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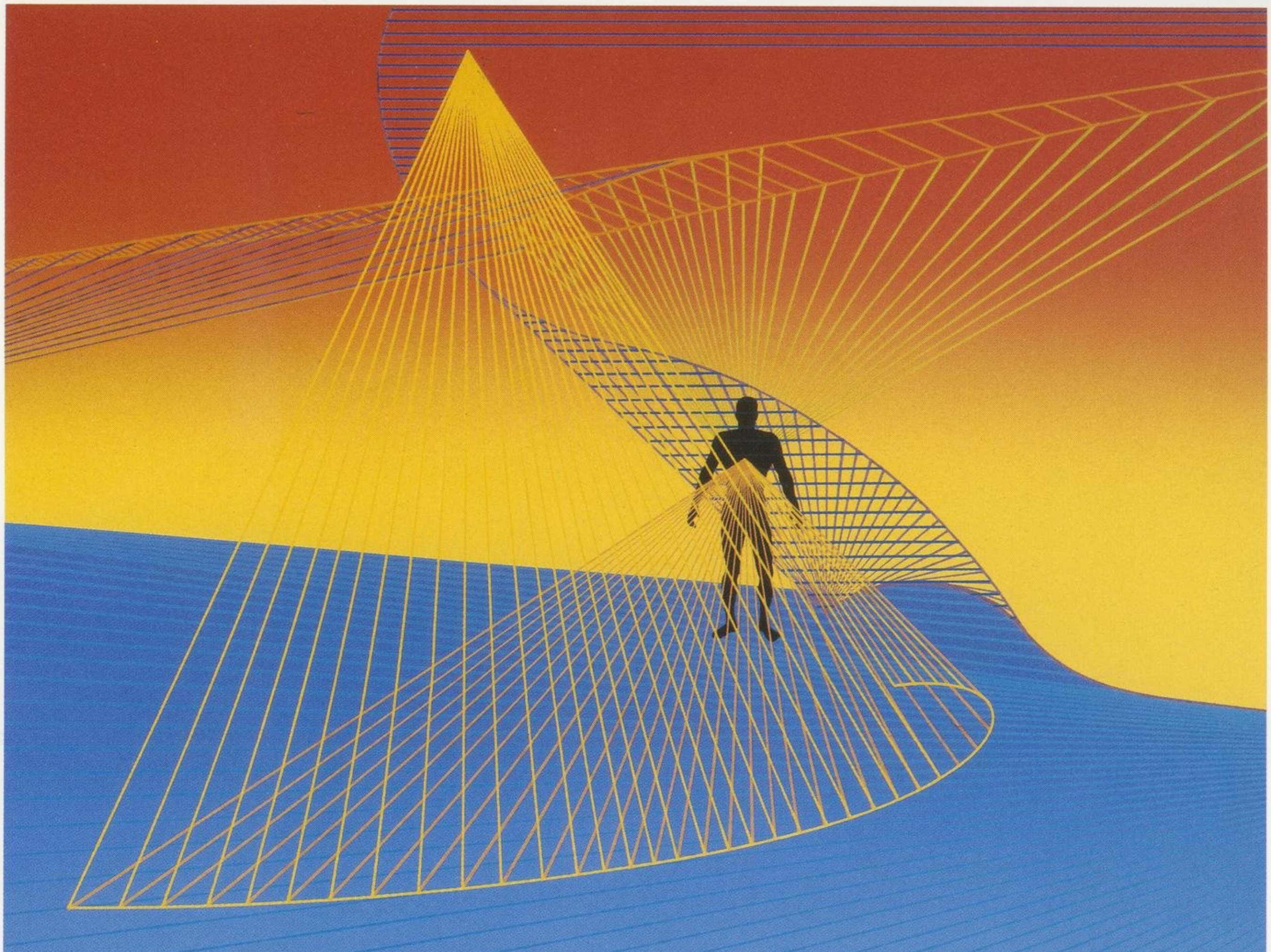

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Mike Waters

Production
Deanson Lin
Dawn Stanton
Craig Tierney
Wendy Weinbrenner

Graphics/Art
Dawn Stanton

Photography
Shaun Burke

Circulation
Mike Bashel

Cover

The Wisconsin Alumni Research Foundation (WARF) building towers over practice fields at the west end of campus. See page 4 for *UW-Madison's Link to Research Excellence.* Photo by Norman Lenburg and courtesy of UW News and Publications Office.

TABLE OF CONTENTS

2 Editorial

3 Dean's Corner

4 Wisconsin Alumni Research Foundation: UW-Madison's Link to Research Excellence

6 *Stunning* Research in Electrical Fishing

9 Research Experiences for Undergraduates: Education in Plasma-Aided Manufacturing

12 Engineering Briefs

14 Dr. Jay Samuel: Dedication and Motivation

16 The Facts About Fax

18 Technology Transfer Facility: High Tech Classrooms for the College of Engineering

20 High Speed Education: A Formula for Success

22 The Final Challenge: Developing Your Interviewing Skills

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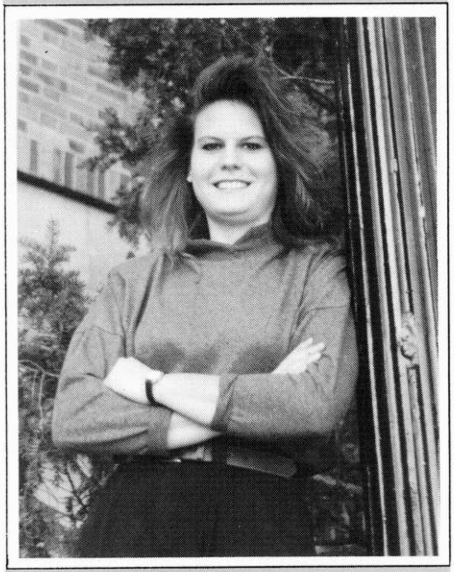
EDITORIAL



Amy R. Damrow, Co-Editor
Wisconsin Engineer

When I first set foot on the engineering campus as a freshman, I was engulfed in awe. As I strode down Johnson Drive, ERB towering overhead, I thought to myself with pride, "I am an engineering student!" I had come a long way to reach this apex in my life. From kindergarten on through my senior year of high school I worked hard with visions of someday being *someone*, perhaps someone great, and now I was going to be an engineer.

As the lump started to form in my throat from the deep emotion, I noticed the many curious stares directed my way. Why were they staring? Was it because I was a female? Or was it my wild hairstyle... or perhaps the heavy-metal band on my t-shirt? The passers-by looked at me as though I didn't belong there, as if I was lost on the engineering campus and could not find my way out. Needless to say, my state of euphoria faded.

I would like to take this opportunity to clarify that I was not "lost" on the engineering campus. I am not lost today, and I will not be lost tomorrow. I am an engineering student, and I am proud of it. I am not a "digit-head" or an "engi-nerd" as the two favorite engineering stereotypes would classify me. I consider myself a "normal" student, regardless of my engineering major. In my extreme frustration over the stereotypes of engineers, I would love to stand atop the tallest building in the world and proclaim, "Not all engineers are nerds!"

If you, as engineers, have not already noticed, a large, very naive portion of society believes that all engineering students look like Arvid Ingen on ABC's "Head of the Class." To them, we are nerds. These stereotypers have this vision of the engineer, getting all spiffed up in **his** high-water plaid pants and pocket-protector for a fun-filled Friday night with his HP. I am sorry to interrupt their little far-fetched fantasies, but this is not the picture of today's engineer.

Look around the engineering campuses of today. You will see a wide range of different students. You will see students of both sexes and students of various ethnic backgrounds. You will see beautiful women and men with long hair. Big, small, short, tall—they can all be engineers.

Engineering students, like "normal" students, also have hobbies and interests. Many UW engineering students are athletes. A large number of engineering students are a part of the illustrious UW Marching Band. Some engineering students are artists. Some are writers. Some of them are actors or actresses, and some are models. Most of them like to party and have a good time—just like the "normal" students do!

All of the above-mentioned, non-nerdy people belong on the engineering campus. Why? They belong there because they possess the two engineering essentials: intelligence and determination. These bright students have what it takes to make it through four to five (...okay, maybe six...) years of excruciating agony to become an engineer. It does not matter what you look like or what thrills you in your spare time; if you have what it takes and you really want to be an engineer, **you can be an engineer!**

So the next time you are strolling down the hallowed walks of the engineering campus, and someone gives you that "Are you lost?" look, flash them a big smile and show 'em who can be an engineer!

DEAN'S CORNER

Donald Dietmeyer,
Associate Dean-Academic Affairs

Although students come to Madison to study engineering, not academic rules and regulations, most of the students that I see as Associate Dean for Academic Affairs have discovered that the UW and the College of Engineering have what I call the three R's: rules, regulations and requirements, brought to their attention. They come to me seeking a better understanding of a particular R, an answer as to why it exists and often exemption from that R. It is enjoyable working with these students when I can say "Yes, you may be a part-time student; you may enter or return to the College of Engineering; you may count that course toward your degree, etc." I do not enjoy having to say, "No, you can't...," but I must do so on occasion as part of the job. Of course, the students don't like it either, but some do return after a period of time to report that it was in fact in their best interest.

Copies of the "Official Regulations of the College of Engineering " are available in my office. These R's are also published in the *Bulletin of the College of Engineering* together with a bit of explanation. They cover:

1) Admissions to the College (the campus also has requirements that must be met) and to degree classifications;
2) Registration: full- versus part-time, adding, dropping, substituting, pass-fail and audit;
3) Performance: grading, GPA and PCR, Dean's Honor List, class standing, status (good, probation and drop);
4) Graduation requirements.

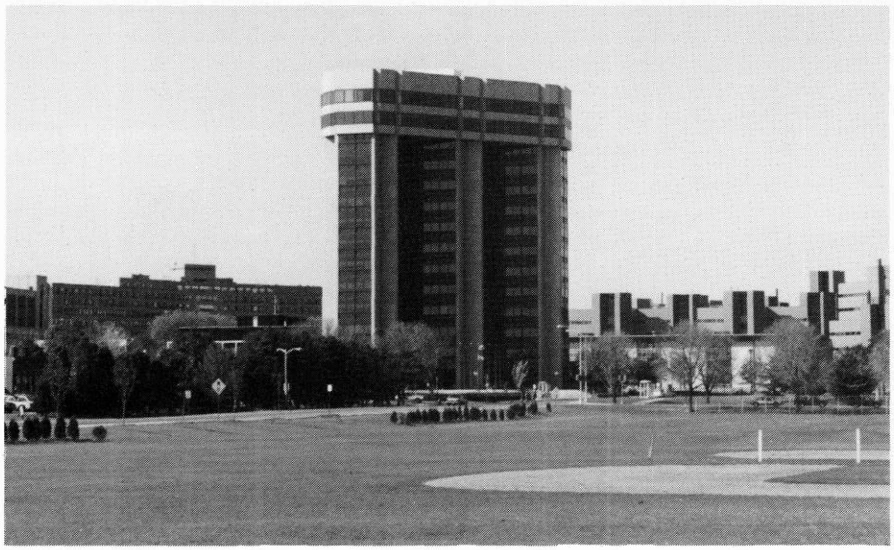
The final regulation gives the Dean authority to waive any of the others when they are unjust. Dean John G. Bollinger has delegated his authority to me and to Associate Dean George Maxwell in these matters with one exception: We cannot change grades, even if we and the students feel they are unjust.

The faculty of the College established the regulations. The faculty may change them upon recommendation of the Academic Programs, Curriculum and Regulations Committee, which is an elected faculty committee. One of the nicer names for that committee is the "Alphabet Committee."

One of the requirements for graduation is satisfaction of a curriculum. Again the College faculty is responsible for course content and curriculum, but departmental faculties usually make the recommendations for change. While each student is responsible for the curriculum as published in the *Bulletin of the College of Engineering* at the time of admission to the degree classification, the *Bulletin* is sometimes a bit out of date, and departments are permitted to have additional lists of elective courses and R's. I get involved in these issues, also, but usually attempt to have departments act on their rules. Most departments have advising literature for their students.

I don't think students should dwell on the R's, but I do recommend that they read them over once in a while to be aware of areas of concern and to avoid problems. If you have an academic problem or think you are about to have a problem, read more carefully and talk to knowledgeable people. Do not be too ready to accept advice. I seldom accept "I didn't know," "My roommate told me," or even "My advisor told me." My office staff and I are available to find and give accurate answers and decisions. We are here to help; give us a chance to do so if you run into an unruly R.

Wisconsin Alumni Research Foundation
UW-Madison's Link to Research Excellence



The Wisconsin Alumni Research Foundation (WARF) building rises above the Natatorium practice field on the west end of campus.

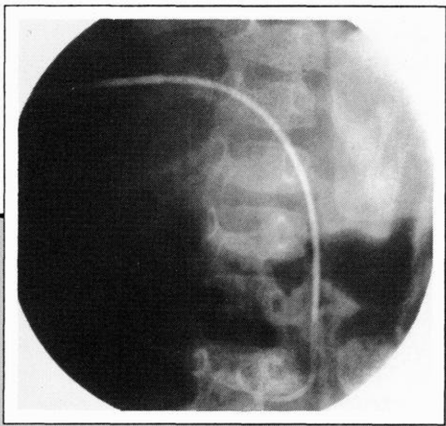
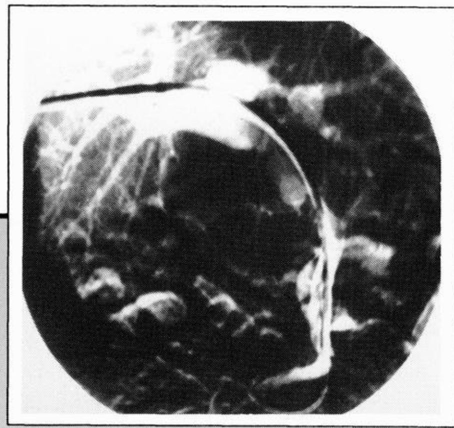
Rising 14 floors above the practice fields at the western edge of the campus, WARF Tower looks like any other modern University Building. Inside, however, is the Wisconsin Alumni Research Foundation, a uniquely successful organization devoted to promoting research at the University of Wisconsin-Madison and consequently helping humanity. WARF grants licenses to companies to use patents developed by researchers here and uses the money generated, in addition to gifts and profitable investments, to fund further research. Last year alone, WARF donated over $14 million to the UW, showing the effectiveness of the program's ties to research and industry.

WARF was created in 1925 to solve a common problem with giving inventions to society. Professor Harry Steenbock faced this problem when he found a new way to fight some nutritional diseases by discovering a revolutionary way of creating vitamin D in foods. He was eager to distribute the knowledge but was hesitant because other researchers had experienced difficulties in trying to do so. Specifically, UW Professor Stephen Babcock had invented a new method of measuring the butter-fat content of milk and decided to "give it freely to the world" rather than patent it. He then found he could not ensure the reliability and accuracy of his test, as he had no control over who used it. In addition, neither he nor the University could reap the profits of the invention. The concern of UW professors, administrators and alumni about the final uses of Steenbock's discovery led to the formation of WARF.

> ***WARF's job is to earn money and give it to the University***

An early WARF executive said, "WARF's job is to earn the money and give it to the University. The professors' jobs are to spend the money as wisely as they know how." WARF receives two-thirds of its money from investments, one-quarter from profitable inventions and the remainder from gifts, donations and bequests. Most of the money given for research to the University is distributed by the Research Committee, a group of over 30 University faculty members appointed by the University of Wisconsin-Madison chancellor. It is this committee alone, not WARF, which chooses the research projects to be funded. Researchers funded by WARF who receive patents do not have to give them to the Foundation, except when required by federal law. If the researchers do so, they receive significantly more royalties than is the norm for inventors with licensing agreements. In addition, the researcher's department receives a portion of the profits to support any research it chooses.

An example of WARF's commitment to helping the University, industry and society at large can be found in the story about creating vitamin D, WARF's first patent. In 1924 Steenbock discovered that vitamin D could be produced by exposing food to ultraviolet radiation. Vitamin D helps to maintain bone health by depositing calcium and phosphorous in bones. In experiments, Steenbock found that vitamin D prevented or cured rickets in lab rats. Rickets is a nutritional dis-

This sequence of DSA pictures shows a transplanted liver. The left photo was taken before any contrast agent was added. The following photos show the blood carrying the contrast agent into the the liver. DSA allows the spine, present in the first photo, to be subtracted from the successive images. (Photos courtesy of Dr. A. B. Crummy)

One of WARF's most successful patents is Digital Subtraction Angiography, pioneered by Professor Charles Mistretta with funding from the National Science Foundation and the National Institutes of Health. An angiogram, a picture of blood vessels, is made by injecting a substance into a patient's blood vessels and then taking an X-ray picture. The substance, called contrast agent, blocks X-ray energy, making the blood vessels show up in the picture. Typically a large amount of the substance must be used to make the vessels visible. However, Digital Subtraction Angiography compares two pictures, one taken before the agent is injected and one after. With the subtraction the blood vessels become much more visible than in a single picture. As a result, much less of the blocking substance needs to be used, decreasing the risk to the patient, and cutting the cost, as the contrast agent is rather expensive. Angiograms can be displayed practically instantaneously with DSA, allowing doctors to see the results of their work immediately. In addition, the images are clearer as the features common to both pictures (e.g. bones) disappear, making diagnoses easier and more accurate.

ease which makes bones soft and weak, leading to their deformation. In Steenbock's time, millions of children were deformed and even crippled by rickets.

WARF provided loans to the University to help it purchase Picnic Point and parts of the Arboretum

In 1927 WARF awarded its first license to the Quaker Oats Company for the vitamin D fortification of breakfast cereals. Acceptance of vitamin D grew and spread across the world, so by the 1940s rickets was a "lost" disease. The development of vitamin D was later carried on by one of Steenbock's former graduate students, Professor Hector DeLuca. In 1971, after extensive research, DeLuca and his colleagues discovered that vitamin D was converted by the body to a hormone which actually did the work. The team then created an equivalent substance called "super-active vitamin D", which directly helped the bones. Since then, DeLuca and his team have extensively researched the use, synthesis, function and identification of several derivatives of vitamin D, generating over 900 patents and patent applications in the process. The results of the research, through WARF patents and licenses, are being used globally to help humanity.

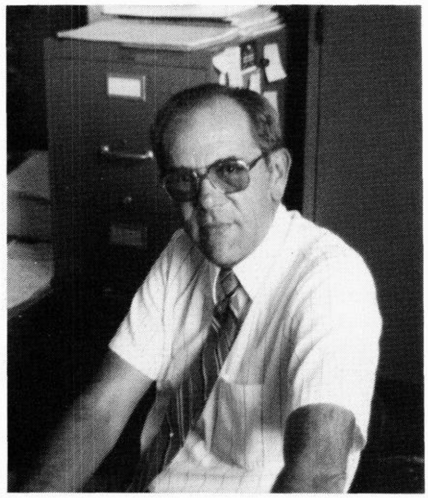
WARF's aid to the University is not limited to funding patent-oriented research; it takes other forms as well. In the 1920s, WARF provided loans to the University to help it purchase Picnic Point and parts of the Arboretum. During the Depression in 1933, WARF provided funds for emergency research leaves for professors, bailing out the University. In 1957 WARF helped to found the Wisconsin Survey Research Center, dedicated to social science and humanities research. During the early 1980s the salaries of UW-Madison faculty were frozen, making the salary offers of competing "raiding" universities much more attractive. To keep the faculty from leaving, WARF provided $5 million to augment salaries. WARF has maintained a history of helping the University in both good times and bad.

WARF, the world's oldest successful venture between university research and industry, stands as an ideal which others have tried to emulate. A study by Harvard University says, "WARF has gained a reputation for skill and professionalism unsurpassed in university patenting and licensing operations." Society, the University and industry have all profited tremendously from the successful cooperation promoted by WARF.

AUTHOR

Alex Dean is a senior in electrical engineering. After spending the semester at the Computer-Aided Engineering lab, Alex is looking forward to moving back into his apartment over the holiday break.

Stunning Research in Electrical Fishing



UW-Madison ECE Professor Donald Novotny assisted with research on electrodes and now serves as a consultant to the DNR.

As the autumn sun drops toward the horizon, a boat skims slowly along the shore of Madison's Lake Mendota. A pair of long thin rods extend from the front of the boat; electrified tentacles hanging from the ends droop down into the water. About once a minute two men at the front of the boat reach out with their nets and scoop up a northern pike, a large-mouth bass or a walleye. In a short time they fill the tub in the boat with fish. These specimens will be observed, possibly tagged and then released.

The Wisconsin Department of Natural Resources uses this technique of electric fishing to study fish populations in local lakes and streams. By establishing an electric current in the water, fish are attracted to the area around the boat. Electrodes, the "tentacles" described earlier, are placed in the water and charged by a power source, creating an electric field. Current flows in the water between the two electrodes, taking the path of least resistance and affecting fish nearby. Fish generally have a lower resistivity than water and thus tend to attract the current. Once a fish is in the electric field, a controlled current can induce involuntary muscle contractions which cause the fish to swim toward an electrode near the surface of the water. The fish can then be easily netted.

Once a fish is in the electric field, a controlled current can induce involuntary muscle contractions which cause the fish to swim toward an electrode near the surface of the water

Smaller fish are more easily attracted; they can come under the influence of electric current before they know what has happened. Larger fish are more difficult to attract because their larger bodies can sense small current and can escape the field quickly with their stronger muscles.

The primary equipment for this type of fishing consists of a power source and a pair of electrodes. The two electrodes are generally circular metal rings charged oppositely to induce an electric field between them. Power sources include single-phase or three-phase alternators, direct current generators and batteries. Power is delivered to electrodes in the water in a variety of forms from sinusoidal AC, pulsed AC, DC, pulsed DC, full-wave, half-wave, quarter-wave or smooth rectified, condenser discharge or some combination of these forms.

Research has been performed on the UW-Madison campus to identify the most efficient setup for electrical fishing. Professor Donald Novotny, Electrical and Computer Engineering at the UW, and Gordon Priegel, Fisheries Management at the DNR, conducted a series of tests to determine the effects of different power sources and various electrode shapes. The results of their research indicated that rounded electrodes work best, and that although DC attracts fish the best, AC has the largest range. Searching for an agreeable medium between the two, the researchers found that a pulsed DC most effectively attracts fish. This type of current induces forced swimming and allows the easiest netting.

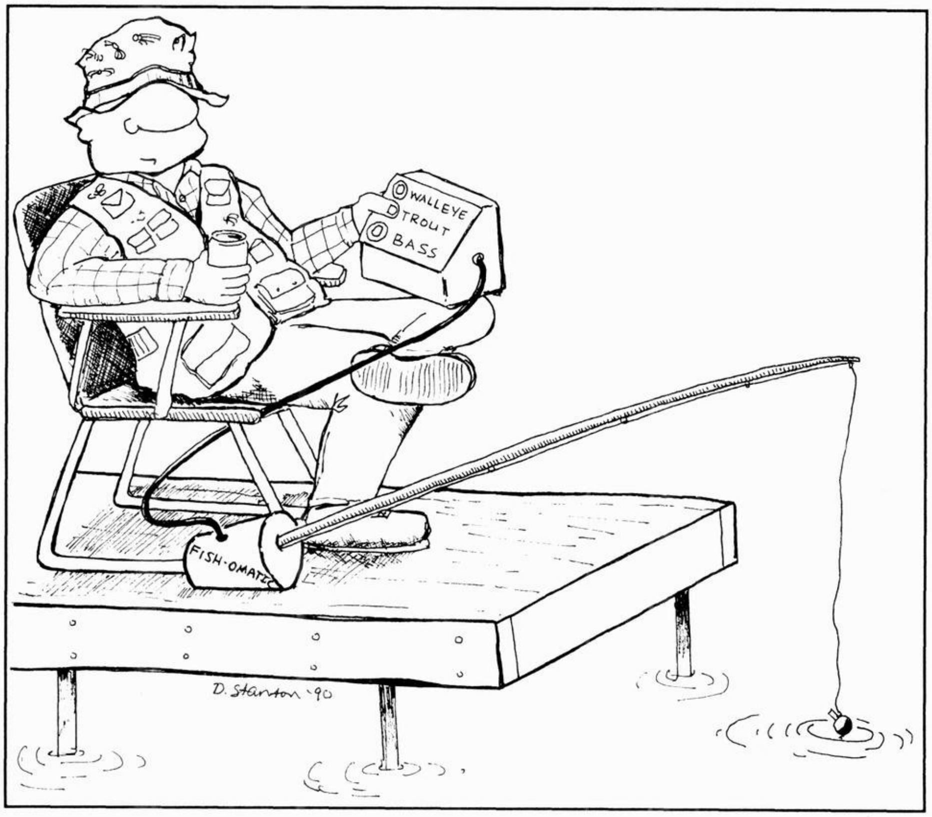
The Wisconsin DNR started fishing with electricity in the early 1950s. But, in 1970, the Industrial Commission, now the Dillard Commission, shut down all electric fishing operations in the state because of safety concerns. This shutdown led Gordon Priegel, then a Fishery Biologist with the Madison Bureau of Research, to begin work on fishing with electricity. Priegel says, "We had to come up with safety systems for the equipment."

When Priegel first took up the task of designing proper safety equipment, he contacted the University of Wisconsin-Madison for help with research. Professor Donald Novotny, an avid fisherman, agreed to help with the electrical safety issues. "Priegel's request got me interested in trying to make electrical fishing boats more effective," says Novotny. A joint effort between the UW and the DNR spanning two decades resulted. Novotny notes that this research was, "lots of fun - really different than the work we usually do. Here in our lab, when we want to test something, we just go and perform the experiment. But on the lake, many factors influence the results, and they are always changing."

According to Priegel, Wisconsin is the leader in electric fishing. All related equipment used in Wisconsin originates under Priegel's authority. Currently, two companies manufacture electric fishing equipment wholesale in the United States, and both offer a 'Wisconsin Option' as an upgrade on standard equipment. The results of this research continue to influence electric fishing operations across the United States. "We used to travel all over the countryside giving week-long seminars through the Fish and Wildlife Service Fishery Academy," says Priegel. "All their people had to go through the course before they were allowed to fish with electricity," he continues.

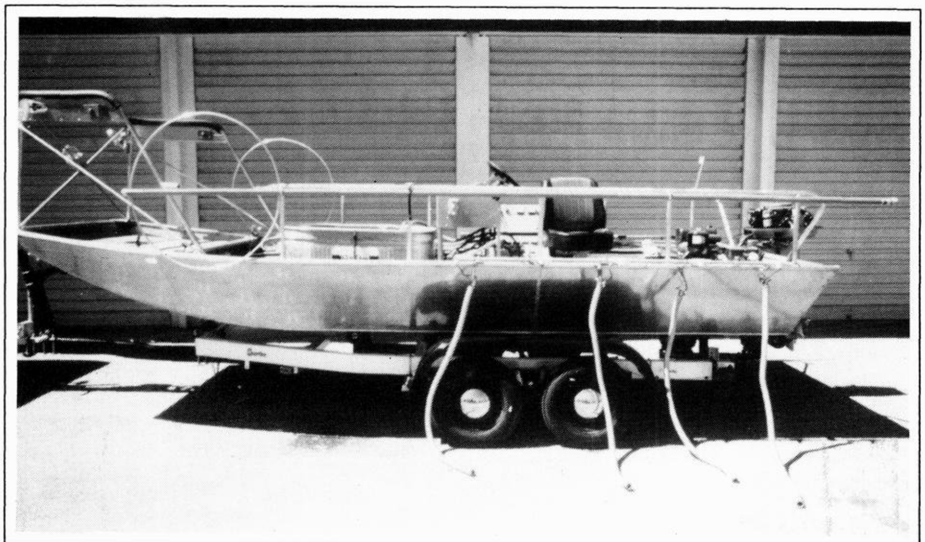
Fishing with electricity in its simplest form dates back to the previous century. The first documented record is a British patent issued to Isham Baggs in 1863. Since that time, several methods have been developed. The three most common methods of electric fishing are screening, which involves the use of electrified arrays to direct fish movement; wading, which requires transporting a backpack power source to corner fish in shallow streams; and boating, which relies on suspending large electrodes from the boat to lure fish to the water's surface.

These different methods have evolved because of the many different reasons for electric fishing. The screening method is used most often by the Chinese who have developed a system of electric arrays to prevent fish from escaping over spillways of reservoirs doubling as fish pens. Electric screens are also used by governments and environmental



conservation companies across the world to direct migrating salmonids. For example, the Salmon and Freshwater Fisheries Laboratory of the United Kingdom has used electricity to direct migrant salmon smolts away from streams polluted with industrial waste.

The wading and boating methods are used primarily in Europe and in the United States. Both forms entail placing



The "tentacles" of this man-made Portuguese mon-of-war produce a current which causes fish to swim toward an electrode in the water.

two portable electrodes in water to attract, stun or kill fish for subsequent netting. Most electric fishers try to electrify the water with only a minimum current to prevent harming the fish. Here, the power supply, a gasoline fueled generator or batteries, is a limiting factor. The principle is based on attracting fish in the case of DC and stunning them in the case of AC.

Most national governments have passed restrictions on the use of fishing with electricity. In Wisconsin and neighboring states, private use is strictly forbidden. However, electric fishing is commonly used in the United States by the 50 state fish and game agencies and the 10 federal fisheries. In Canada restrictions are similar; in European countries it is allowed for research purposes or with

...two companies in the U.S. manufacture electric fishing equipment, and both offer a 'Wisconsin Option' as an upgrade on standard equipment

special license only. In China electricity is used by the state in large communal fish pens. In countries across the world fishers use electricity for researching fish species, assessing stock, and directing fish migration.

AUTHOR

Douglas Maly is graduate student in electrical engineering. Doug is asking Santa to pay his telephones bills for Christmas.

Researchers easily net their "electrified" specimens. The fish are studied, sometimes tagged, then released.

What About the Fish?

"It has come to light that electrofishing is more harmful than thought," comments Professor Donald Novotny of UW-Madison. A report prepared as the result of research performed by Novotny and Gordon Priegel of the Fisheries Management branch of the Wisconsin DNR, advocates the use of pulsed DC, partially because of its minimal harm to fish as compared to that caused by AC.

Novotny and Priegel designed equipment to electrify the water just enough to attract the fish, but not so much that the fish are stunned or killed. After fish had been captured, they were thrown back into the water seemingly unharmed as they darted off. However, new studies show that even the minimum required electric currents can have long-term damaging effects on the fish.

The actual extent of damage to fish is still unknown. One study suggests spinal injury occurs in about half of the fish tested. This study was performed on trout, which have relatively strong muscles. According to Novotny, trout are more at risk because involuntary muscle contractions cause bone damage in stronger and older fish where the contractions cause more stress, and the bones are weaker. The damage to smaller fish may be less critical.

Novotny says even if fish are damaged more than previously thought, "Electric fishing is far less harmful than mass netting." He tells of once, when testing equipment on the lake, he looked down after a full 20 minutes and to his dismay saw a big pike had been in the field. He says, "The fish was stiff as a board. But after a few minutes the fish started to twitch, and a few minutes later it darted off for deeper water."

Priegel claims, "We have done some preliminary work on damage to fish, and there is no evidence that it is true," as he refers to huge x-rays of fish tested. Even so, he has several experiments planned to further test for damage when the weather warms up again.

Research Experiences for Undergraduates

Education in Plasma-Aided Manufacturing

(Left) Kristine Bell (UW-Platteville), Andy Johnson (Milwaukee School of Engineering), Lih Fang Chew (Mankato State University), and David Crowcraft (University of Illinois) gained valuable research skills in the REU program last summer.

Lih Fang Chew did not spend her summer vacation working at home. Nor did she take a full load of summer classes at Mankato State University. She didn't even work as a co-op in industry. Lih Fang spent her summer at UW-Madison working with plasma source ion implantation. She saw first hand how plasma modifies the surface of materials. She tested artificial knee caps to see if nitrogen implanted into their surfaces affected their hardness. She also tested the microhardness of other materials and tools. Then Lih Fang began her junior year at MSU this fall with a new attitude. Unlike many of her peers at this regional college, where the emphasis is on undergraduate education, Lih Fang felt certain that she wanted to go to graduate school and, maybe, work with semiconductors.

Lih Fang's goal of graduate school is not unique, but her reasons for setting such a goal certainly are. Lih Fang spent her summer vacation working as an intern in the Research Experiences for Undergraduates (REU) program at UW-Madison's Engineering Research Center (ERC) for Plasma-Aided Manufacturing.

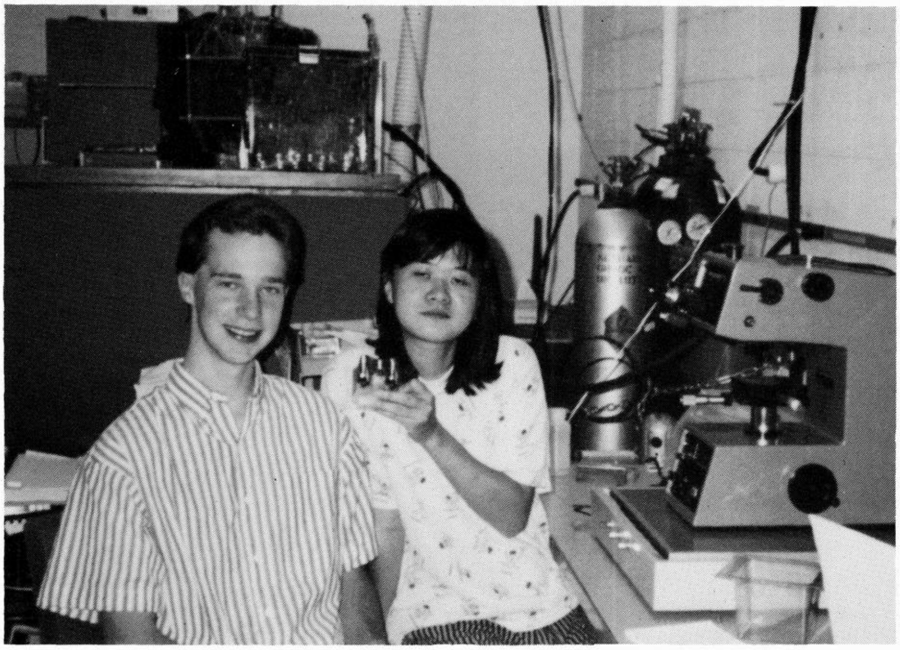
The Engineering Research Center

You hear plasma mentioned at any high-tech research university, but at UW-Madison, it has special importance. That's because in 1988 the National Science Foundation awarded a $12 million grant to UW-Madison College of Engineering researchers to found the ERC for Plasma-Aided Manufacturing. The grant established UW-Madison as one of 21 ERCs nationwide, each with a different area of specialization. Grant extensions and supplements make it possible that the Plasma-Aided Manufacturing center may be funded through 1999.

ERC grants have a broad mission and the hefty funding level brings many responsibilities. According to ERC director and electrical engineering professor J. Leon Shohet, the general goal of UW's ERC and others is to make our country more competitive in the world market by developing and applying new technology. Specifically, the mission of the ERC is to link academic engineering research and education to engineering practice; to establish a cooperative environment that includes faculty, graduate students, and undergraduates from a broad range of disciplines, together with counterparts from industry; and to provide not only missing knowledge but also the mechanisms for converting that knowledge into useful industrial technology.

UW-Madison's ERC works together with the University of Minnesota and 23 industrial partners on four thrust areas of plasma research. The ERC includes 25 faculty members and 55 graduate students. The companies involved desire practical applications of the technology developed at the ERC and will work with researchers to transfer that technology to industry. The faculty and graduate students work on teams to develop the technology that industry desires. Other members of the research teams include a number of fortunate undergraduates.

Perhaps the most unique aspect of the ERC is its emphasis on undergraduate research. The ERC is eager to get undergraduates involved in its work to educate them on not only plasmas but also on what research is all about. On a local note, the ERC is proposing a new lab course for undergraduates from any engineering discipline. This unique course will emphasize engineering statistics as applied to plasma-aided manufacturing. In line with outreach activities, the ERC sponsored undergraduates to develop a demonstration to present to area middle and high school students interested in math and science. This summer, ERC sponsored six student interns to work at companies such as Cray Research and Hewlett Packard, where they worked hands-on with plasmas in manufacturing. ERC also awarded research internships to selected members of Madison's student section of the Society of Women Engineers. And when the NSF offered to sponsor the REU program, Madison's ERC eagerly accepted.



Lih Fang Chew and David Crowcraft, interns in the Research Experiences for Undergraduates program, display an artificial knee cap that they used for Plasma Source Ion Implantation experiments at UW-Madison's ERC.

The REU Program

Last summer marked the first opportunity for the ERC to become involved with the REU program. Six students from universities other than UW-Madison and the University of Minnesota worked for eight weeks in a full-time research capacity. According to Shohet, the students came from primarily undergraduate universities, where most students never consider graduate school or a career in research. "The students we selected have qualities that are different from other students. We looked for people with a number of backgrounds, interests in many activities, good academic standing, and a little desire to learn about research."

Kristine Bell worked with the Physics department before continuing her senior year at UW-Platteville. "I work with diamond deposition and optical emissions readings. I analyze the experiments to determine the temperatures of the plasmas during processes," explains Kristine. Kristine came across an announcement about the research opportunity while she was searching for a summer internship with industry. "It seemed interesting, though I didn't know what plasmas were and really never considered research. Now I'm glad I applied. This has been a great experience."

"...I feel that the REU program gave them an in-depth, intense research experience that opened their eyes."

Lih Fang worked with David Crowcroft, a junior from the University of Illinois, on the plasma source ion implantation experiments. David was surprised at how unstructured the program seemed. "We worked on our own more than I expected. I didn't realize how much responsibility we would have." David felt that his experience in the research program was encouraging and he will definitely consider graduate school.

David assisted Andy Johnson, a junior from Milwaukee School of Engineering, with computer testing as well. Andy's primary research focused on a computer program called Plasma Device Planar in 1-Dimension, or PDPI. Andy worked with Professor Shohet to modify the program, which simulates plasmas. The program is used for comparisons of the simulations and experimental results. Andy explains, "I didn't really know what to expect of the program. I am excited about my work here and I hope I can come back next summer."

The mission of the REU program is to get undergraduates involved with a team of cross-disciplinary researchers.

"We expose them to university research in the hope that they can more easily make a choice between a career with industry or graduate school," explains Shohet. "I am pleased that so many of our interns asked to come back next summer. I feel that the REU program gave them an in-depth, intense research experience that opened their eyes." ▮▮

If plasma research is something you would like to know more about, contact the ERC for Plasma-Aided Manufacturing. We encourage undergraduates from universities other than UW-Madison and the University of Minnesota to apply for next summer's REU program. Students from UW-Madison and the University of Minnesota may contact the ERC for information about internships at other universities. Just so everyone knows, REU interns were paid $3500 for the eight week program. Marlene Barmish, Assistant Director, ERC, 1410 Johnson Dr., Madison, WI 53706. 608/262-2181.

AUTHOR

Shelly Hoffland is a senior in mechanical engineering. As she looks forward to a co-op position in Green Bay next semester, she asks Santa to grant those Packers a home field play-off game.

Ask an engineering student about plasma, and you will likely hear, "I don't really know what plasma is. Isn't lightning a plasma?"

Plasma is a slippery concept. It is a categorical term for super high-energy, highly heated state of matter produced by adding energy to a gas. Thus, plasma can be referred to as the fourth state of matter. Plasmas can also be described as groups of positive and negative particles which are characterized by temperature, density, and composition.

There are two types of plasmas. Fusion plasmas are made of hydrogen and its isotopes and have been considered a possible long-range energy source. Industrial plasmas are made up of gases heavier than hydrogen with much lower temperatures. UW-Madison's Engineering Research Center (ERC) for Plasma-Aided Manufacturing concentrates its research on industrial plasmas.

Why is plasma research so important? Break-throughs in the applications of plasma to manufacturing can improve America's position in the world marketplace. Already competitors in Japan and Europe have had greater success with plasma-aided manufacturing.

Researchers at the ERC are trying to find better and more efficient applications of plasmas. The main goal of the ERC is to develop these applications and effectively transfer their findings to industry.

The breadth of research topics at the ERC is astonishing. First, researchers are developing tools to help them achieve their goals. These tools include improved engineering statistics, chemical characterization techniques and computer modeling programs. The improved tools are being applied to general research goals of producing new materials with superior properties and developing new chemical compounds. Particular targets are super-hardened cutting tools, superior anti-corrosive coatings, techniques for decomposing hazardous wastes and fabrication of semiconductor integrated circuits.

These applications of plasma-aided manufacturing can mean a lot to consumers. Possible results include better tire traction, more durable textiles and improved computer chips.

Attention Co-ops!

Registrations for the Co-op Program must be made prior to Christmas break this year in order to be eligible for summer or fall employment in 1991. The reason for the change is to get resume packets to employers earlier so that UW students can compete with students from universities on a quarterly system. (Students on the quarter system usually submit their applications earlier, and are thus interviewed first and get the first shot at open positions). Information and sign-up are available December 3-22 at Wendt Library, Room 407.

wisconsin engineer

College of Engineering Celebrates Engineers' Day

As a part of the Engineers' Day celebration on Friday, October 26, the UW College of Engineering sponsored morning seminars on topics such as micro-machines, high-tech ceramics and information access. Laboratory tours and additional seminars were held in the afternoon. The day's events culminated in an awards dinner at Memorial Union where twelve alumni received Distinguished Service Citations. Three faculty and staff awards were also presented.

ENGINEERING BRIEFS

EXPO '91: Combining Sport and Science

EXPO '91 will take place April 19-21 under the theme "Sports and Engineering." The biennial event promises to be bigger and better than ever, but organizers and exhibitors need your enthusiasm and creativity to make EXPO '91 a success. So, if you want to have some fun and add a little volunteer work to your resume, you can get involved by contacting Lynn Graber (255-0653), or get together with some friends and design your own exhibit. If you're worried about the financial obligation, money is available to individual students and small groups through the College of Engineering. For more information contact EXPO '91 Co-Chairpersons Pat Barber and Jane Markquart, or call the EXPO Office (262-5137).

Assistant Professors Receive NSF Awards

Three assistant professors in the Mechanical Engineering Department have received National Science Foundation Research Initiation Awards. Jeroen Rietveld is using a technique called infrared pyrometry to develop better designs for injection molding by monitoring the temperature and state of polymers during the process. Tim A. Osswald is investigating the thermo-mechanical behavior of compression-molded fiber-reinforced composite parts in order to help predict shrinking, warping, and surface waviness in fiber-reinforced automotive body panels before they are actually molded. This knowledge should eliminate some of the expensive and time-consuming tasks done in the early stages of part and mold design and lead to better quality parts. Slawomir A. Spiewak is studying designing methods of corrective filters for sensors used in manufacturing. Increasing the accuracy and reliability of measurements of these sensors will improve control, monitoring, and diagnostic systems needed for factories of the future.

Farewell and Good Luck

Once again we must bid farewell to a few well-respected faculty members who have retired. Edward Daub, Engineering Professional Development, has been a UW faculty member since 1971. After earning bachelor's and master's degrees in chemical engineering from the UW in the 1940's, Daub attended the Union Theological Seminary in New York City and later won the seminary's traveling fellowship. The fellowship took him to Japan, where he spent ten years as a missionary and professor of engineering. During his 19 years at the UW, his experience has been a vital part of the technical Japanese curriculum.

Herman A. J. Kuhn, Civil and Environmental Engineering, joined the UW faculty after receiving his Ph.D. in civil engineering from the UW in 1967. Kuhn devoted much of his career to transportation planning, accident reconstruction and cause analysis, and traffic engineering.

Lawrence B. Polkowski, Civil and Environmental Engineering, received his M.S. in civil engineering in 1951, joined the UW faculty as an assistant professor in 1957, and earned his Ph.D. (also in CEE) in 1958. Polkowski is well-known for developing innovative solutions to wastewater treatment and for developing national standards for municipal sewer ordinances and state standards for certification of wastewater treatment operators.

We wish each of these men continued success in their future endeavors.

Dr. Jay Samuel
Dedication and Motivation

Jay Samuel, a senior lecturer in mechanical engineering, teaches so well that it looks like he isn't even working hard. Writing on the board in flawless italic-style characters, he completes entire lectures without losing his place in his notes, erasing mistakes in equations or jumping abruptly to new topics. He is a notetaker's dream.

Jay Samuel teaches Materials Science and Engineering 350 and Mechanical Engineering 311 and 437. Samuel emphasizes the use of computers in education.

Of course, it only looks like Jay Samuel isn't working hard—just as a good marathoner racing for a championship looks to be jogging around the block. The truth is that Samuel takes his teaching seriously—very seriously—and really cares about his students.

Samuel has been an outstanding instructor at UW-Madison for 11 years, and he says he will continue teaching until his students can say, "My mother/father had you in class." He teaches Material Science and Engineering 350, Mechanical Engineering 311, and Mechanical Engineering 437.

After over a decade of teaching, Samuel is confident that engineering education needs an overhaul. "The engineering curriculum needs to be revised," he states. There should be a uniform curriculum for all the engineering students in their first three semesters. In these classes, students should learn more about engineering, not just basic math and science. One of his suggestions is the addition of a problem-solving class in which students would learn more about the dif-

"Money isn't anything. You have to do something you enjoy."

Jay Samuel spends several weeks each summer teaching engineering concepts to high school math & science teachers. Here he is pictured(lower left) with the 1990 participants in the Academic/Industrial Teachers' internship program.

ferent types of problems engineers must face and solve.

Samuel has maverick ideas about computers in engineering education, too. Samuel believes in using computers to streamline his teaching, not replace it. In his Material Science and Engineering class, computers are used to correct the homework problems. The students go to the computer lab and type in their answers. The computer then checks the work, scores the homework and prints out the grades. Samuel says that the process is easier both for him and his students. Samuel wrote this complex computer program with the help of some graduate students. "This is a good use for computers in education. It saves the college money that it would have to spend on TAs, and it frees my time so that I can talk to my students."

Even though his ideas are not always in the mainstream, his educational background is fairly standard, and his credentials are impeccable. Raised in Philadelphia, Samuel attended the Rensselaer Polytechnic Institute in upstate New York, a small school with a reputation for excellent science and pre-medicine grads. He went there thinking of studying chemistry but found physical chemistry more interesting. After ten years of undergraduate and graduate work, he earned his Ph.D. in Metallurgical Engineering.

When asked why he is teaching engineering rather than making more money by taking his Ph.D. to industry, he states, "Money isn't anything. You have to do something you enjoy." Samuel first realized he wanted to be a teacher when his professor at RPI asked him to teach a lab course. He enthusiatically taught the two semester course that discussed the different kinds of engineering.

Samuel chose to teach at Madison because of its good reputation and its location—away from the East Coast. "The East is too hectic, and everyone is too concerned about themselves." As a second opinion, Samuel adds, "They are too materialistic." He admits that his opinions are based on the 1970s, but he is not eager to test them by moving closer to home.

Samuel's interests extend beyond both material goods and the classroom. He enjoys spending time with his students outside of class by challenging them to a game of tennis, racquetball or volleyball.

Samuel's interests extend beyond both material goods and the classroom. He enjoys spending time with his students outside of class by challenging them to a game of tennis, racquetball or volleyball. During the summer term, Samuel teaches high school math and science teachers in the Academic/Industrial Teachers Internship Program. These teachers, who generally come from high schools in inner cities, come to Madison for two weeks before they work for an industrial sponsor. Samuel enjoys teaching them basic engineering concepts–the same concepts that he wished he could teach UW-Madison freshmen.

Photos by Shaun Burke

AUTHOR

Amy Erickson a freshman in pre-engineering and this is her first contribution to the *Wisconsin Engineer*. Amy is asking Santa for an 'A' in EPD 199.

The Facts About Fax

The madness all began with a Scottish clockmaker's 1843 innovation

Alexander Bain attached an electrically sensitive stylus to the end of a clock pendulum. The clock pendulum swept across the raised metal type of a message block and recorded the electric pulses it sensed. These pulses were then transmitted via telegraph lines to an identical machine which converted the pulses into print. Bain's innovation was the first prototypic facsimile transceiver, more commonly known today as the fax machine.

Faxes have come a long way since Alexander Bain's day. In 1843 the world was not paralyzed in awe of this marvelous invention. In fact, even in the early 1900's, faxes were used only by a minute fraction of society, mainly newspapers and the U.S. military. These faxes used radio signals instead of the telegraph wires. This fax method was plagued by interference and very slow speed: nearly five minutes per page.

New technology in the 1980s has made "fax" a household word. Fax machines are now quick and inexpensive due to developments in fiber optics and digital technology.

Today's fax works by converting text and graphics into binary code, a series of 1's and 0's. This code is transmitted to the receiving fax through ordinary telephone lines. The receiving fax translates the code and prints the image. Most modern faxes take between nine and twenty seconds to send or receive a page.

There are two basic types of faxes: stand-alone faxes and fax boards. Stand-alones are independent machines, sometimes portable, that need only a telephone line and power. Fax boards connect to a personal computer. The fax board is not your standard modem. A modem deals primarily with text, while the fax deals with images. Also faxes are four times faster than modems.

Fax boards are convenient; however, they do have a few downfalls. For instance, once a file is faxed, it cannot be retrieved. This does not allow for editing, and even plain text is nearly impossible to translate back into something a PC can comprehend. Also, images that look like a work of art on a PC may look distorted when they reach the receiving fax.

Some people argue that faxes have had a negative influence on society. They claim the fax has reduced the need for personal communication, as this spontaneous mode of communication eliminates the need for many business meetings, and personal business contacts. Because of this, business is becoming less "face-to-face" and altogether impersonal.

On the other hand, the fax has had a tremendous positive impact on society. By making many types of communication quick and simple, the facsimile transceiver has made life easier for all. The plethora of fax services available today ranges from faxing services at local copy shops to fax dating services. Radio stations now take song requests by fax. A hungry person can fax in a take-out order at a favorite restaurant. And faxes are just what students need to get that last-minute paper to the professor! ▮▮

AUTHOR

Amy Damrow knows she is getting *nuttin'* for Christmas because Santa is checking his list twice.

Fax machines are not only useful in everyday American life, but have proven essential in the management of political crises around the globe.

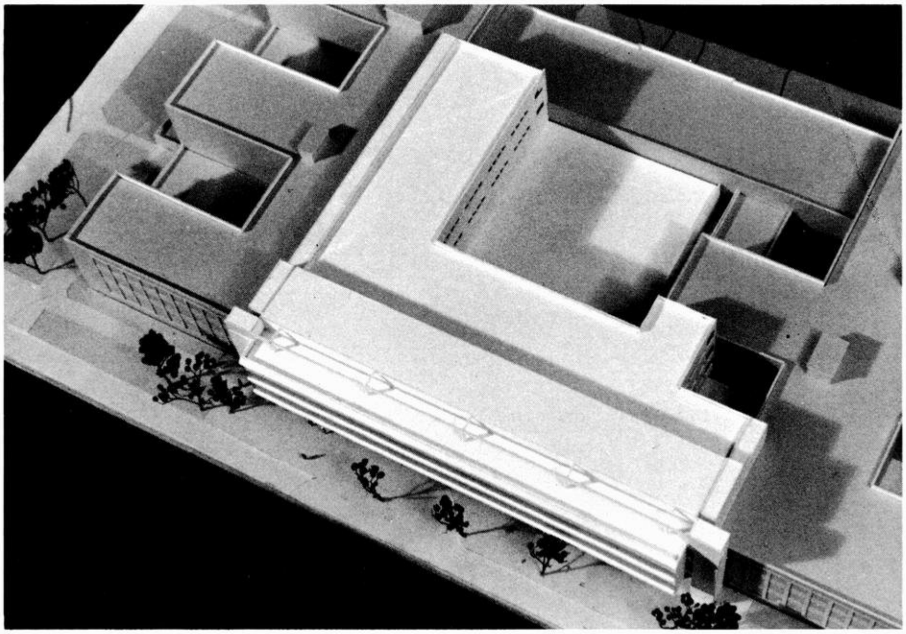
When martial law was declared in China during the summer of 1989, all Chinese channels of communication were shut down by the government, that is, all except the telephone. Without printed or televised media, the Chinese people had no way of keeping current on the developments occurring in their own "backyard".

Chinese students in America saw the desperate need to let everyone in China see what was happening in their country. The students set up an underground fax network to transmit photos and news releases to their homeland. Only after seeing the faxed photos of the Tiananmen massacre, did the Chinese people believe what was happening in their country.

During the Panamanian crisis in December of 1989, faxes were used to distribute underground media. While in exile, Albert Conte, president of the Panama Journalists Association, edited an opposition newspaper which was faxed to Panamanian businesses and, as an act of defiance, to Noriega's top generals. Conte dared to do this after a brutal interrogation preceding his exile. During this questioning, the most insistent query posed regarded his use of the fax machine.

Even in the present Persian Gulf crisis, fax is making life easier on the front line. AT&T is providing "Desert Fax", a free fax service for friends and families of U.S. military personnel taking part in Operation Desert Shield. To find out more about Desert Fax, consult your nearest AT&T Phone Center or call 1-800-555-8111, Ext. 36.

Technology Transfer Facility: High Tech Classrooms for the College of Engineering



The engineering mechanics and chemical, civil, and electrical engineering departments are located in the current engineering building. Expo Mall is in the center of the photo. The proposed addition to the engineering building will enclose Expo Mall and house classrooms, labs, and administrative offices.

Any campus map printed since 1966 provides an accurate picture of the UW-Madison engineering campus. It has been almost 25 years since a major engineering building construction project has taken place.

But, that status will soon change. The College of Engineering will be adding a new section to the Engineering Building. The new four-story addition will be located in what is now the building's courtyard, the past setting for annual IEEE student parties, SWEenie weenie roasts, and volleyball games. Students and faculty can expect to move into the new addition during the 1992-93 school year.

The College has estimated that it has an approximate shortage of 150,000 square feet of office, classroom, lab and storage space—equivalent to a new American TV store. The new addition will greatly reduce this shortage by providing an extra 72,000 square feet of offices and classrooms. The addition will consolidate the engineering administrative staff and deans' offices from three separate locations. Not only will the consolidation of the offices in one area be more convenient for the students and faculty, but it will also allow the labs and facilities to spread out in space vacated by the former administration offices.

The first floor lobby of the addition will be a convenient area for 20 new interview rooms to be used by the Career Planning and Placement Office. Three new technology transfer auditoriums will also be located on the first floor.

The largest of the three technology transfer auditoriums will have a 300 person capacity, the second will have a 150 person capacity, and the third will have a 90 person capacity. The smallest will be fully equipped as a TV studio for taping of on-campus courses and broadcast of other courses via the college's satellite dish.

According to Bob Perras, college Audiovisual Services Director, "It will be a state-of-the-art facility. One of the main demands will be for seminars and conferences relating to the college's numerous consortia and research centers. The Engineering Professional Development Department will also be involved, both for credit and noncredit courses such as short courses for practicing engineers."

The second floor will consist mainly of deans' offices. The layout will allow engineering students to solve all their administrative problems in one handy location. Currently, deans' offices are in two different locations, one in the Mechanical Engineering Building, and one in the General Engineering Building.

Along with a small portion of the second floor that will house chemical engineering labs, the third and fourth floors will accommodate laboratories and faculty offices. The new labs will be used for electrical and computer engineering research and also for chemical engineering research labs and faculty.

The new addition was first proposed in 1985. Considerable time and effort went into getting campus approval, which hinged on the college obtaining some private funding for the project. Of the total $16 million price tag, a grant from the Grainger Foundation will pay $2 million to be used to cover the cost of the auditoriums. Almost $750,000 of the $16 million will be used for new furniture for the auditoriums, labs and offices.

Another $2.9 million will go toward upgrading the present Engineering Building space. Improved air handling equipment and electrical service will be included in this renovation. Also, greater accessibility for the handicapped will be provided to the first floor and to restrooms.

The architectural plans for the building are nearly complete. Bowen Williamson Zimmermann of Madison is the primary designer of the new addition in collaboration with Berners-Schobers of Green Bay.

Although a definite completion date has not been set, ground-breaking should take place soon so that the addition may be ready for Expo '93.

AUTHOR

Jennifer Juergens is a computer science major and a Technical Communication Certificate candidate. Jennifer says we'll have to wait until Christmas to find out what she's asking for.

High Speed Education
A Formula For Success

Historically, Formula One racing has been the epitome of auto racing. Formula racing is so named because each team in the competition must follow a prescribed "formula" when building its car. Limits on important factors such as engine size, air flow and wheelbase are set by the body governing the competition. These standard factors help to insure that each team starts out with roughly the same opportunities. Because of the standardized starting point, a team must rely on knowledge, creativity and just plain good engineering to surpass the other competitors.

Formula Team members Randy Zoran and Phil Weber watch as John Zipp checks the car's roll stability.

In an attempt to provide valuable hands-on experience to young engineers, the Society of Automotive Engineers sponsors a college-level formula car competition each year. This event provides students a chance to apply the knowledge they have been accumulating in the classroom. Many colleges from across the country and Canada send teams to compete. In addition to being an opportunity to gain practical engineering skills, this competition makes it possible for a team to gauge its expertise in comparison to teams from other universities.

For the past four years, the University of Wisconsin at Madison has been a part of this experience. Every year a group of students, under the direction of the Mechanical Engineering Department, designs and builds a car to bring to the national competition. The group starts from scratch and must obtain or construct all systems of a working high performance race car. Funding and materials for the project are provided by the Mechanical Engineering Department and a variety of corporate sponsors. The design rules which all teams must satisfy are as follows:

- Engine displacement must be less than 610 cubic centimeters.
- Intake airflow must pass through a restrictor of 20 millimeters diameter.
- The wheelbase must be at least 1.5 meters.
- The design must integrate adequate safety and fire precautions.

Typically, the engine is acquired from one of the newer high power sport

Event	Maximum Points
Endurance	350
Engineering Design	150
Maneuverability	150
Oral Presentation	100
Acceleration	75
Fuel Economy	50
Skid Pad	50
Cost	50
Total Points	1000

Figure 1. Maximum Point Values in Formula Car Events

motorcycles. The remainder of the car, including the frame and power train, are designed and fabricated by the students in the project. The diversity of the car's systems results in a broad range of engineering challenges. These include machining, welding, wiring, composite formation and many other aspects of real world technology.

The actual competition takes place at the end of the spring semester. Each participating university sends part of its student team to the school hosting the event. The overall quality of each team's product is assessed through a series of static and dynamic events created to test all areas of a car's design and performance. A point score is given to each team for every event. The events and their maximum point values are given in Figure 1.

Awards are given to the best car in each event. There are also awards for the best performance car (as determined by the total points awarded in dynamic events) and for the best overall car.

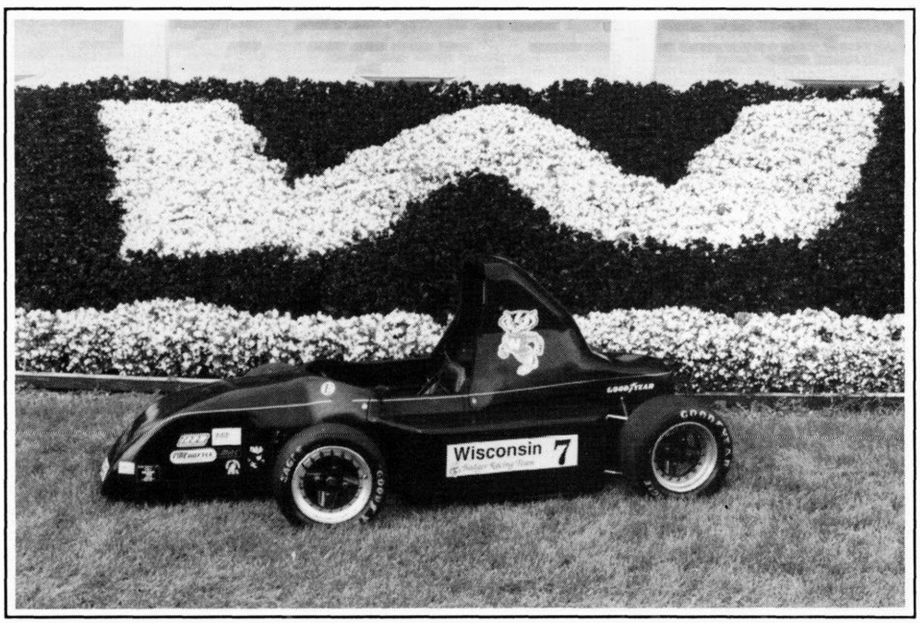
In the past, the Madison team has done very well in this competition. In 1989, the University of Texas at San Antonio hosted the competition. The field consisted of 44 cars. Madison ranked seventh overall. In 1990, 58 cars from 52 universities took part in the event which was held a the Lawrence Technological University in Detroit, Michigan. The Badger team scored 147 out of 150 possible points for engineering design. This was the third highest score in that event. They also took third place in the skid pad event with a performance of 1.11 g's. (For comparison, the Chevrolet Corvette ZR1 pulls only 0.98 g's). A seventh place finish in fuel economy was also earned by the Madison team.

Once again this year, the Formula Team Project is underway. A group of 24 students, with a diversity of talents, is working to generate the best possible formula car design. Using experience from previous competitions, the group plans to overcome its weak points–too little power and too much weight. The new car will feature a frame constructed largely of aluminum to reduce weight. The engine will be maintained at peak performance by a custom designed computer engine management system. The strong points of past designs will be incorporated into this year's car. The finished product should be a state of the art racing machine ready to compete with the cars from some of the top engineering schools in North America.

The Formula Team Project is one way in which the University of Wisconsin at Madison provides its students with an opportunity for a thorough, yet practical education. Students learn to cooperate and work as a team. They develop sound engineering techniques which work in the real world. They learn to challenge and motivate themselves. They learn many important lessons, and in the process they have a lot of fun.

AUTHOR

Dan Schneidewend is a senior in electrical engineering and wrote this article for an assignment in ECE 350. Dan asked Santa for a gift certificate good for one Formula Car competition win, redeemable at next spring's event.



The 1990 Formula Car competition was held at the Lawrence Technological University in Detroit, MI. UW-Madison's car competed with 58 cars from 52 universities.

THE FINAL CHALLENGE

DEVELOPING YOUR INTERVIEWING SKILLS

The light at the end of the tunnel has appeared; your final year is here and you are starting to get excited about entering the real world and applying the knowledge you have gained over the last four or five years. Much to your dismay it is not going to be a time to relax. You are going to have to find a job, and during the job hunt you will have to participate in some interviews. What is an interview like? What is needed to be successful in an interview?

The whole process of job hunting is a selling process where you are the salesperson and the product. You must successfully market yourself and your skills so that you, as the product, will have as much sales appeal as possible. You must be able to demonstrate to the recruiter that you possess the skills, talent, drive and style they are looking for. Your performance in the interview may determine whether or not you will get the job.

...job hunting is a selling process where you are the salesperson and the product...

Therefore, you must realize that there is a lot riding on your performance during the interview. This realization is scary, but so is the idea of a final test determining 50% or more of your final grade. What did you do when you were confronted with such an important test? You studied and became prepared.

Being prepared for an interview is extremely important. Not only will this show the recruiter that you are interested in his or her company, but it will also help you feel more relaxed.

Interviewers are looking to fill specific positions in their companies. They will look for a match between your skills, experiences and talents and the company's available positions. The company needs someone who will be able to excel in the position and match the company's style.

Researching the company through its literature (annual reports, sales brochures, etc.), magazines and newspaper articles is an excellent way to determine specifically what products it makes or services it performs. This research will also help you determine the structure of the company, its personality and the type of position it is looking to fill. From this information you must determine what skills, talents and experiences you have that will best fill the company's needs, and then highlight them in the interview.

The interviewer will also try to determine who you are. To prepare for handling these types of questions you must get to know yourself, who you are and what your future goals are. An in-depth analysis of yourself and your goals (short and long term) on paper will help with this.

The interviewer is out to uncover information about you, such as your communication skills, cooperativeness, objectivity, social-interaction skills and creativity. When addressing questions try to keep some of these points in mind.

The more you know about yourself and the interviewer, the more comfortable you will feel and the better the interview will go.

Knowing how to make a good first impression is a valuable skill that some people possess, and others must learn. Whether you are interviewing, meeting new co-workers or trying to dazzle people at a presentation, the image you project will cause people to make snap judgments about you. These judgments may mean the difference between success and failure.

How do you succeed at the first impression game, particularly for a job interview? First and foremost, smile, and be polite and pleasant. The mood you set at the beginning will follow you throughout the interview. Non-smiling people give the appearance of a grouch, even if they aren't grouchy people. On

From your research of the company and the position, you know basically what to say, but can you communicate it effectively? The Northwestern University Lindquist-Endicott Report summarized 25 reasons employers did not offer a candidate a job. The number one reason was poor communication skills.

Good verbal skills in an interview are a must. You must communicate your answers in a way that will create the best impression. How you communicate in a interview is just as important as what you say. Speak clearly and distinctly right to the end of each sentence. Do not mumble. Watch the tone of your voice as you speak and adjust it appropriately for

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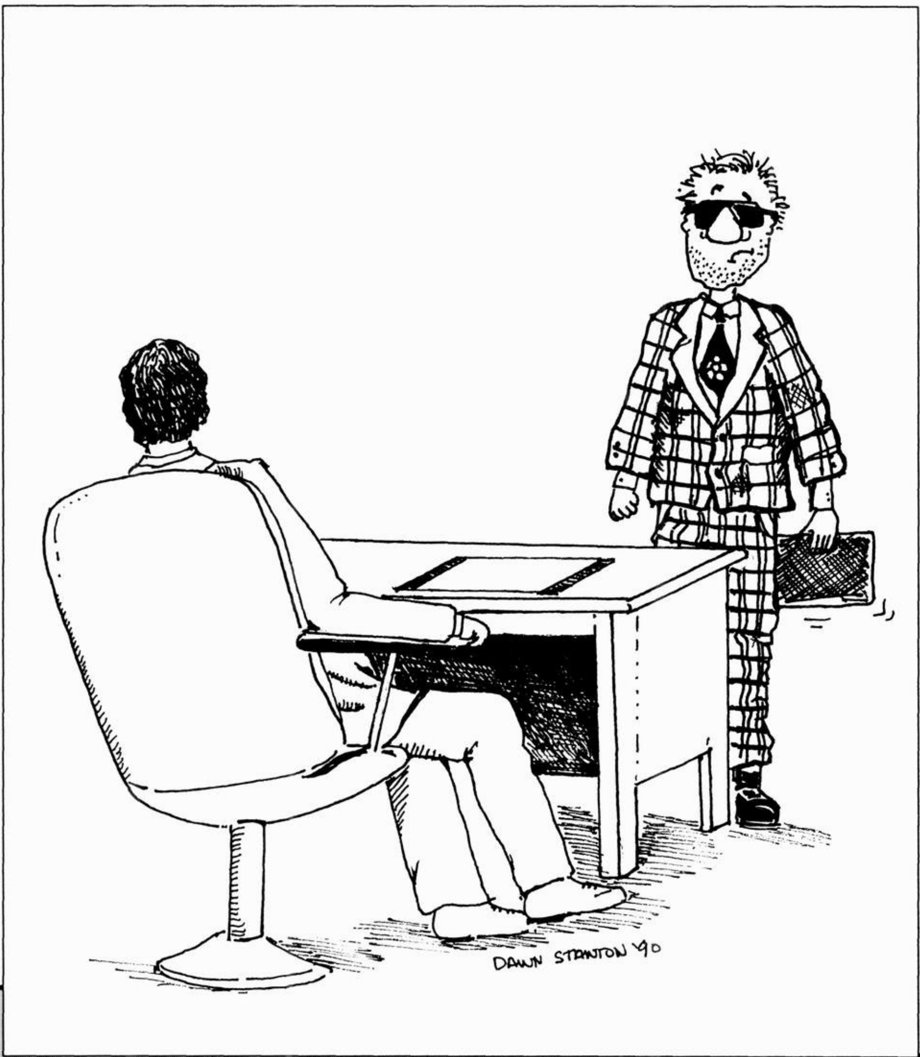

the other hand, smiling people appear to be confident and happy, and these are the kind of people others like to be around.

How you carry yourself is also important. Things such as speech and posture influence how you appear to others. If you speak softly and slouch, people will think you are timid and meek. In contrast, if you speak firmly (but not too loud), and carry yourself confidently (chin up and shoulders back), people will think you are capable and will want to listen to what you say. Be cautious, however, not to speak too loudly, or you will be thought of as arrogant and crude.

The handshake is essential. Though there is only slight truth to it, many people think that the handshake is the window to a person's character. The proper way to shake someone's hand is to grip firmly, palm to palm, and shake no more than three times. Some common mistakes made are gripping too loosely or too tightly, and gripping the person's fingers, not the palm. The three time shake will vary from person to person, but more often than not it is the perfect length of time to hold onto the other person's hand.

One of the most important things when making any first impression is your physical appearance. This feature involves grooming and dress. There are volumes written on good grooming and dressing techniques. Here are a few of the more important tips:

Make sure you are clean from head to toe. This may seem obvious, but it is surprising how many people don't follow this basic rule. One part of the body that is often neglected is the hands. Make sure your nails are clean, and your cuticles are neat. Your hands are one part of your body people will constantly see during an interview.

Make sure you smell clean. This is

(continued on page 24)

each situation. Try not to be long winded. Get to the point while still being assured the recruiter understands your message.

Your attitude in an interview is also extremely important. You must show the recruiter that you are confident in yourself, easy to work with and have initiative. All of these qualities must be expressed without seeming arrogant.

A good way to help portray these qualities in an interview is to keep good eye contact. It shows that you possess good conversational skills and that you are confident in the topics you are discussing.

It is believed that within the first 60 seconds the interviewer has formed a distinct opinion about you, which is then reflected throughout the interview and in the results. What does this mean? It means that appearance counts. Dean Donald G. Hileman, College of Communications, University of Tennessee reinforces this by stating, "Your appearance by the clothes you wear, your mannerisms, your facial expressions, in fact, all the non-verbal signs are just as important as the words you use in an interview."

You must make a good first impression. A good first impression starts before you even personally meet the interviewer. Arrive for the interview five to ten minutes early. You must be professional, clean looking and well groomed. Dress appropriately for the interview. To be safe, always dress conservatively.

A good first impression starts before you even personally meet the interviewer.

Men should wear ties and jackets, while women are best off in business suits. If your dress is sloppy, the interviewer will be wondering if your work might also be sloppy.

Now that you are prepared and dressed appropriately, it is time to start the interview. Upon meeting the recruiter greet him or her with a firm handshake and a nice smile. Avoid sloppy handshakes and nervous facial expressions. Try to be relaxed, comfortable and confident. There is a fine line that you must draw between appearing too relaxed or too nervous. Remember that your body speaks for you, so you must train it to speak favorably.

After the interview, it is good practice to record some of the important details discussed in the interview. Include high-points as well as problem areas. This information can be used in your thank you letter or any follow up interviews.

Remember, always begin an interview prepared and with a positive attitude, and always present yourself as a professional. Good Luck!

AUTHOR

Chris Conto, a senior in electrical engineering, wrote the interviewing skills article. We assume he wants his degree for Christmas.

Sharon Chen, a junior in chemical engineering, wrote the sidebar. Sharon is a retired *Wisconsin Engineer* editor, and she knows, "You can't always get what you want!"

not suggesting that you bathe yourself in cologne or perfume; on the contrary, strong cologne or perfume smells are irritating to many people. It seems ironic, but smelling clean means not smelling like a human. This includes your breath as well as your body.

For women, less make-up is better. Be sure you don't wear colors that are too bright for your face. Conservative, earthy colors are better.

Make sure your clothes fit. A good fitting jacket does not gape at the lapel, or pull at the buttons. Properly fitting slacks are not tight, and do not show the socks. If you have a jacket or slacks that you want to wear, but that freshman fifteen has become the senior sixty, get it altered so that it will fit properly.

Invest in good quality suits. While interviewing, you probably won't need more than two suits, and they should be good quality ones. Quality doesn't always mean expensive, but it usually costs a little more. The quality of a suit can be seen by its material, cut, seams and accessories, particularly buttons. If in doubt, just remember this rule of thumb: you can always tell the quality of a jacket by its lining. Well made linings are an inherent property of good craftsmanship.

Invest in good leather shoes. Darker colors are better, and always be sure they are shined and polished properly.

Colors and patterns are nice, but if it screams, don't wear it. Most interviewees wear conservative colors, such as dark blue, gray and black. This is not entirely necessary; it all depends on your sense of style. If you lack style, stick to the conventional colors.

Finally, remember to relax and be yourself. People can usually tell when you are trying to impress them, and more often than not, it is not necessary. Remember, smile, chin-up, and relax - it will lead to a great interview!

- by Sharon Chen

Cindy Mouton keeps looking for trouble.

As a new member of GE's Field Engineering Program, Cindy Mouton trouble-shoots equipment in some pretty wild places. Like the day she spent dangling six stories above the Mississippi River, trying to fix a crane.

Cindy's also gone trouble-shooting at chemical plants, paper mills and steel mills. She's been called on to repair everything from a vintage 1930's motor to the newest programmable controllers.

Field Engineering is not a job for the timid. You need the confidence—and broad-based knowledge—to walk day after day into new situations where you face the unknown.

If, like Cindy, you've got a sense of adventure, then Field Engineering could be the field for you.

In fact, if you're gutsy, outgoing, and capable, GE has opportunities for you no matter what field you're in.

So while you're out there looking around, take a good look at GE.

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