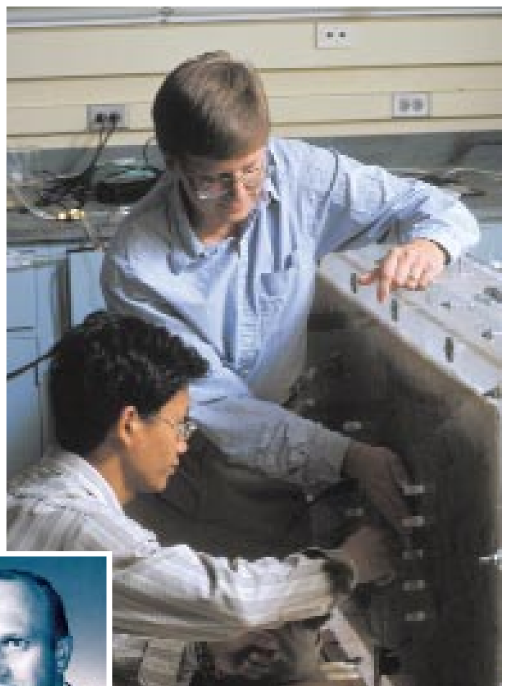
The center is now open from 7:00 a.m. through 11:00 p.m. daily. Guidelines drafted by representatives from the student council for use of the center are as follows:

- Be considerate and respectful of other students in the student center. This includes stereo and television volume.
- Keep kitchen area clean. Each student is responsible for cleaning up after himself/herself at the counter, the refrigerator, and the shelves.
- Television and stereo are available on a first-come, first-served basis.
- The front portion of the center, couch area, can be reserved for meetings through a reservation book to be kept in the center. Other students, provided they do not disrupt the meeting, may use any open tables.

The Charles B. Kitz Engineering Student Center was dedicated on November 18. Among those present were, left to right: George Duke, director of regional development; Betty Kitz; Robert Cunningham, College of Engineering director of budgets and operations; Charles B. Kitz; Rev. Mark Poorman, C.S.C., vice president for student affairs; Dean Incropera; and Jami Meteer, a senior in electrical engineering.

Rupp Memorial Fund to Support Field Teaching Laboratory

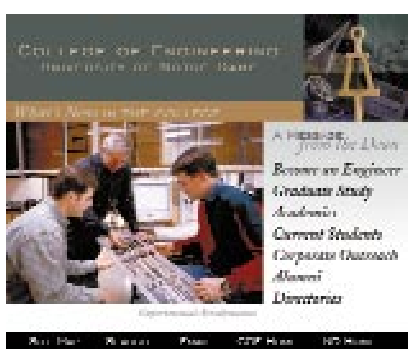
The wife of Paul Rupp Jr. has established a memorial fund in her husband's name to support the College of Engineering. Daughter Linda Scorzo and other family members worked with Dr. Stephen E. Silliman, associate professor of civil engineering and geological sciences, and Kenneth J. Hendricks, associate director of planned giving, to decide how best to manage the fund as a true memorial to their father. Initially, the fund will be used to develop a Field Teaching Laboratory on a site close to the campus. Each academic year this lab will give up to 100 undergraduates the opportunity to gain unique hands-on experience in both water treatment and groundwater systems. Designed for the study of water treatment and supply, the lab's efforts will include remediation technologies and resource management studies. The facility will also provide for the expansion of a developing nations program, which focuses on training students and adult volunteers to develop and treat water supplies in less developed countries. Creation of this laboratory puts Notre Dame at the forefront of water supply and pollution control efforts. Annually, the Paul Rupp Jr. Endowment for Excellence Fund will be used to support undergraduate research activities and field trips, with a strong emphasis on student travel to less developed nations for the implementation and evaluation of water supply and treatment technologies. It will also provide incentives for students and faculty who excel in this field and will nurture and expand the academic opportunities undergirding the mission of the University.



Family members have established a memorial fund in the name of Paul Rupp Jr., a 1953 graduate of the University.

Surf's Up!

The College of Engineering is updating its web site. New features and additions include information on internship opportunities for students and corporations; a calendar of events for College activities; featured laboratories and research; an on-line version of College publications; and an alumni page. As always, comments from alumni, as well as current and prospective students are welcome. Coming on-line in late December, the new site should be even more interactive and helpful in finding information or contacting College faculty and staff. Access the new College web at www.nd.edu/~engineer. Comments and suggestions may be sent to: Nina Welding, Editor, College of Engineering, 357-B Fitzpatrick Hall, Notre Dame, IN 46556-5637 or via e-mail at Nina.R.Welding.2@nd.edu.



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