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Volume 92, No.2

December 1987

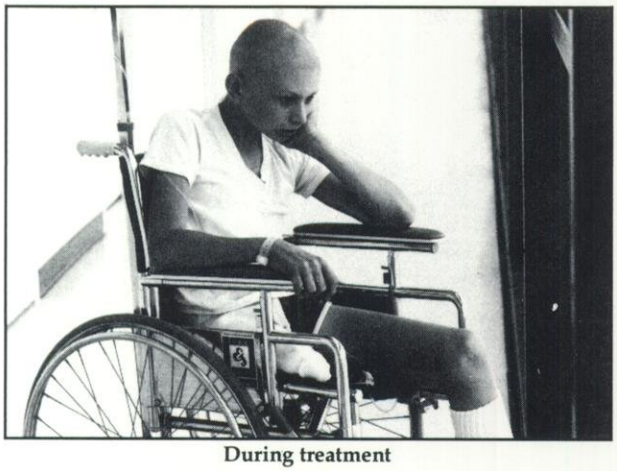
wisconsin engineer

Special Co-op Issue

SAE's Mini Baja

Wisconsin Engineer Magazine
Mechanical Engineering Building
Madison, WI 53706

You Can Help Save Lives . . .



During treatment

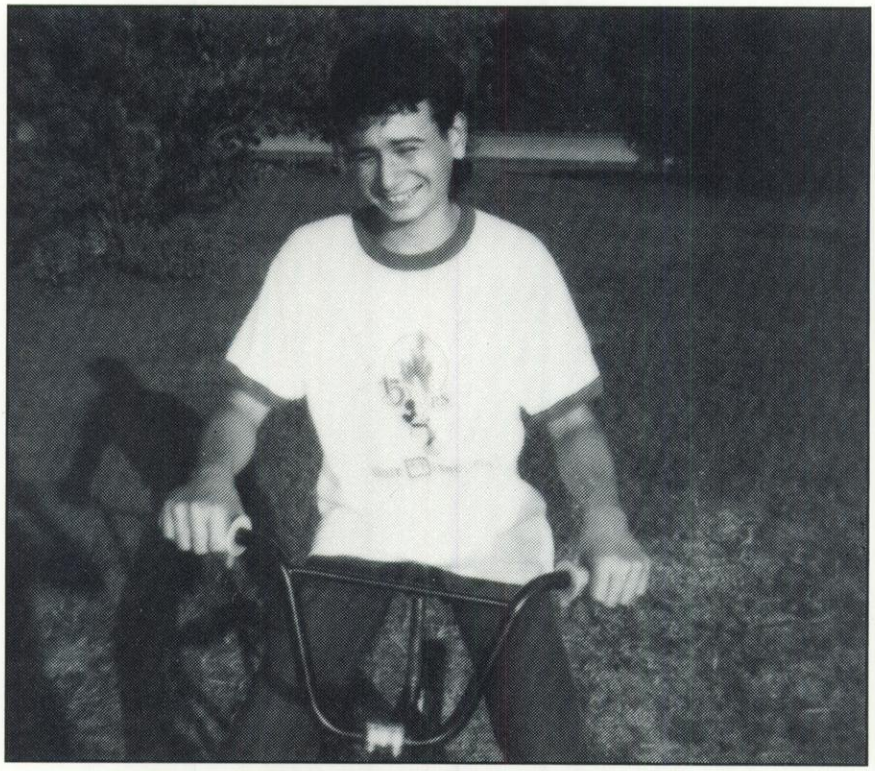
The doctors at St. Jude Children's Research Hospital caught Shane's cancer in time. To save his life they removed his leg. Despite his loss, Shane considers himself lucky . . . he had St. Jude on his side.

Every year, St. Jude is on the side of thousands of children just like Shane. Almost 60 percent of these children will survive, but many, too, will die. To hospital founder Danny Thomas and the entire St. Jude staff this is unacceptable. St. Jude's work will not be finished until **all** childhood cancer is nothing more than a bad memory.

. . . Like Shane's

Just look how far Shane has come in three short years. St. Jude has given him another chance at life and people like yourself helped to make it possible.

Fighting cancer is a painful ordeal, and there are no certainties that Shane will not relapse. But Shane is alive and healthy and doing the things boys his age like to do. And as long as St. Jude has the support of a caring public, there will be hope for children like Shane.



Today, Shane is healthy and active.

St. Jude Children's Research Hospital
505 N. Parkway
Memphis, TN 38105

For more information on how you can help, please write for your free brochure, or call 1-800-238-9100.

wisconsin engineer

PUBLISHED BY THE ENGINEERING STUDENTS OF THE UNIVERSITY OF WISCONSIN-MADISON DECEMBER 1987

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The **Wisconsin Engineer** magazine is published by and for engineering students at UW-Madison, and is a charter member of the Engineering College Magazines Association. Philosophies and opinions expressed in this magazine do not necessarily reflect those of the College of Engineering. All interested students have an equal opportunity to contribute to this publication.

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Editorial

Public Service:
An Engineer's Responsibility

A few weeks ago, I was watching the news with one of my roommates when a McDonnell Douglas commercial came on. A jet came whooshing across the screen, completing a double-barrel roll in classic "Top Gun" fashion, prompting my roommate to wantonly exclaim, "Geez! I want to work for that company!"

I immediately asked myself, "Well okay, but who's going to save the world for humanity?"

Too many students use their engineering education as merely vocational training to achieve personal ends, rather than fulfilling what I believe to be a responsibility of the entire profession— service to the public.

It is ironic that students can attend a major public university, a veritable cornucopia of public service, and still be insensitive to the need for this noble work. The mission of the College clearly states its commitment to public service, but I question how many undergraduate students take this commitment seriously.

In his recent Engineers' Day speech, Dr. R. David Pittle, Technical Director of Consumers' Union Laboratories, summed up best why we desperately need engineers in public service professions.

"Technology is not connected to the consumer; he doesn't understand it— but he is killed by [redacted] Pittle.

These words dramatize the awesome responsibility that engineering students are charged with today. In our increasingly technical society, average consumers are alienated from the technology they rely on for the conveniences of life, be it nuclear power plants or lawn mowers. The general public respects high technology and trusts manufacturers to produce fool-proof products. People take safety for granted, expecting to be protected.

The old adage that guns don't kill people simply isn't true and never has been. Guns manufactured with cheap, shoddy materials that misfire in the user's face kill people, as do lawn mowers made without safety throttles. A hair dryer that can be turned off without unplugging it from the wall has the potential to fall into a tub and kill someone as well.

But products aren't the only things that can kill or harm people. Creating holes in the ozone layer has got to be viewed as a no-no in my book, as is the production of radioactive waste without safe disposal techniques. Even a poorly designed nuclear power plant might indirectly kill or harm a person.

If scientists and engineers do not continue to assume the responsibility of protection, I would argue that no other group will.

The government may claim to assume this responsibility, but they lack the experts, resources, and initiative to do so. The Reagan Administration's position toward OSHA and NIOSH is well known, and to what degree officials heeded warnings from engineers at the Challenger launch is questionable.

Similarly, our capitalistic private sector is an equally unlikely candidate for the job. It is certainly doubtful, in most cases, that companies would unilaterally add costly safety features on lawn mowers if their competition is not forced to do so.

What can be done to create a greater awareness of the need for public service? According to Dr. Pittle, awareness at the undergraduate level must begin with faculty. While it is certainly vital that the college's research in public service applications continues, it is not enough. If it were possible to instill public service awareness in all students going through the college, engineers would then carry awareness and ethics with them into industry, government, and education, having a profound effect on those respective institutions.

In short, our political and economic systems are so intertwined that, left alone, little will be done to promote public service. And so it is left up to those who are best-suited for the task— the scientists and engineers working in institutions such as our own College, the forementioned Consumers' Laboratories, and others. They must continue to show why we need environmental policy reforms, to design safer products and to create systems for the integration of the handicapped into mainstream society. And hopefully, the engineers of the future, as the extreme minority of the population that can affect the relationship between technology and society, will come to recognize their responsibility. Those who control and create technology have the obligation to protect those that use it, but don't understand it.□

Jerry Hill

Letters

Editor's note: In order to produce an informative, interesting magazine, and to prevent us from lapsing into some sort of stale, muddled, and thoroughly totalitarian mindset in which we present material pertinent to no one in particular except ourselves, we ask that you PLEASE interact with us—tell us what you like and don't like about the magazine; tell us what you would do if you were in charge; tell us an interesting story; send us your grocery list, or your poems, or your fiction, or your non-fiction, or your photos, your cartoons, your LETTERS, etc., etc. While technical articles, book reviews, and similar non-fiction have traditionally been and will continue to be the substance of the magazine, we welcome anything you would like to submit to us. To this end, we inaugurate our "Letters" page, which we hope will become your page. What do you think about SDI, the Badgers, Sematech, or the Stock Market? Our educational system? The Engineering profession? The state of technology? Let us know— an example follows.

To the Editors:

It may seem strange to you editors that I, your faculty advisor, am writing you a letter; you are used, I know, to scribbled sticky notes and phone calls. My reason for writing is to serve as a role model for others who have comments even vaguely related to our magazine. I think they should share them with **Wisconsin Engineer** readers. More letters to the editors would, I am sure, make for more lively reading while giving the staff ideas on content, style and so on.

Currently, the magazine gets very few letters. That is curious since after each magazine comes out, I receive MANY comments from UW engineering faculty and students showing that people read the magazine, some fairly critically. (I suspect that the record number of comments occurred after we published the cover with the three-centimeter-high typo; I thank the three people I know who DIDN'T call it to my attention, whether or not they refrained because they thought I could spot it myself.) As a one time service, I will forward three such comments on the October issue to other readers; next time anyone who has a comment or criticism of the last issue will have to write a publishable letter FIRST before I will listen.

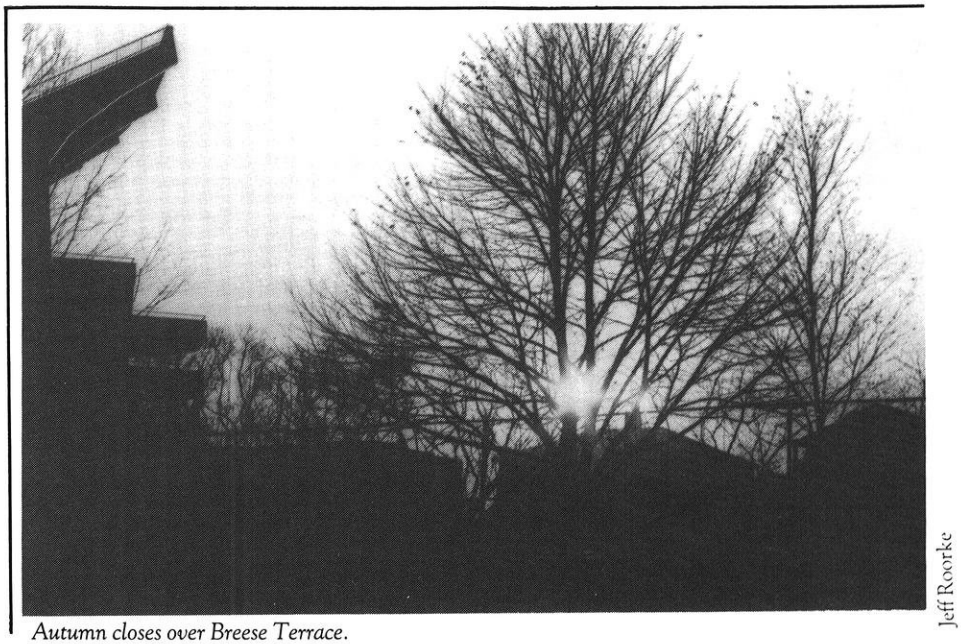
1. Many colleagues and students commented about my picture appearing on the same page with notables such as the football coach and the dean of students. To tell the truth, I found that juxtaposition to be quite droll— in fact, uncharacteristically witty of my staff, whose collective humor is somewhat suspect. I'm sure the humor was intended, since they know better than to confuse me with these other people; the staff and I have worked together long enough for them to know that in the grand scheme of things at this university, I am so low that I am frequently tripped over.

The caption under my picture, "Technical Writing Director," does deserve comment. My official title is "Technical Writing Course Leader." Under other circumstances, this inaccuracy would cause little harm, but in General Engineering we are embarking on an ambitious technical communications certificate program, for which I am not the director. My friend and colleague Patricia Robinson will lead that effort.

2. A former colleague called to mention a discrepancy in the otherwise excellent article on new lab equipment in the metallurgy labs. He wanted to point out that, because of funding sources, the new equipment was for TEACHING and not for research, not even by undergraduates. The word "research" appeared only once, but it appeared in big letters in one of the boxed excerpts used to even up the columns. He made the point that reporters should be more careful, and I made the point that he should write a letter to the editor.

3. Several colleagues hinted that the editorial on the Space Defense Initiative was a bit tendentious. (Well, to be perfectly accurate in my reporting, no one used "tendentious," but it just happens to be one of my favorite words). I thought it was a little slow in developing, but otherwise unobjectionable; editorials, after all, are supposed to state an opinion, and an editorial that pleased everyone couldn't possibly express a very interesting opinion. I hope my editors will continue to use restraint in their choice of editorial topics— their doing so will preserve our unique status among student publications at UW-Madison. But I hope even more that some readers will be tempted to WRITE expressing THEIR opinions on SDI and any other editorial topic on which they have an opinion. The magazine will definitely benefit from the effort.

Donald C. Woolston



Autumn closes over Breese Terrace.

Jeff Roorke

Dean's Corner

By Dean John Bollinger

Over the past few years, I have noticed a changing attitude of industry towards recruiting engineers. The drive for corporations to become more competitive has forced businesses to reduce total costs of doing business, including reduction of the personnel costs associated with recruiting new employees. It is no longer as attractive to interview large numbers of graduating seniors, and to incur the expenses of becoming well acquainted with students through plant trips and multiple interviews without first establishing a meaningful rapport. It is important for a company to develop approaches that improve the success rate of acceptances of job offers. In an effort to reduce the costs of excessive employee turnover, it also appears that there is a greater desire to assess the long term potential "fit"of a candidate with the company before making an offer. For our engineering graduates, these trends offer new challenges and opportunities when entering the engineering profession.

Opportunities exist for students to become acquainted with companies earlier in their careers. This demands that students place more emphasis on career planning at the beginning of their studies rather than at the end. It is probably no secret that many students do not worry a great deal about their first job until the beginning or near the end of their senior year. It should be obvious that the more time spent on this issue throughout college and the more experience gained in the employment marketplace, the better will be the final result. The challenge is to set some objectives early and to develop some strategies for obtaining working experience along the educational pathway.

Summer employment is one of the best ways to prepare for the selection of the first full-time job. The accumulated background gained from nine months of industrial experience through a summer job relative to your field of study is invaluable. In varied roles these nine months can be very important in developing a perspective of your future. Working on the shop floor as a first line production supervisor, or on a construction team, provides educational experiences that tuition cannot buy. It also provides the opportunity to develop a rapport with a company to start an employment courtship. Industry is increasing summer internship programs because they lead to very cost effective recruiting.

To facilitate the meeting of students with industry, the College of Engineering has a rapidly growing Co-op program, with new companies expressing interest in participating each year. If a student has a desire to work in a particular geographic area, for example, the College can help to create opportunity with local businesses who may not have previously participated in Co-op programs. Smaller companies typically do not participate in University placement programs. Therefore, there maybe missed opportunities if they are unpursued for small business participation with educational institutions like ours.

Competing for a corporation scholarship, summer employment, and participation in a Co-op program are all ways to improve your communication with potential employers. The financial reward ranges from simply helpful to allowing you to nearly pay your way through college. But perhaps even more importantly, these opportunities can be part of your own master plan for a career. I hope you will take advantage of the many programs the College of Engineering offers you as part of our commitment to your education. □

John G. Bollinger

WHY SHOULD I HIRE YOU?!

Drug Testing on the Rise

by Lisa Russell

Co-op students beware: as part of your interview process, you may be asked to submit to drug screening procedures as soon as there is a mutual interest between you and your potential employer. Drug testing is no longer simply limited to those applying for full-time positions and many employers are no longer giving advance notification of drug testing.

Employers can screen for drug usage with a variety of methods used individually or in combination. The most common methods of screening are to ask direct questions, to administer a written test, and to analyze hair, blood or urine samples of the applicant.

Jeff Roorke

A lab worker carrying out the urinalysis procedure.

Urinalysis is the principle screening method used. The test is administered by a medical practitioner and is usually combined with a questionnaire. The Enzyme Multiplied Immunoassay Test (EMIT) and gas chromatography are two types of such tests. The EMIT detects the presence of chemical metabolites, and a distinct reaction occurs if the test is positive. Gas chromatography tests are usually used to back-up a positive EMIT. For this test, the urine sample is placed on chemically treated paper, which identifies drugs by distinctive colors and patterns.

To prevent any potential mix-ups, the applicant should ask ahead of time if the prospective employer uses drug screening and why. Invasion of privacy can be kept to a minimum and confidentiality should be assured. Any prescription drugs a student might be taking must be made known to the employer prior to testing. Also prior to testing, the applicant should find out if the company has a retesting policy, and discover its details. The applicant should also be aware that observed testing may be used. Reluctance to be tested will most likely be viewed negatively, and the company could decide not to consider prospective employees refusing to cooperate with drug-testing procedures completely.

Some common myths about drug testing follow.

1) The screening of urine is illegal.

Drug testing is not illegal because no provisions or laws currently exist that prohibit the implementation of drug screening programs. The employer has the right to demand a drug-free workplace while the employee has rights of privacy and confidentiality.

2) "False positives" abound.

"Cross reactivity" results when a substance other than the ones being tested for reacts to give a positive result; however, if the lab uses certified, well-trained personnel, the accuracy of the lab should be very high.

3) The presence of drugs in urine indicates that the individual is impaired.

Positive results only prove previous drug use— they cannot be used to prove inebriation or impaired performance since inert metabolites may appear without related impairment.

4) Drug testing can determine the last time a drug was used exactly.

Due to the screening method used and various physiological factors, drug concentration will vary, and thus detection time varies. Detection time increases dramatically following a period of chronic use.

5) Passive inhalation of marijuana could result in a positive test result.

Clinical studies have shown that it is highly unlikely that a nonsmoker could passively inhale enough marijuana smoke to produce a positive test result.

6) Once employed, admitting to a drug problem results in the firing of the employee in question.

The Rehabilitation Act of 1963 as amended states that employers must make provisions for employees with diagnosable diseases, and drug abuse is included in this category.

Employers argue that few current or prospective employees have objected to being tested, but this does not imply that everyone accepts it— it may just mean that not very many people are willing to risk a job or job offer in defense of this principle.

Drug testing alone will not eradicate the problem of drug abuse, yet drug testing has become popular at a time when the Reagan Administration has cut funding for drug education and treatment programs. Most drug testing programs do not test for alcohol in spite of the fact that it is the most widely abused drug in the United States. Companies have jumped on the drug testing bandwagon because they are afraid that if they do not, they will end up employing people who were rejected by other companies' drug testing programs. There are companies such as Drexelbrook Engineering Company in Pennsylvania who have decided against drug testing because of its human costs. As its vice-president said, "...a relationship does not just come from a paycheck. When an employee is told that he is doing a great job yet must submit to drug screening, it undermines the trust."□

SAE's Mini-Baja: #2 and Closing

by Paul J. Gassere

What has forty cylinders, 160 wheels, makes dust, and sounds like an invasion of lawn mowers? Why, the running of the endurance event at the annual Society of Automotive Engineers (SAE) Midwest Mini Baja competition, of course.

Every year, the student chapters of SAE at UW-Madison and other engineering schools compete in this event. The competition includes the main endurance event, acceleration and maneuverability events, a hill climb and chain pull and judging of design, execution and other technical features.

At the 1987 contest, held in Houghton, Michigan, the UW team took second place overall, scoring 246 points to finish just one point out of first place.

At the 1987 contest, held in Houghton, Michigan, the UW team took second place overall, scoring 246 points to finish just one point out of first place. The team did take first place in the mechanical design category.

The Mini Baja concept is based on a set of regulations issued by SAE. Intended to be a practical application of engineering skills by students, the design process is very similar to that found in industry. The student teams are responsible for designing a vehicle from scratch and building a prototype of an off-road recreational vehicle that could be produced commercially at an annual volume of 10,000 units. Within this context, the economics of design and production are a strategic component of the overall program.

The winner of this event must show the judges that every aspect of the vehicle has been thought out in a deliberate manner and that engineering analysis has been performed with both the consumer market and the abusive operating conditions inherent to off-road thrashing in mind. The requirement of economical mass production potential translates into selection and adaptation of standard components and non-exotic materials and fabrication processes.

ENGINE AND DRIVE TRAIN

The power plant for UW-Madison's #47 racer is far from the high-tech stuff one might expect in a race car. It's more like a garden tractor. Would you believe an eight horse power Briggs and Stratton? Rated output is 6.4 horsepower at the governed maximum 3600 RPM and 12.5 ft-lb torque at 2500 RPM.

Mini Baja cars use two major classes of transmission and final drive arrangements. The majority use a mechanical torque converter or continuously variable ratio transmission (CVT) that consists of a set of adjustable sheaves and a v-belt, much like the system used on snowmobiles. The other type of driveline allowable under the rules is a more automobile-like manual gearbox and clutch setup.

A disadvantage of the belt-based system is lower overall efficiency due to belt slip and the fact that driving through water or mud compounds this problem. Based on this and the higher weight of the belt system, the UW team selected a five speed manual transmission. The current installation is a modified Honda motorcycle unit. Final drive is by chain and sprocket, with a tensioning idler.

One goal of the front suspension design was to minimize camber change and bump steer.

Rear drive axle design for off-road use dictates a provision for differential lockout. A solid rear axle with no differential action causes handling problems on solid ground. Solid axles tend to hop around in turns because the inside and outside wheels are trying to rotate at different speeds. To prevent this, the drive axle is split such that the drive sprocket applies power only to the left rear wheel under dry-road conditions. When operating in mud or on wet, slippery ground it is necessary to drive both rear wheels and let them spin. Axle hop isn't a problem in hog-wallows. This differential locking function is accomplished on #47 with a sliding dog-clutch controlled from the cockpit by cable.

Power is supplied to the rear wheels through agricultural type power takeoff shafts with double universal joints. This design is similar to that used on Corvettes and Jaguars with fully independent rear suspension. The double U-joints are needed to accommodate the wheel travel designed into the rear suspension.

FRAME

The frame of an off-road vehicle intended for operation by weekend-warrior types (the hypothetical end users) must be able to take outright abuse. It must also be designed to protect the driver from, shall we say, "minor miscalculations" like trying to drive over a modest sized boulder at full speed.

Tubular welded steel construction provides the required roll cage, the safety harness attaching points, and the overall structural integrity required.

During the design and development process, suspension stresses were estimated for conditions like driving off a shear embankment, falling four feet straight down, and landing on one wheel—not unrealistic, considering the intended use of the vehicle. The stress evaluation and material selection process involved the construction of a full scale prototype frame made of one inch mild steel electrical conduit. This conduit

Number 47, SAE's second place finisher in the 1987 Mini Baja.

prototype was fitted with full running gear and actually driven. It was also drop-tested and deliberately abused to failure. The idea was to use the failure behavior of the low strength tube to locate high stress areas and establish baseline strength and stiffness values to be used in the final material selection.

Titanium and aircraft-grade high strength aluminum alloys were considered, but the material and joining process combination ended up being 4130 chrome-moly steel fabricated by arc welding. A 4130 tube of 1-1/8" diameter and 0.0625" wall thickness proved to be the most satisfactory material in terms of cost, weight and mechanical properties.

SUSPENSION

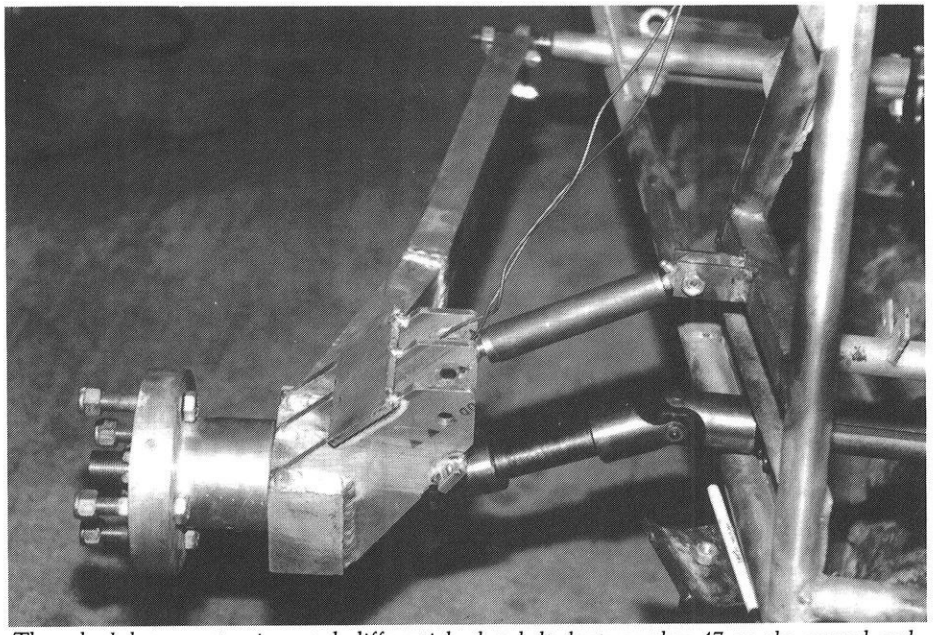
The bumps and grinds of off-road operation can take a toll on the driver and the vehicle. It is the job of the suspension to minimize damage to both man and machine. Wheel travel and selection of spring rates, weight balance, and shock valving are all important and are consequently the subject of constant redesign. For 1988, the car retains parallel unequal length A-arms in front with variable rate coil springs. The coil-over-shock lower mounts were relocated to the upper control arms.

One goal of the front suspension design was to minimize camber change and bump steer. Camber change is the tendency for the wheels to tilt in or out vertically during cornering. Bump steer is the tendency for the wheels to change their steering angles temporarily during suspension travel induced by bumps.

On the current car, bump steer is minimized by coordination of the tie rod length to the control arm swing radius. This keeps the toe change during suspension excursion to a minimum, keeping the driver in better control. Rear suspension in 1986 was a swing axle system that used the axle as a stress member.

The 1988 run is of particular interest because it is being held in Wisconsin, at Aztalan State Park in May.

Like an old Volkswagen Beetle, the rear wheels tended to tilt dramatically under hard cornering loads, reducing traction and imparting toe changes as well. For 1987 the rear suspension was redesigned to incorporate a camber strut above the axle. This strut is the same length as the center to center distance of the double U-joint half shafts connecting the wheel hub to the solid portion of the drive shaft. Thanks to the strut installation, the rear wheels are kept straight up and down under all conditions.



The wheel base, suspension, and differential that help keep number 47 on the ground and under control.

BRAKES

What goes must also stop. Regulations require that all four wheels be able to lock up on dry ground and stop the car without tipping it over or creating control problems for the driver. Bill Cavros, SAE Mini Baja group leader, told of one car from another school that actually rolled over frontwards during the brake competition. Points are awarded for the shortest stopping distance under safe control.

The brake system on #47 consists of a single master cylinder and a proportioning valve feeding three calipers. Each front wheel has a six inch rotor and a single piston caliper. The rear is

equipped with a single ten inch rotor mounted near the drive sprocket. Brake system design was based on calculations of the maximum braking force that could be applied without causing the car to tip about its center of gravity.

PEOPLE MAKE IT RUN

The UW team is headed by Bill Cavros and consists of about ten people who are responsible for every stage of the project. They design components, track down sources of parts, materials and machine work. They also put in untold hours of wielding wrenches, CAD terminal keys and any other implements needed to put the car on the track.

Home base for the Baja team and the SAE chapter is a garage and lab on University Avenue, next to the MME building. At any hour of the day and many hours of the night engines rumble on the dyno and gears can almost be seen turning in the heads of those plotting and preparing for the next Mini Baja. The 1988 run is of particular interest because it is being held in Wisconsin, at Aztalan State Park in May.

Bill Cavros describes the off-road track at Aztalan as an excellent proving ground for such vehicles. He said that the Houghton track used last season was really not very rough in terms of bumps, drop-offs and mud holes. Some entrants had cars with solid rear axle mounts. He smiled and said that he would "... pity anybody trying to run (solid suspension) at Aztalan... They're going to hurt," he said politely referring to the driver's rear suspension as well as the car's.

GOODIES IN THE WORKS

Regulations specify the engine that must be used in Mini Baja cars, but say nothing about what can be done with the power available. Bill Cavros and his team have a plan up their collective sleeve. They are designing an energy storage system based on a nitrogen charged hydraulic accumulator. The system uses a variable displacement hydraulic unit that would function as a pump to charge the accumulator during deceleration or low load conditions. The same unit would act as an extra motor and supply short bursts of energy for acceleration. Cavros figures that the accumulator "... would store enough energy to give us almost double horsepower for about nine seconds, good for the hill climb..." He added that the major design challenge is in the area of control systems needed to regulate the hydraulics.

THE PROOF IS IN THE MUDDING

Just as in Detroit, Tokyo or Stuttgart, automotive designers are always thinking up, testing and building new things into their vehicles. Mini Baja is a chance for students to literally take an idea off the drawing board and drive it through a mud hole. Since on-the-track performance is the best form of feedback for the design process, it's obvious that driving through dirt, dust , small trees and bodies of water isn't just good fun; it's also good engineering.□

Specifications

Engine
1 cyl. Briggs and Stratton 4 cycle
6.4 hp at 3600 RPM
12.5 ft.-lb. torque at 2500 RPM

Transmission
5 speed manual, modified Honda
Final Drive
Chain and Sprocket

Chassis
Tubular, Welded 4130 Steel

Weight
310 lbs. (without driver or mud)

Track Width
Front....46.5"
Rear....47.0"

Wheelbase....64"

Length....84"

Width....57"

Height.... 58"

Suspension
Independent, coil over shock
Front
Double A-arm
Rear
Trailing arm with camber strut

Steering
Rack and pinion, 229 deg. lock to lock

Brakes
Hydraulic, disc and caliper
Front
6"rotors, single piston calipers
Rear
Single 10" rotor, single piston caliper

Tires
Off-road only
Front
21x7x10 Dunlop KT786
Rear
21x11x8 Goodyear Rawhide
Pressure.... 5 psi.

Earn While You Learn

by Keith A. Bouterse Jr.

Keith's article was written for Evelyn Malkus' Professional Expression class and is published here with his permission.

I was throwing trash, the same job I had held for the past three summers, wondering how I could compete with other students in the interviewing program the following semester at school. Suddenly, my thoughts were distracted by the sight of an enormous pile of garbage that stretched the entire length of the yard. Well, the day came to an end and I returned home exhausted, not unlike any other day in the "sanitation engineering" business. I had a message on my desk that a Mr. Bryson from RICH, Inc. had called. I returned his call and set up my first career-related interview.

It was very satisfying to be able to see the achievements of an entire summer project put to work.

Mr. Bryson's call was in response to a resume and transcript that I had sent to the company a few weeks earlier. I sent the transcript on a tip from a recent alumnus of my fraternity. He said they occasionally accepted summer internships when the workload was appropriate. It was my first and only inquiry into an internship. I had not done any research into companies having internships since my current summer job was putting me through college. But my attempt paid off!

The company is located in Franklin Park, Illinois, approximately fifty-five miles from my hometown. Accordingly, I left my house two and one-half hours ahead of time. I didn't want to be late for my first interview. I arrived at the building about one hour before the scheduled interview, so I grabbed some breakfast before going back into the building. The interview began with a few routine questions, and then came the dreaded UNIX and C programming test. My buddy had warned me of the test, but I had been working about four to five hours overtime each day. I was so drained of energy when I came home that I immediately fell asleep whenever I lifted the manuals. I suffered through the test and was informed of a second interview with the director of a group in the research and development department. The first interview had taken place with a company recruiter. This second and final interview was extraordinarily relaxed. It lasted approximately fifteen minutes, and the work that was to be completed by the summer intern was described— I left the interview with a good feeling.

I expected a call and a response within the next few days, and one came exactly one week after the interview. They offered me the job and wanted me to start working the following Monday! I accepted, and arrived to work as scheduled. My job was to design a database for the entire research and development department. The company had purchased a database management system for use with its Convergent Technologies megaframe. The system chosen was Unify, a trademark of the Unify Corporation and a relational database management system.

The database was to hold information on all projects, and had four major groupings— development, support, hold, and unspecified. The projects in development were those projects that were currently being developed and worked on in the research and development department. The projects in support were those projects that had been completed and were already running at customer sites. Hold signified those projects that had been dropped from development, and unspecified were those projects that had not, as of yet, been assigned a developer. All relevant site information also had to be added to the database since it directly referenced projects. In addition, all developers, as well as information about the developers, had to be incorporated into the database. The summer project kept growing with each day. More and more information needed to be tracked.

Few employees in the research and development department had any working knowledge of Unify. I was given a desk, a terminal, a tutorial on Unify, and a reference manual. For the first few weeks I read the manuals and became familiar with the database management system. Those were without a doubt the hardest two weeks of the summer. I studied those manuals eight hours a day. The tutorial was not too exhausting, since it was written in a readable manner. The reference manual, however, was not designed to be read cover to cover.

The following weeks I spent learning the tools available on the UNIX operating system, and after I had a pretty good grasp of them I began work on the design specification for the database. A design specification is a detailed description of how a particular design is to be implemented. A design spec is necessary to inform the company of the estimated time and equipment needed to produce the project. My document eventually grew to fifty-seven pages. I never thought I could write a coherent paper, let alone a technical document over eight pages long! While working on the design spec, which was completed only three days before I left for school, I was implementing the design of the database. The major design was completed about four weeks before the fulfillment of my summer employment. Within those last four weeks, I perfected the design specification, added security, added user friendly interfaces, and made the system public. The system went up for public usage on the last day of my internship. It had bugs, of course, but few corrections had to be made.

I learned a great deal of information in areas that fascinate me— areas that I had never before had the time to explore.

It was very satisfying to be able to see the achievements of an entire summer project put to work. I learned a great deal of information in areas that fascinate me— areas that I had never before had the time to explore. I would highly encourage every engineering student to actively hunt for a summer internship. Most students might not be as lucky as I was, and I think it's a great way to learn.□

Tips for Co-op Students

by Craig Bahr

The Engineering Cooperative Education Program has a lot to offer engineering students. Students who have co-oped, in general, receive more offers after graduation; they also tend to get better offers than those students who have not. As well as gaining valuable work experience, co-oping helps the student by giving first-hand knowledge of the materials learned about in the classroom. For example, a Civil Engineering student who co-ops for the Bureau of Land Management in Alaska can easily apply the knowledge learned in Surveying and Geometronics to his co-op job.

The first step in the Cooperative Education Program is "Program Entry." To be eligible for the co-op program you must be a registered student in the College of Engineering and you must have sophomore standing. To get started, go to room 407 of the Wendt Engineering Library and ask Marion Beachley for information. She will give you an information packet, including a College Interview Form (CIF). The first step is to fill out the CIF and return this with your transcript to Marion so that she can start with the paper work on her end. The CIF is a very simple form and is probably shorter than any job application you have ever filled out. It asks for your name, address, previous work experience, schooling and references. The most difficult part of the form is a brief statement of job interests, or possibly the fact that it must be typed.

Do not question your perspective employer's views on the Hereafter, and do not make snide comments on his or her clothing choices.

The CIF also asks you how many terms you would like to co-op. Many employers require students to work for three terms while a few allow only one term of work. By limiting the number of terms you are willing to work, you are limiting the number of employers you are eligible to work for. It is best to get this information to Marion no later than registration week of the semester prior to when you would like to co-op. If you can get it in during the previous semester you will have even fewer problems. Students interested in a one-term summer co-op should check in the Summer Jobs Notebook which is available after November 15 of every year in the Co-op Office.

Besides just the extra money, co-oping will give you an edge in the future job search over students who flipped burgers at McDonalds while going to college.

The second step is "Interview sign-ups." First, you need to send copies of your CIF to the desired employers. Some employers ask for CIF's to be sent to them so that they can pick the students that they would like to interview. If a company would like to interview you, and you are interested in them, an interview time will be set up. There will also be a sign-up period for students seeking co-ops with employers that are indiscriminate about who they interview. Interview opportunities are posted on the Co-op Office Interview Notebook and departmental bulletin boards. You may sign-up for as many interviews as you would like as long as you meet the requirements of the companies.

The third step is the interviewing process. This is not as easy as you may think, but panicing is not necessary either— you simply should be prepared before your interviews. When you go to your interview you must be able to answer questions about yourself and your plans for the future, and you also need to know quite a bit about the company you are going to interview with. A typical interview consists of four basic parts.

The first part is a few minutes of chitchat, and is for first impressions. If the interviewer does not open with any kind of question, it is up to you to start the conversation. You should stick to intelligent, non-controversial topics. Do not question your perspective employer's views on the Hereafter, and do not make snide comments on his or her clothing choices.

The second part will show the employer if you are really prepared. This is also where you can show off if you are ready. The employer will ask such questions as "What do you see yourself doing five years from now," or "What have you learned from your mistakes?" The questions will be short and to the point. You will be asked how much you know about the company and will be expected to have good answers. There are interview workshops that provide information and give you a chance to participate in practice interviews. You may also like to see a few interview video tapes. These are located in the Wendt Library audio-visual center. Company literature is also available in the Co-op Office.

The sell is where you are given the opportunity to say what you want about yourself. Talk about why you want the job and why you should be chosen over others. Caution should be excercised. Interviewees need to convey a confident, but not arrogant image.

The close of the interview is where you should try to give a lasting impression. By leaving the interview on an

up-note you are at an advantage because the employer will remember more about you. The better prepared you are for an interview the easier it will be for you to make a lasting impression on the employer— you need to read between the lines in all of the questions asked of you. If you prepare well for your interview you should be relaxed and confident, a desirable quality, and you should have no problems getting what you want. Interviews take place at Union South and you should arrive early at the Co-op office so that you can find out where to go. You can leave your books there.

By leaving the interview on an up-note you are at an advantage because the employer will remember more about you.

Following a successful interview, you are ready for the next step of the co-op process— "plant visits and the second interview." If a company is still interested in you after your interview, they may ask you to come out to see their plant or ask you for a second interview. This type of invitation usually means the company wants you and at this point it is up to you to decide if you would be interested in working with them or not. You should inform the Co-op Office about any offers of this nature and inform the company if you do have an interest. When you are visiting their plant, you should conduct yourself as if you were interviewing. You will probably be introduced to other company workers and it can only help to make a positive impression on anyone you meet. You should inquire about travel expenses and arrangements should you have to relocate or commute.

If you get this far, count on an offer. Companies will contact you by phone or mail. When you receive an offer, contact the Co-op Office immediately. You will have to fill out the Co-op Job Offer Form and return it to the Co-op Office. The company will generally specify when you must accept or decline their offer, but is helpful to respond as quickly as possible.

Your acceptance must be confirmed by the employer in writing even if you accept immediately over the phone. Be sure to request an acceptance letter if it is not offered and give the Co-op Office a copy of it. Acceptance of a job offer is final and it is not wise to put off accepting one offer while waiting for another offer that may never appear. After accepting an offer it is a good idea to attend a co-op pre-work seminar. These seminars will provide helpful information and give you an opportunity to talk with experienced co-op students.

After signing on, the all-important paper work must be completed. Registration and address update are crucial. During each work period you need to register for the one credit Cooperative Education course. Registering for this course will give you good standing with the College of Engineering. You may register yourself if you are able to be in Madison, but if you are unable to register at your assigned time, friends may register for you by proxy. Proxy registration forms are available in the Co-op Office. You may also request that the Co-op Office register for you. However you decide to do it, you should inform the Office of your plans to make sure you are registered. You will have to pay tuition for one credit and complete some forms. If you do not register and pay tuition you will not be considered a student and you will have to re-apply for admission to the University. You also have to inform the Co-op Office of your permanent address. Any correspondence will be sent to your permanent address since co-op students usually move a lot. You should do this so that you can keep informed of any important dates, deadlines and other information regarding the Co-op Program.

The final step is a work report. Near the end of your work period you will have to file a work report with the Co-op Office. In the report you will have to describe your job, how it relates to your major field of study, and how you have grown from your experiences as a co-op student. The report should be at least three pages and will determine your grade. Students normally have no problem completing three pages and often can write quite a bit more. Your employer will also submit an evaluation that will go into your records but will not affect your grade in any way.

The Co-op Program can be the solution to some of your problems. Because starting pay for co-op students ranges from $1000 to $1600 per month (depending on major, year in school, and cost of living where you work), you might save enough money to pay for part of your future schooling expenses, and possibly add a little to your beer fund. Besides just the extra money, co-oping will give you an edge in the future job search over students who flipped burgers at McDonalds while going to college. By working for engineering companies, possibly such giants as Kodak, General Motors, or Xerox, you will look better to employers when you are looking for a job. You will have a real advantage at your interviews because you have been through interviews during the co-op process. You will build confidence and work experience while earning money— an opportunity that should not be passed up.□

Jeff Roorke

Marion Beachley assumed the duties of Cooperative Education Program Director on September 15 after former director Sandra Arnn moved to the Placement Office.

Beachley is a graduate of Beloit College where she studied German and political Science. She received her Teaching Certificate from the University of California at Los Angeles and and went on to teach German in California and New York.

After moving to Madison, Beachley received her Masters Degree in counselor guidance and took a job at Mount Horeb High School. After a stint at Sussex University in England, Beachely started work in the Office of Foreign Admissions of the UW Graduate School before moving to her present position.□

What They Don't Tell You in the Co-op Office

by Elise Lind

I was so unprepared. Halfway through my sophomore year, my first co-op job offer came. I was already sick of school, I didn't know how I was going to get any mechanical engineering experience before graduating, and I needed money. When the Standard Oil Company of Ohio told me they would fly me to their headquarters for an interview, I decided I had to give it a shot, even though it was in Cleveland.

After the interview, while I was waiting in the airport for my flight back to Wisconsin, some lady ran through the terminal with a gun, shot a guard, got on a plane, and took some passengers hostage. A swat team immediately showed up and blocked off that entire end of the airport, including the gate where I was to board my plane. I sat in the Cleveland airport for six hours waiting for a flight. After this trauma, I thought I could handle just about anything; I decided to take the job and venture out into the real world for awhile.

My first assignment was in an oil refinery in a small town in Ohio. I didn't know what to expect from this place: the number of donut shops per capita rivaled the number of bars per capita in Wisconsin towns. On my first day of work, my supervisor told me it was "sort of The Twilight Zone." I was apprehensive, to say the least.

The engineers I worked with were friendly enough, but seemed strange to someone used to a world of students and professors. One guy was a Seventies relic. He wore bell-bottomed pants, listened to the Guess Who, and had probably only recently stopped wearing love beads. He turned out to be my boss.

The refinery took some getting used to. On my first day, I wore dress pants and a nice sweater and no heels because, after all, this was a "plant" job. When my supervisor told someone to give me a tour of the refinery, he said "Probably shouldn't let her get out of the truck."

Jeff Molter

Elise takes time out from bossing around big Bubba's to blow a bubble.

That was the last time I made that mistake. I soon had my own hard hat, boots, and safety glasses, and blended right in to the scene.

That first assignment was mainly "gofer" jobs and supervising construction projects. I must point out that I use the term "supervising" very loosely. When I went out to a job site to make sure work was getting done, the workers would stop whatever they had been trying to look like they were doing to make witty comments. They must have gotten the biggest kick out of seeing me cringe every time I walked up to them.

After a semester of classes, I was sent back to the same place. This time, I was much more relaxed. I knew enough not to take myself or the construction workers too seriously, and just tried to have a good time. I was finally able to start throwing back a few comments of my own. One example: For about two weeks, one guy (a huge pipefitter) would ask "So when ya takin' me out to dinner?" every time he saw me. I finally just told him I was sure there was no way I could ever afford that much food. He stopped asking.

Living on my own in other cities was also a learning experience. It taught me independence, and it exposed me to things I might not have heard of or seen.

My third co-op assignment was again in a refinery, but this time in Marcus Hook, Pennsylvania. It was great to get out to a different part of the country. I got to see Washington D.C., New York, the New Jersey shore, and quite a lot of Philadelphia.

Unfortunately, my living conditions left much to be desired. The company did not provide us with housing, so I called a college in the area and got a room in what they called their "miscellaneous housing." I guess miscellaneous was their euphemism for dive. Think of the worst campus house you've ever seen... unfurnished. It took me three weeks to get my bare-wood floor to be the color of wood again. When I came home at night, I would stand in the hall and turn on my bedroom light, then wait at least a minute before going in so that I would not have to see the cockroaches run under the bed.

This is definitely one of the disadvantages of co-oping, especially out of state; unless you can afford a trip to check out places to stay, you end up taking something sight-unseen. I still shudder to think about it.

One of my first days of work, my supervisor told me it was "sort of The Twilight Zone."

Aside from my living conditions, it was a great co-op term. The engineers in my department were from all disciplines, so I learned a little more about the work done by electrical, civil, and chemical engineers. The overall atmosphere at work was one I found to be typical of the refineries— very laid-back. A few times a year they were very busy, but the rest of the year was slower-paced. I didn't mind that, and I even got used to the plant setting after a while, but I knew it was not the kind of work I wanted to do. At the end of my third assignment, I was ready to do something else.

I finally got my chance when, for my last two co-op semesters, I was assigned to the corporate headquarters in Cleveland. It was a radical change from the refineries. All of the engineers wore suits (including Claudia, the only woman engineer in any of the departments I worked in). I had to go on the "build a wardrobe with just five dollars" plan, because I could not afford enough suits for eight months on the job. Pride went out the window, because there was no way anyone would miss the fact that I wore the same five skirts every week. My only consolation was that at least I could not be mistaken for a secretary; they were the best-dressed women in that place. I heard this joke there:

Q: What's the only way to tell a secretary from a well-dressed professional woman?

A: The secretary is wearing Giorgio.

The work I did in this department was definitely challenging. This was the job I benefitted most from academically. I had to use heat transfer, though I had never had a class in it. (My boss told me enough for me to be able to do the calculations.) I had to learn two new computer systems. When the computer support person in the department asked me what kind of experience I had, I told him I had only used the University's HARRIS system. He said, "Well, at least you're used to ugliness." During this assignment, I learned probably more than I cared to know about computers, finite element analysis programs, and some other aspects of engineering design.

Although co-oping had some disadvantages, like paying two rents and getting behind in school, I must say that it was invaluable experience I don't regret for a minute. I learned what engineers actually do and whether or not it's what I want to do. I learned how to communicate with people very different from myself and have a good time working with them. College is a good place to meet interesting people, but it is relatively homogeneous. It is much harder to get along with engineers and co-ops from other parts of the country who continually rip on you for loving beer and cheese.

I finally just told him I was sure there was no way I could ever afford that much food.

Living on my own in other cities was also a learning experience. It taught me independence, and it exposed me to things I might not otherwise have heard of or seen. (I had no clue about what a "hoagie" was until I lived near Philadelphia, or that in Ohio you cannot buy liquor after 6 p.m. on weekdays or at all on Sunday. These are handy things to know.) I also became an expert in packing and moving. I can fit everything I need to live for a semester in a VW Rabbit.

Probably the most valuable lesson I learned from co-oping, however, is that I can make it in an engineering career if I want to. In classes, it is easy to be intimidated and to think "I'll never be able to learn all this stuff well enough to do it for a living." Because of my co-op experiences, I know that I can handle even the more technical parts of an engineering job. My engineering school background will be just enough to get me started when I finally go back out into the real world— this time permanently.□

Engineering Briefs

by Helen Lau

Society of Women Engineers

The Society of Women Engineers is a national, professional, nonprofit, educational service organization of graduate and undergraduate engineers, and men and women with substantial engineering experience.

The student section of the Society of Women Engineers has a full line up of events planned this year for all interested students. There will be monthly meetings which will be devoted mainly to presenting information on "Alternative Careers for People Trained in Engineering." The presentation will feature speakers who have engineering degrees, but are applying their skills in non-engineering related jobs. Other exciting events include "An Evening with Industry" on January 21, 1988, which is an informal gathering for engineering students and corporate representatives and also a plant trip to McDonnel Douglas in St. Louis, Missouri scheduled for April 7, 1988.

All programs are designed for both men and women from any of the engineering disciplines and SWE heartily encourages men to participate in the activities.

American Institute of Chemical Engineers

The American Institute of Chemical Engineers is a professional society which provides services and activities mainly for chemical engineers.

This year, the student chapter has set up a "Meet the Faculty" program which will give students the opportunity to get better acquainted with their professors and also learn about their research and social interests. A ChE faculty member will be invited to speak to the students at each monthly chapter meeting. AIChE has made and will continue to make arrangements for corporate representatives interviewing on campus to give short presentations about their companies. Included in these presentations will be descriptions of jobs and opportunities that chemical engineers have at their companies. AIChE will also be sponsoring a pig roast, in traditional Hawaiian style, as a kick-off for Engineers' Week.

American Society of Civil Engineers

The student chapter of the American Society of Civil Engineers provides an educational and social atmosphere for all students interested in civil engineering.

The society provides a wide variety of activities for all interested students. Two of their current activities are the designing of a concrete canoe and a park shelter. ASCE will be designing and building a concrete canoe to compete in a race which will be held at Marquette University. The ASCE was asked by the city parks department to design a shelter house for Olin-Turnville Park. Both projects are under way but more help is needed. All those interested should contact the ASCE office.

Society of Automotive Engineers

The SAE sponsored Midwest Mini-Baja and Formular Car competition are the main projects for the UW-Madison SAE student branch. The projects usually require one to two years of design and construction work. The cars will compete on a performance level where speed, handling and endurance are emphasized. A complete design report along with a detailed cost analysis is also required for judging. These projects provide engineering students with excellent practical experience.

Other important events designed to help students gain more information in their areas of interest are the monthly speaker meetings. The meetings will feature engineers in industry and UW-faculty members who will come and talk about new ideas and technology in automotive design.

Tau Beta Pi

Tau Beta Pi is a national engineering honor society which serves to honor outstanding engineering students as well as provide activities and services to the engineering campus.

Tau Beta Pi sponsors many industrial presentations which allows engineering students to learn more about opportunities available in industry today. It also provide various social activities that encourage student interaction with the many engineering disciplines on campus. T-shirt sales are held throughout the year around the engineering campus.

The Wisconsin Alpha Chapter also provide open-hours tutoring services through Guts/Hash and one-on-one tutoring through the General Engineering Department.

The Technical Writing Internship

The Technical Communication Internship is a new, one-credit class (GE 398), that will be offered for the first time in the Spring of 1988. The internship consists of eighty hours per term (four to five hours per week) of on-the-job experience, and eight hours of in-class discussion. The internship placement will be in Madison and the surrounding area. This one-credit internship is a part of the proposed Technical Communication Certificate (TCC). Final approval of the TCC program is pending.

Jeff Roorke

Sandra Courter, Technical Writing Internship Director.

by Laurie Ulman

The internship program arose from the increasing demand for competent technical writers in industry. According to Mr. George Morrison, the Documentation Manager at Nicolet Instrument Corp., this demand increased for three reasons: users have changed, products are now more complex than ever before, and increased product liability has brought a need for clear instructions.

Today, the users of technical instruments have a less scientific background than in the past. This change in users requires the revision of manuals and instructions to accommodate the general-public background.

The second reason for the high demand for technical writers is the increasing number of complex technical products currently being produced. The increase in technology causes a similar increase in the demand for good technical writers to bridge the gap between the scientist and the layperson.

The last reason for the high demand involves the risk of product liability. A product's correct use and precautions must be carefully explained in the product's instruction manual. Technical writers are indeed important in most industries today.

Skills for technical writing

The skills required to be a technical writer are many and varied. The technical writer must be clear, concise, technically accurate and well-organized. A good knowledge of the English language and a solid technical background are two essential elements. Mr. Morrison described the technical writer as something of a "Renaissance man," in that he must combine clear writing skills with a highly technical background. The technical background must be both broad and deep, which can lead to "technical writer's burnout." Some companies avoid this problem by assigning the technical writer to work only in one technical area (e.g. studying and writing about only one type of computer). Good technical writing is a challenging job that requires many skills.

Projects

In the Technical Communication Internship, approximately 80 hours will be spent working in an industry. The 80 hours may be spread over the entire semester (about 4-5 hours per week), or the internship period may be concentrated over a few weeks. The distribution varies with the company and type of project. Every project is unique and the scope covered will depend on the assignment. For example, Mr. Dave Gilreath, the Technical Writing Leader at Tracor Northern in Madison, mentioned that the interning technical writer may be responsible for all aspects of a project including art work, graphics, documentation, research, and printing. Mr. Morrison stated that because most technical writing projects involve from six month's to one year's worth of full-time work, interns at Nicolet may work on a relatively small project. The project would be well-defined and have clear goals. One possibility might be writing a chapter in a manual. The type of project and the range of work depends upon the company.

For example, professor Donald Woolston, a technical writing instructor, worked one summer in the publication department of a large Midwest computer manufacturer. He was assigned to a 10-person department that produces manuals which describe how to set up a business computer. His specific assignment was to produce a 30-page manual on how to attach a certain printer to a computer; a task that would consume approximately eight weeks. During his first week on the job, Woolston became familiar with the word-processing and typesetting programs. He spent his second week interviewing engineers and programmers and gathering information. He then completed his first draft. In the subsequent weeks, arbitrating with the various departments and revising the draft occupied most of his time. Almost all of the comments were due to design changes made in the few weeks since he had arrived. After a second draft and considerable arbitration, he was able to complete his part of the final product: a computer file that could be merged with computerized illustrations into a typeset manual.

Industrial Response

How do industries in Madison feel about the Technical Internship program? Mr. Gilreath thinks it is a good idea, and the first step to offering undergraduate and graduate degrees in Technical Writing. Currently, some universities do offer degrees in technical writing. For example, Rensselaer Polytechnic Institute (RPI), the University of Michigan-Ann Arbor, the Illinois Institute of Technology, the University of Minnesota, and Carnegie-Mellon are just a few of the many universities that offer undergraduate degrees in technical writing. RPI also offers a graduate degree, and currently the University of Michigan is developing a program for a graduate degree.

One semester's work can not be the sole criteria in determining the internship's value. What is more important is that the technical writing internship will improve the quality of the profession as a whole.

Benefits

Mr. Morrison feels that both students and industry will benefit in a number of ways from the program.

According to Professor Sandra Courter, the program coordinator, the internship will meet students' needs in three ways. Students will experience working with professionals in solving technical communication problems as well as gaining opportunities for observing and analyzing work experience.

Students will experience working with professionals in solving technical communication problems...

Students will also learn strategies to deal with on-the-job issues. These issues include: ethics, proprietary rights, time management, interpersonal skills, and leadership skills.

In addition, industry and the University will also benefit from the internship program. Industries will benefit from the increase in student training and hiring of students who have no unfounded expectations. They will also benefit in that they will have the settings in which to influence students and to observe future employees.

One should note, however, that one semester's work can not be the sole criteria in determining the internship's value. What is more important is that the technical writing internship will improve the quality of the profession as a whole.

Prerequisites

The Technical Communication Internship is clearly beneficial to all concerned and will improve the communication skills of the students in the program. The prerequisites for the internship are: GE 397 Technical Writing, 6 communication credits, and the consent of Professor Courter. The 6 communication credits may be credits in: Agricultural Journalism, Communication Arts, English, Journalism and Mass Communication, Business 320, ECE 350, GE 315, or GE 399/699 (**Wisconsin Engineer** staff).

If you are interested in the internship, don't hesitate to contact Professor Courter— you may find a place in an internship this Spring! You can reach Professor Courter in room seven of the General Engineering Building, or by phone at 262-4819. You may also find out more about the program by calling the Technical Communication Center at 262-4820.□

Consider an International Job...

by Matthew Friederich

Matthew's article was written for Evelyn Malkus' Professional Expression class and is published here with his permission.

What does a graduating engineer or hard science major look for in a job? Some look for advancement opportunities. Others seek to live in a certain geographic area while others will take the highest paying job. Advancement, location and wages are all important factors in choosing a job— all too often, however, the graduate limits his or her choices to work in one country— the United States. Why not look outside of America? International jobs are not often considered even though they can provide many opportunities and experiences not available in traditional domestic jobs. Having traveled to Europe, and based on the experiences of some of my friends who have worked overseas, I find myself in a unique position to offer some insights into overseas job opportunities.

Of course, living in another country means learning another language too. Linguistic specialists note that learning a new language involves many of the same skills required to learn math. In short, if you have above average math skills, as most scientists do, you should have little difficulty learning a new language. Many countries offer intensive language classes where one can learn a new tongue in a year. This may not even be necessary if one can find a job in an English-speaking country. Australia and England come immediately to mind but many African countries and India also have English as a major language. Nevertheless, if a company is willing to pay for its employees to take technical classes it would certainly pay for language training.

Why not look outside of America?

WE Photo File

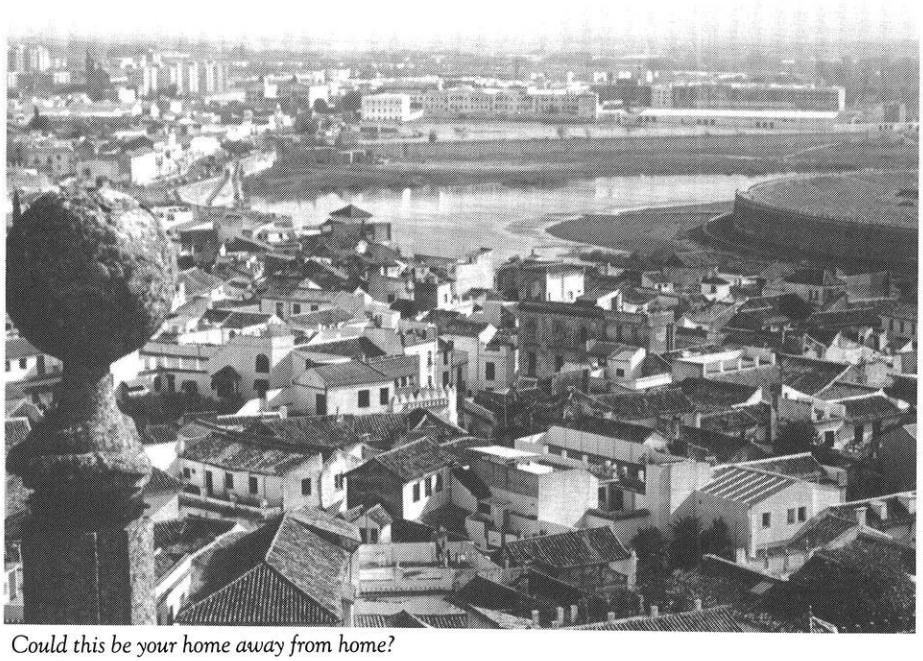
Your own flat in downtown London.

Many American based businesses such as Armco, Exxon, Du Pont, ITT, Kodak, General Motors, IBM, Texaco, Pan American Airways, Honeywell or Xerox (to name just a few) have overseas branches. Did you know that 33 percent of IBM's income comes from Europe, the Middle East and Africa? Forty-five percent of Kodak's sales are to foreign consumers. Texaco has interest in 135 countries and GM pulls in ten percent of its total income from overseas sales. Obviously these businesses hire people to run their overseas operations.

The advantages of overseas jobs are many including opportunities to see new people and places. A job in Europe would allow one to travel to a different country every weekend. While some people can see the World Trade Center from their offices, the international employee might see such sights as the Eiffel Tower, St. Peter's Basilica or German castles on the way to work. The overseas employee has an opportunity to learn about a new culture and gain a broader world view. Have you ever noticed that America is at the center of many of our world maps? In my room I have a Russian world map; can you guess what city is at the center of that map? People look at the world differently in different countries! The international employee would learn to see the world through another cultures' eyes.

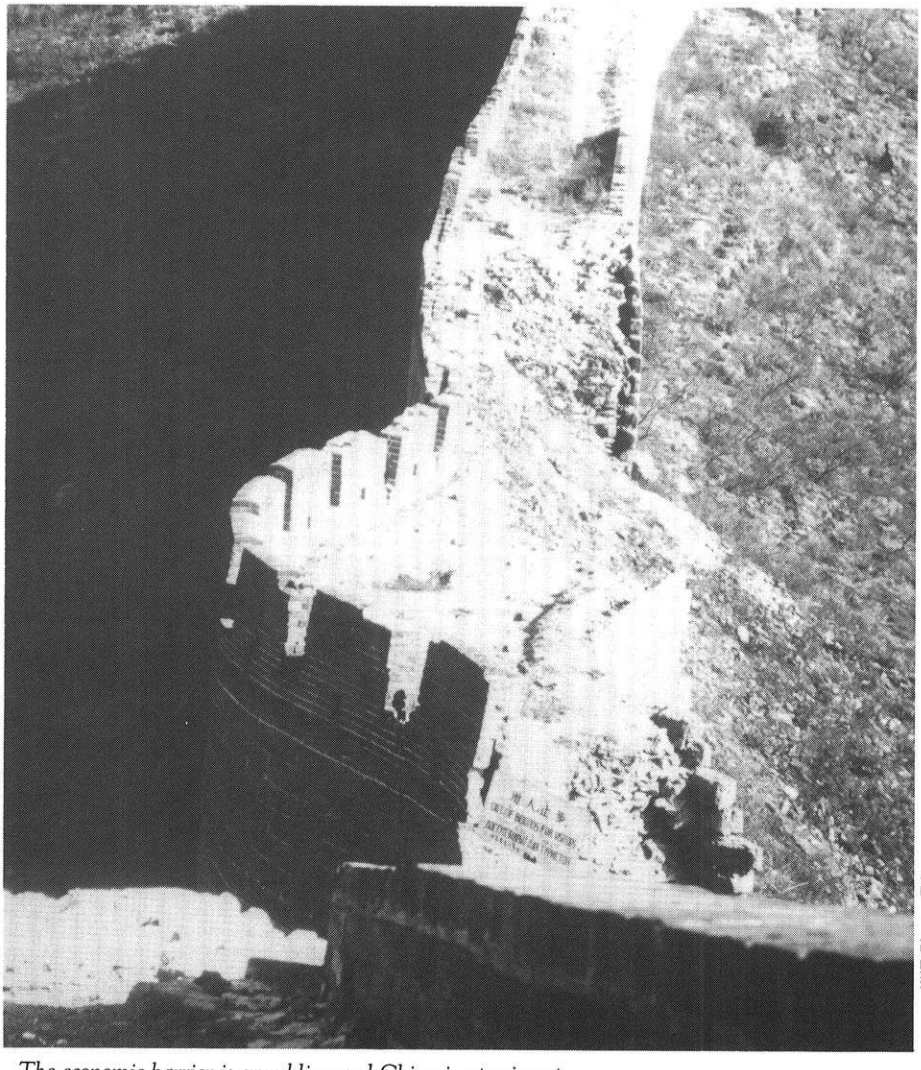
Texaco has interest in 135 countries and GM pulls in ten percent of its total income from overseas sales.

With Eastern Europe opening up, American businesses are making inroads that were impossible to build ten years ago. This summer, for example, I saw British Petroleum and Shell gas stations in Hungary. The economies of Eastern Europe are based on agriculture and heavy industry. High technology is of great importance to these industries and lags behind Western standards. For these reasons, many Western professionals are getting jobs in Eastern countries.



WE Photo File

Could this be your home away from home?



WE Photo File

The economic barrier is crumbling and China is opening up.

The Soviet Union is always in need of hard (Western) currency to trade with. Since Western countries do not accept payment in rubles, the Soviet Union is eager to let Western companies export their goods in exchange for hard currency. This provides an opening for Western professionals to work there.

Other countries are looking for engineers and scientists to teach citizens of their country. One does not always need a Ph.D. to teach. In the Philippines, for example, someone with a masters degree can teach at a university. This is also the case in other countries that are emerging from the third world into the second world.

No discussion of foreign industry would be complete without mentioning Japan. Who thinks of high technology without thinking about Japan? If you like *Chinese* food and baseball, you should consider finding a job in Japan.

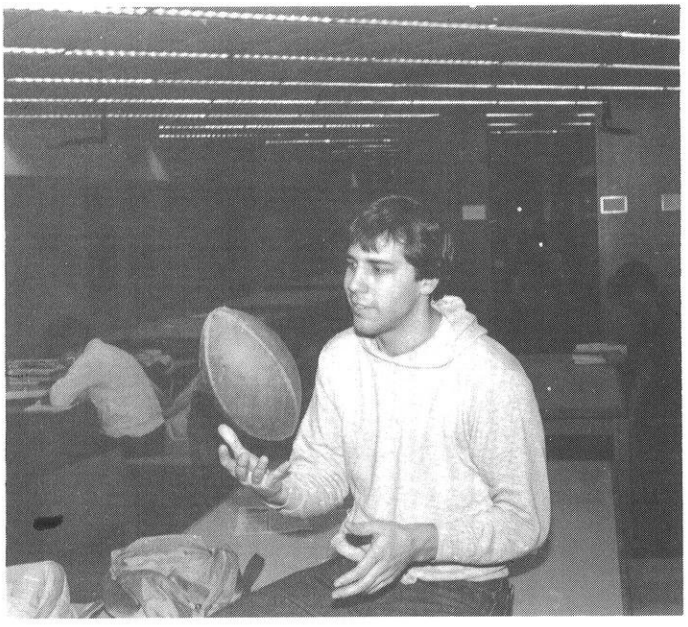
In short, if you have above average math skills, as most scientists do, you should have little difficulty learning a new language.

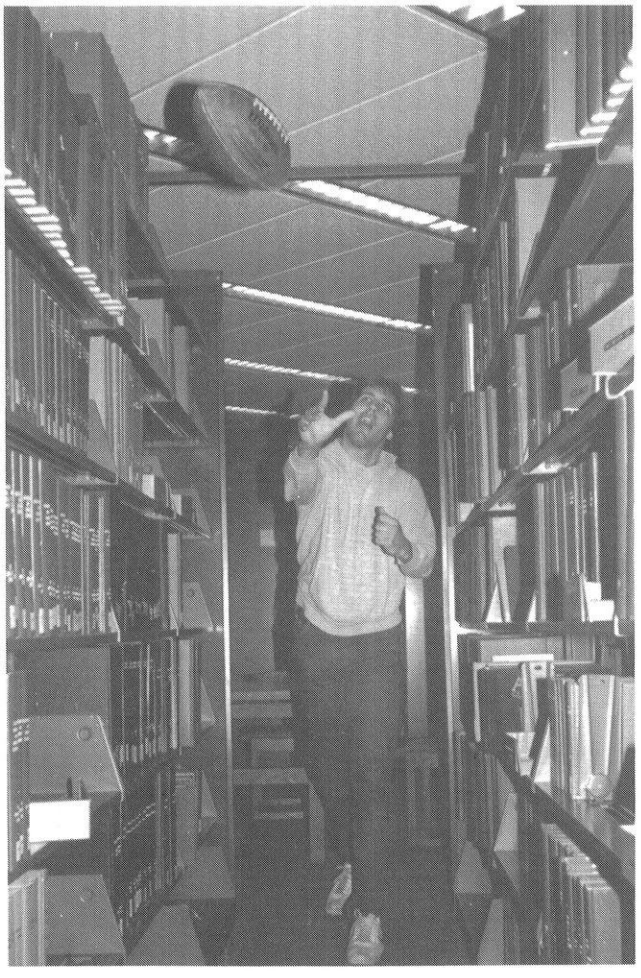
Working overseas does have some drawbacks such as cultural adjustment and all the frustrations that go along with learning a new city where nothing is spelled in a familiar way— including the word "bathroom." However, knowing that you are experiencing something that few experience, and that your income is tax exempt up to $95,000 can help overcome these minor hindrances.

So now that you are considering overseas work (if you weren't you still wouldn't be with me) what is the next step? If you have the free credits and a specific interest, you should learn the language. One would also do well to find a good book on the subject. One I can recommend is International Jobs by Eric Kocher. His book gives addresses to write to and tells what individual companies are looking for. Contacting a country's consulates or embassies would help one find out what companies operate within that country. Whatever you do, I hope you will consider the opportunities that are open to you all around the world.□

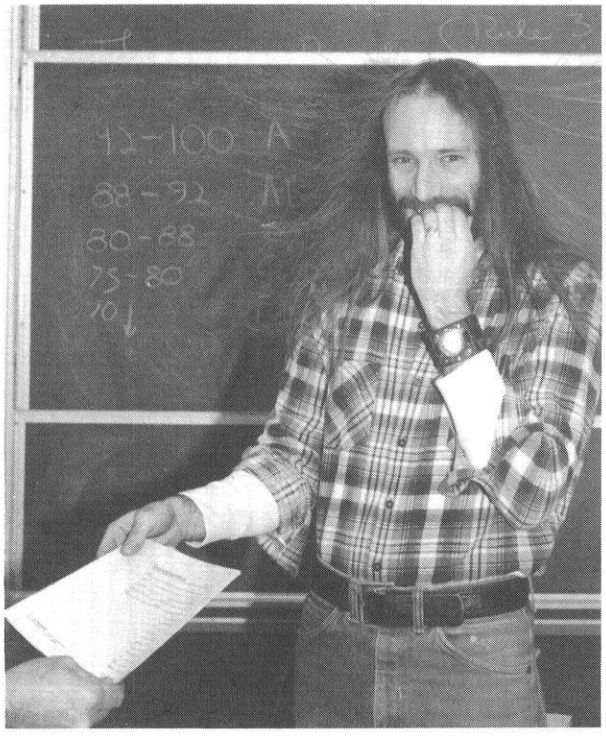
Just One More

by Jeff Molter





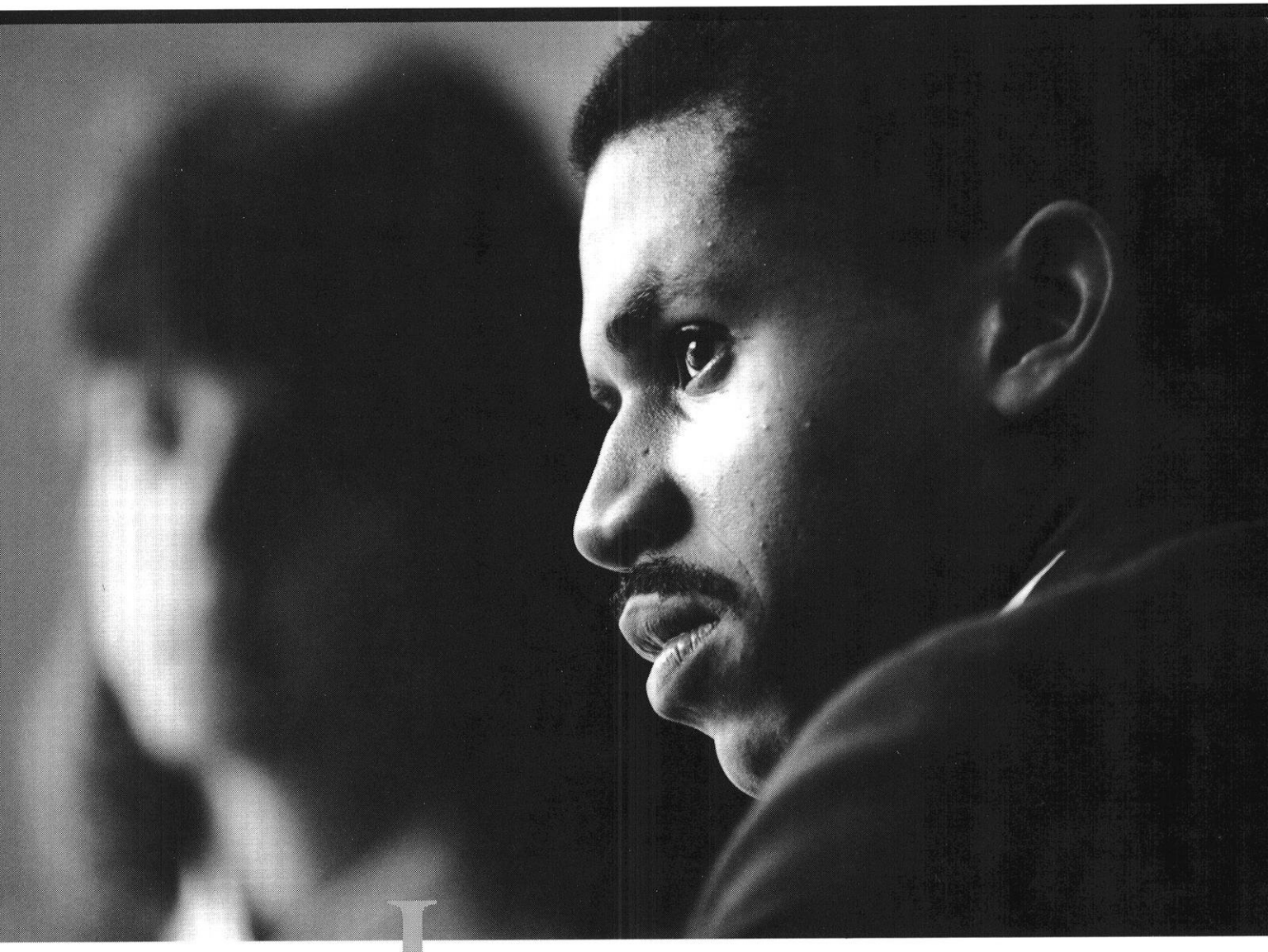
It's a good thing the football team is getting the new Dave McClain Memorial Indoor Practice Facility. Hopefully they won't have to practice in Wendt Library anymore.



Join the Wisconsin Engineer

After a disappointing 3-8 season, football coach Don Morton has turned his recruiting efforts toward the engineering campus. Here a graduate student hands the coach his national letter of intent.

Darryl Greene knows that teamwork is the key to winning.



Just a year out of school, Darryl Greene is responsible for supplies and services that support 14 major plants in GE's Lighting business.

What makes this young engineer so successful, so fast? His dynamic sense of teamwork is a big factor. He's got the confidence to interact with people at all levels. His personality inspires trust. He knows how to act like a leader, so his colleagues will act like a team.

Darryl knows it takes the best resources to back a winner. That's why he chose a job with GE.

GE provides unlimited scope for outstanding talents. The diversity—in businesses, resources, and locations—is second to none. Above all, there's a real willingness to give the ball to those who are willing to run with it.

If you want to be a leader, join the front-runner.

The mark of a leader.

An equal opportunity employer.