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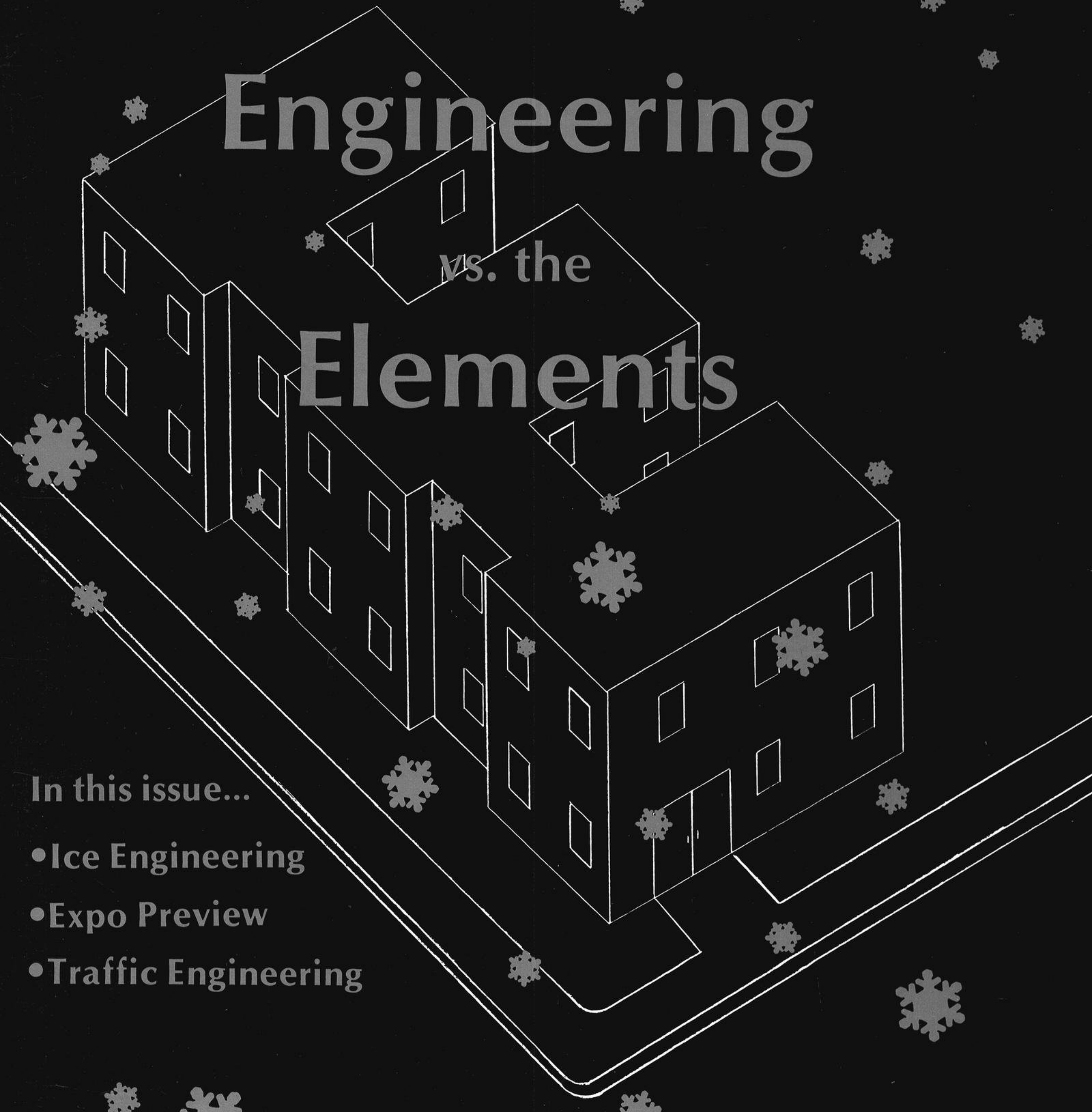
Volume 91, No.3

February 1987

wisconsin engineer

Engineering vs. the Elements



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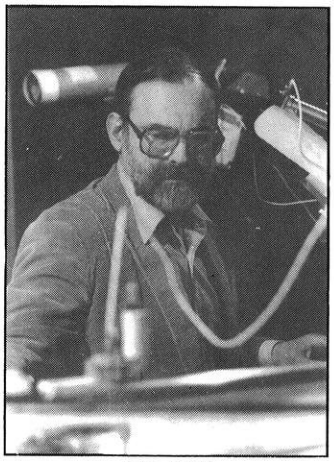

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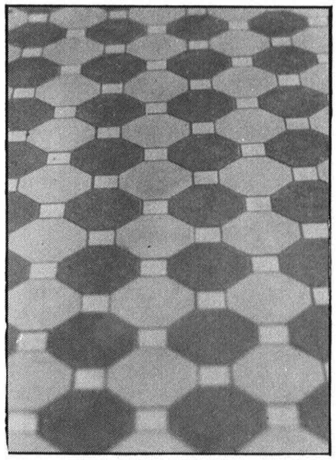

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Wisconsin Engineer
Volume 91, Number 3

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Big, Big Plans for the Wisconsin Engineer

Editorial

by Jerry Hill

Hi! Welcome to the **Wisconsin Engineer** 1987. My name's Jerr and I'll be your new editor for the spring semester. Who knows, maybe if the powers that be like me, I'll be around even longer. Let's get down to the heart of this editorial.

Because of time constraints and generally complete disorganization, I'm not going to address any volatile or controversial topic in this issue's editorial. Instead, I'm going to just ramble about whatever I feel like and hopefully when I'm done I'll have given the reader some sort of explanation as to what direction I'd like to see the magazine head in.

I know that every engineering student relies on the **Wisconsin Engineer** for timely, up-to-the minute reports on the latest developments in modern technology. Well, unfortunately we're not able to accommodate people on that note since we only come out twice a semester and once in the summer. What we can do, and what we have done in the past, is to focus on research being done on this campus. This will not change under the new dictatorship.

What I envision as the quintessential engineering magazine is one that not only reports on all-important, earth-shattering, life-affecting research, but also caters to an engineering student's lighter side. C'mon, admit it, you have a lighter side. Gradually the reader may notice humor, or a facsimile thereof, creeping onto these very pages. The key word here is "gradually" as changes around here tend to evolve rather than occur spontaneously.

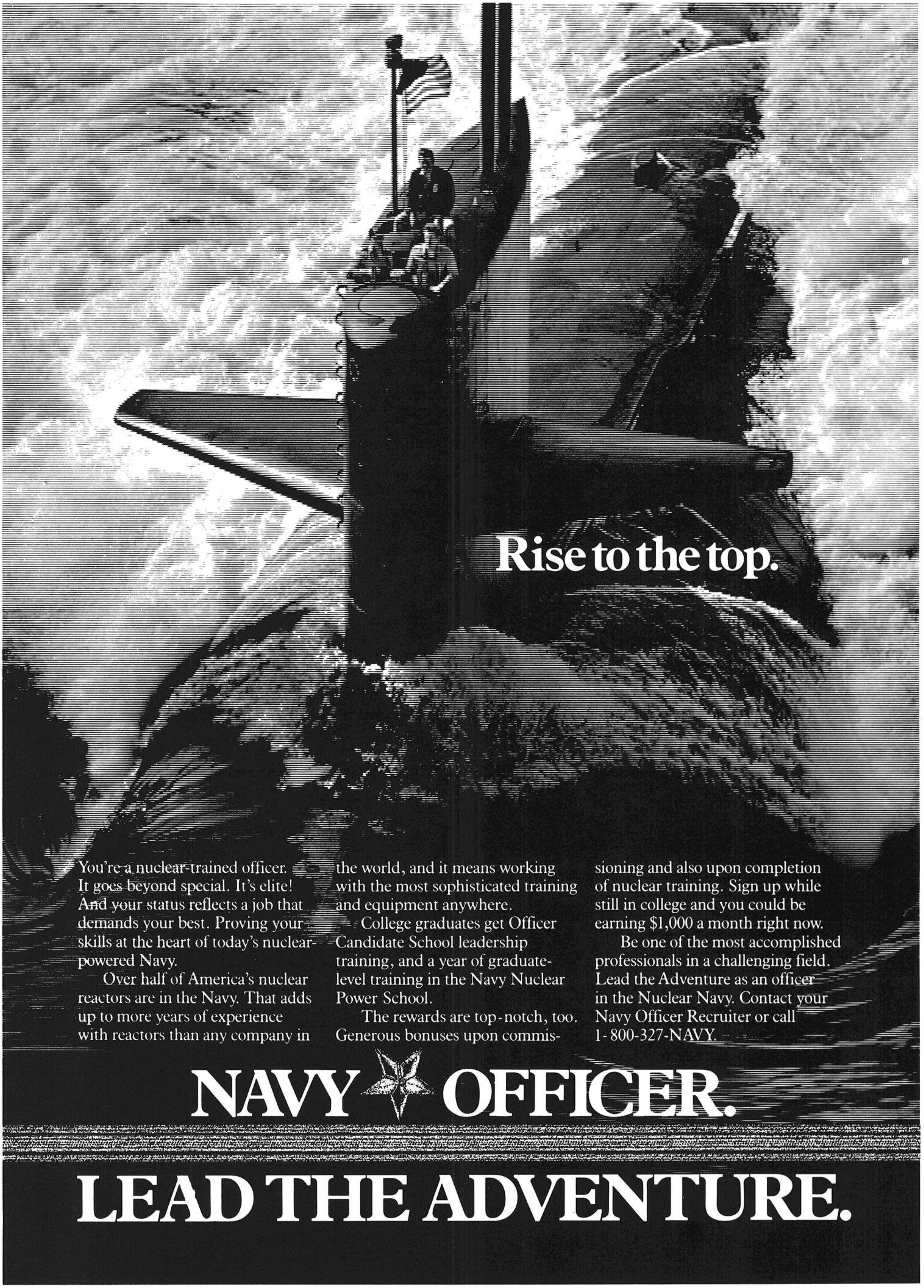
Another change the meticulous reader may notice is in the layout of the magazine. Not to take anything away from those who produced past issues of the **Wisconsin Engineer**, but it did seem that one page resembled another just a little too much. Again, this change will probably evolve as well. Golly, I hope I'm still around to watch everything evolve.

I envision the construction of ERB II, high-rise offices of the new **Wisconsin Engineer**. Circulation is up to 4 million and we're available in every grocery in every home town. Granted, some of these changes are a ways off, but it's important to have goals.

I'd like to take this time to invite you, the reader, to become actively involved in the production of this publication, the bible of the engineering world. Any letters or comments would be greatly appreciated. If you guys write some good letters, maybe we'll even print them. Wouldn't that be fun! Gee, there's no end to the things we could do here.

Well, I think that about fills up the editorial space for this issue. Maybe next time I'll say something important and meaningful that will change your life forever. Stay tuned.□

Jerry Hill is an Industrial Engineering sophomore bent on finishing this magazine so he can do some homework.



Rise to the top.
You're a nuclear-trained officer. It goes beyond special. It's elite! And your status reflects a job that demands your best. Proving your skills at the heart of today's nuclear-powered Navy.
Over half of America's nuclear reactors are in the Navy. That adds up to more years of experience with reactors than any company in the world, and it means working with the most sophisticated training and equipment anywhere.
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Dean's Corner

Civil Engineering: The Foundation of our Modern Society

by Dean John G. Bollinger

Civil Engineering provides essential management and technological services to society. The highways we travel, the structures we live and work in throughout the country, the bridges we cross, structures providing our energy resources, the water we drink, the safe disposal of our sewerage and waste, and the collection and maintenance of the information, use, and management of our land records all depend on the technological foundations of civil engineering. The degree to which civil engineering contributes to the health and welfare of a society did not have its full impact on me until a few years ago when I was traveling in rural areas of Asia.

Traveling through native villages along the winding rivers in rural Asian countries, being able to drink only bottled water, hearing of the difference in life span of nearly twenty years between peoples of the area and of those in the United States, makes one realize that no investment in health care can compare with the value of investment in projects conducted by civil engineers in sanitary engineering, clean water supply, and sufficient economically produced energy.

The role of civil engineering in developed countries takes on a further dimension when we realize that basic societal needs for sanitation and transportation have been accomplished only at a minimum level over the past 100 years. In the United States, our emphasis is on highly technological issues such as the control of hazardous waste indicative of high production and technological advances, the desire to provide efficient and effective land management technologies, the construction of sophisticated structures and the increased protection of our health and safety.

For more than a decade, there has been great concern for the protection of our environment in the United States. Engineering solutions have been found for major sanitary waste disposal problems in municipalities. Special industrial waste technologies have been developed to prevent the accumulation of hazardous waste in our rivers, lakes and streams. New technologies have emerged for the treatment of hazardous solid waste to protect our dump sites. This year, Congress will deal with additional water clean-up legislation which could lead to the spending of billions of dollars to help assure that this country's waste management is safe for our environment.

Another issue of growing importance to our nation is the development of a modern land management and land records system. New technologies supporting the remote sensing of critical radiation parameters, the accurate location of features, and the computerized assessment of large amounts of data will provide government, utilities, and private businesses (including the farmer), with vast amounts

WE Photo File

Dean John G. Bollinger

of timely data in a cost efficient manner.

Advanced technology in civil engineering has taken us from the era of a transit to the age of a satellite. This transition is very much analogous to problem solving with a slide rule as compared to problem solving with a super computer. In fact, this technology is not possible without having access to the high-speed, large data storage and cost effective computational power of modern computers. Civil engineering is no different from other engineering disciplines which have become highly computer intensive. Our progress is dependent on the rapid acquisition of multiple channels of data, the high-speed reduction of data into meaningful compilations, and the graphical display of information so it can be comprehended and effectively utilized.

For the young civil engineering student, the challenge of civil engineering should provide a broad spectrum of exciting alternatives.

Signal processing technologies, information theory and computer graphics are essential elements in the formula for success.

Geological engineering which deals with rock mechanics, geology, soils, mineral resources and their exploration, and the mechanics of disposal of solid wastes is becoming of increasing importance. Realization of the importance of our ecology has brought the technological community together on the need to understand the mechanism of disposing our spent resources as being equally important as the development and utilization of our natural resources. This has opened new fields of endeavor for engineering with a host of new problems to be solved.

I recently read an exciting new article about Polestar, the concept of constructing a new city at the North Pole. The idea involves building a super highway across the Arctic ice cap which requires the development of technology involving ice engineering. Today the oil industry is constructing ice structures to protect drilling platforms in the Beaufort Sea. The technology which has been learned in the process of building great ice dikes is equally applicable to the construction of highways. Other ice engineering projects currently underway involve understanding the erosion of shorelines and the developments of construction technologies for harbors and seaports where ice formation is a seasonal hazard. The petroleum industry and the desire to find new mineral resources on the sea floor beneath a giant Arctic ice cap provide significant incentives for the development of technologies which would allow convenient transportation and habitation of far north regions such as the north slope.

The role of civil engineering in developed countries takes on a further dimension when we realize that basic societal needs for sanitation and transportation have been accomplished only at a minimum level over the past 100 years.

As one observes the rapid construction of homes, apartment complexes and office buildings in this country, it easy to get the impression that the construction industry is well established and mature. However, this is an area of great potential for the development of civil engineering technology and professional expertise. It is widely accepted that the construction industry today is highly labor–intensive, inefficient, and competitive. There is great opportunity for the development and management of new technologies in automated construction and the utilization of computer databases, computer process planning, and new management techniques. We have all witnessed the effect on the U.S. manufacturing industry that the development of new manufacturing technologies abroad has had. It is highly unlikely that we will face a similar crisis of employment resulting from competitive technologies abroad in the construction industry. Our survival in this industry will depend to a large degree on our civil engineers to provide new design concepts, construction techniques and methodologies and practices which will keep us competitive.

For the young engineering student, the challenge of civil engineering should provide a broad spectrum of exciting alternatives. Like medicine, it is essential to our quality of life and longevity. For our lifestyle, it is essential. To our transportation needs, our dependence on energy resources, and our exploration of new natural resources, we are dependent. Finally, civil engineers must provide us with a new industrial base in the construction industry with modern technologies patterned after those which are transcending our manufacturing industries from labor intensive activities to fully automatied, computer integrated manufacturing systems. For those students who have thought about civil engineering as a career, I am sure you will agree that the opportunities and the challenges are there to be met.□

Photo Courtesy of WI Sea Grant Institute

Piles driven through dock by ice forces on the Wisconsin shore of lake superior.

The Sea Grant Institute: New Ways to Break the Ice

by Peter Borden

In creating any man-made structure, it is important to consider the natural forces that will affect it. Until we see a tree blown over or a shed roof collapsed, we tend to forget just how strong wind and snow can be. Similarly, when building a pier in summertime it is easy to forget what the ice will do to it in the winter. Upon looking at their handiwork in the spring, many people have gotten rude reminders of the power of ice: docks are warped, broken, snapped loose from whatever anchors them--their pilings may even be pulled up out of the lake bottom.

The destructive power of ice can be an annoyance, and a great expense. If an entire marina is built, and the design does not account properly for ice, every dock in the marina can be destroyed in one winter. Even though an ice sheet may appear solid and stable--even though you can go fishing, skating or even drive your car on it--it is always on the move. A change in the water level of a lake, for instance, is always accompanied by a change in the level of the ice. Changes in air temperature can cause ice to expand, contract, break, or sheer. Waves and wind can also move ice, particularly on larger lakes. In lakes with a current, the current can move the ice sheet as well.

All of these kinds of movement will exert force on any object caught in the ice, including a pier. These forces can amount to hundreds or thousands of pounds for the whole pier structure, and can really wreak havoc. The damage may be minor (especially on a small, still lake) or it can be very dramatic. Docks can be warped laterally into snake-like patterns or curled up like potato chips. Vertical movement of the ice can cause pile uplift. If a floating dock is anchored with cables, the cables can be snapped, or the anchors pulled up.

There is no single simple solution to the problem of ice damage, but understanding how ice behaves can make it easier to minimize problems. Exploring ice's unique and sometimes bizarre behavior has been the province of C. Allen Wortley at the Sea Grant Institute here at the UW for more than a decade. The Sea Grant Institute has been doing field studies of ice conditions and dock damage, investigating solutions, and collecting and disseminating information on designing and protecting harbor structures.

Wortley's work has contributed greatly to the understanding of ice and ice damage, and has helped make harbor construction and maintenance safer and less expensive. He has written a number of pamphlets on the subject, as well as Great Lakes Small-Craft Harbor and Structure Design for Ice Conditions: An Engineering Manual--a thorough guide to understanding the forces at work, the variables to consider, and the possible solutions to ice damage.

Wortley traces his curiosity about ice to the first marina he designed, for a Lake Superior harbor. After the first winter, all of his docks had sunk. It is obvious that through his years of research and experience he has developed a strong respect for ice, a respect he hopes to pass on to others, whether they are designing an entire marina or just putting in a dock at their cottage.

If the dock is small enough that removing it from the lake each winter is practical, this is the surest way to prevent ice damage. Removable docks that rest on pilings need to be designed so the pilings left in the lake are below the deepest level of the ice, so they don't sustain damage. Floating docks can also be freed from their moorings and stored on land.

These solutions, however, are not sufficient for larger harbors. It would be impractical to pull a whole marina up on shore for the winter. The size of the pier system and the need for stability may preclude floating docks. Fortunately, workable remedies for fixed-pier damage have also been developed.

One solution is simply to make the piles strong enough and secure enough to withstand the force of the ice. This involves not only using strong construction materials, but also intimately understanding the environment, especially the lake bottom, before beginning any construction project.

As Wortley puts it: "It is important to remember that a marina dock is a relatively simple man-made structure in a relatively complex water-soil-ice environment." He points out that the glacial soils of the Great Lakes region are particularly varied, and you can't make assumptions about what's below the surface. Core samples and soil surveys of the bottom must be done carefully for each site, and a system for anchoring piles must be developed based on the information. According to Wortley, a skilled soil engineer is crucial to a successful project.

A promising technique for protecting pilings is de-icing. In many lakes, the temperature of the water beneath the ice is slightly above freezing. Fortunately, water as little as a half a degree above freezing can melt ice if it is continually circulated. In a typical system, compressed air is run through tubes along the lake bottom. Streams of bubbles are released at the base of the pilings, and as they rise they bring with them the slightly warmer lake water, keeping the ice continually melted around the pilings.

Ice's strength and relative unpredictability command the respect of engineers, and require the resources of not only their knowledge but also their creativity.

Once again, de-icing is only a possible solution, not a panacea, and a detailed assessment of the environment--including ice formation, ice thickness, water temperature, and snow cover--must be made before a decision can be reached.

In his manual for harbor design, Wortley provides many suggestions about how forces can be estimated and how pier systems can be designed, but he repeatedly stresses the individuality of each situation. Understanding the action of ice involves understanding many variables, but even this knowledge is just a hedge against the power of ice. Ice's strength and relative unpredictability command the respect of engineers, and require the resources of not only their knowledge but also their creativity. □

Peter Borden is a grad student in English, of all things. He's anxious to learn.

Photo Courtesy of WI Sea Grant Institute

Ice raises and falls with changing weather, taking dock pilings with it.

Transportation Engineering
Using the Computer to Reduce Accidents

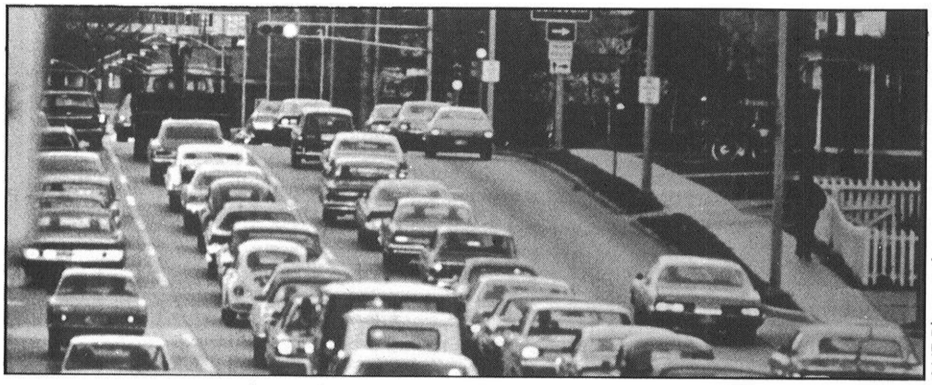
by Mark Voss

When I asked Professor William D. Berg why he had chosen transportation engineering as his profession, he pointed out the window.

"It's right there," he said, referring to the results of his work. "You can touch it and feel it."

The transportation engineer drives through his laboratory on the way to his office, and can see his contribution to society. Transportation engineering, like few other disciplines, affords its practitioners the means to directly assist millions of fellow citizens. It is engineering on a grand scale, and provides the technology for maintenance and control of the highway and rail systems, as well as the boat lanes and the airlines. It is a socio–technical field, in which people, the "transported," play as large a role as the technology.

Funding for transportation systems comes primarily from the public sector, and so the engineer often has the opportunity to work closely with the government. Employment is constant. All idustrialized nations are faced with the problems inherent with moving vast amounts of people safely and efficiently, every day.


WE Photo File

Older-looking cars cruise down Johnson Street.

The transportation systems in countries like the U.S. usually work so well that most people do not appreciate their existence; rather, it is expected that travel from point A to point B should be safe and easy. It is both, for the most part, because of the amount of thought put into modern systems by transportation engineers.

Computer modelling has become a large part of present design and evaluation of transportation systems: Models such as TRANSYT and NETSIM are applied extensively in everything from traffic flow simulation to accident prediction. The TRANSYT model's database contains volume flow rates and the network's geometry, and it optimizes traffic signal timing in order to minimize a performance index, such as fuel consumption or stopping time. In the traffic signal network of an entire city, TRANSYT might adjust signal timing so that the average driver must stop at as few lights as possible. NETSIM is even more complex in that it simulates the velocity and acceleration of individual vehicles in a network, describing the entire flow within the computer.

Professor Berg has used such models in his research on traffic systems management, and on the safety and operational effects of traffic control elements. His work has focused on the development of better warning devices to improve rail–highway grade crossing safety. A credibility problem currently exists with many signal devices. Many drivers seem to think that they know better than the flashing lights. Accidents commonly occur when a driver approaches an active signal, looks around, ponders over options, and then tries to beat the train. Since the car is outweighed severely, the decision to go often results in the driver becoming "of late," rather than simply late, had he waited.

Using computer models that predict accidents and accident causation, Berg and others can develop signals that will motivate drivers to stop when the lights flash. Professor Berg believes that the future in transportation engineering lies in making existing facilities safer. Often the trick is in understanding and providing for the sometimes irrational actions of the system users.

Unfortunately, there are no tricks to acquiring more funding to improve safety and efficiency, but research is underway to make dollars more productive using the computer: Recently an instrumented vehicle roamed Wisconsin highways, taking a photograph every 52.8 feet, and measuring the bearing, slope, and pitch of the road. From this data, software will eventually generate plan and profile drawings of our highways. This large database will greatly simplify cost analysis for changes and repairs. Changes can be made on the computer model, and effects can be measured and prepared for without disturbing a single road sign. The computer will be able to identify hazardous locations through comparison with environment–based accident prediction models, and it will aid in the economic decision–making necessary before corrective construction begins.

What makes transportation engineering interesting is both its complexity and its direct link to physical geography. Every city or stretch of land poses a different set of problems, and each must be accounted for to develop safe, efficient transportation systems. There are so many variables, and the most complex are the people who use the systems. Madison has its own unique transportation problems because a narrow isthmus defines the city, permitting few streets and limited routing. In the years ahead, transportation engineers might fix Madison using computers with artificial intelligence, or they might also work in developing countries to bring about standards already enjoyed here. Opportunities in the field will exist as long as society is mobile, and there is little chance of us slowing down. □

Mark Voss is a junior double majoring in Electrical Engineering and English. Good luck Mark!

James P. Scherz

Civil Engineering Meets Indian Art

by Trudi Brown

Professor James P. Scherz is a very interesting and outstanding faculty member of the UW–Madison department of Civil Engineering. His interests range from photogrammetry and surveying to the crafting of wooden–geared clocks. He has an especially strong interest in Indian art and culture.

Professor Scherz received his bachelor's and master's degrees from UW–Madison. After college he joined the Army as a career officer and spent five years in Germany. He put in his resignation in 1965 and got out of the Army two weeks before the Army froze all resignations as they prepared for the Vietnam War.

Scherz then came back to the U.S. and began teaching at UW. Here he became involved in the research of determining water quality using satellites. While teaching at the University, Scherz received his Ph.D.

His following work took him to parts of northern Wisconsin, Michigan, and Minnesota. In particular, he worked along river systems where ancient Indian sites were located. These sites had been previously overlooked by archeologists.

Scherz and his co–workers developed an hypothesis to explain why these unique sites happened to fall along the river systems. Their explanation was based on the existence of copper mines along Lake Superior. Approximately 250,000 tons of copper were mined by the Indians. It was Scherz's view that the Indian sites marked the shipping route of the excavated copper. The mounds that remain are remnants of the so–called "pit–stops" for boats carrying the copper. Support for this hypothesis is the Indian art found in Muscoda, Wisconsin. The art is similar to art found at a site located in Oklahoma which was a giant trade city in 1200 A.D. This art is evidence of long range trade and communication used by the Indians.

Another area of great interest is the Necedah site, located in the UW–Madison Arboretum. This area is of particular interest because of its geometry. The angle 23½° was commonly used for the layout of mound structures. This angle is significant because the Arctic Circle is 23½° south of the North Pole, the Tropic of Cancer is 23½° from the equator and the earth is tilted 23½° off the vertical. Another significant angle used in the Necedah site is 51½°. This angle was used in Roman and Greek temples, early Christian churches, and Egyptian pyramids. Standing on a pyramid–shaped mound, the Indians lined up the rising sun with a pole on a "crescent marker mound". By doing this they could view the winter and summer solstice alignments. This helped the Indians estimate a rough calendar year.

The mounds at Necedah appear to be specifically arranged. Each mound and rock pile is aligned with the others by the significant or 180 degree angles.

Symbolism is apparent in the mounds themselves as well as their layout. A few of the mounds resemble the shapes of plumed snakes which face in the direction of the rising sun. Probably the most outstanding example of symbolism in the layout of the Necedah site is the resemblance of the mounds to stars in the sky. An aerial view reveals a strong similarity to a snapshot of the night sky. The mounds and rock piles of Necedah can be matched with the prominent stars, including Taurus, Polaris, and the Milky Way.

The maps of the Indian sites are put together using surveying and photogrammetry, methods taught by Scherz within the Civil Engineering Department. The department has specialized equipment which takes two photos and projects them into one, producing a 3–D effect. From this projection a map can be drawn, with altitudes and distances calculated to within one inch.

Another one of Scherz's roles is that of chairman of the board of a new group called the Ancient Earhworks Society. This organization was founded two years ago and now boasts a membership of approximately 70-80 people. The occupationally diverse group is interested in preserving historical sites. One major project they are presently working on is a collection of old books containing surveying maps of the 1800's. Many of the books are the only copies now available. The Ancient Earthworks Society makes copies of these books and sells them to the public, preventing loss of these valuable books forever. It is a great service, providing information that would otherwise be very difficult to obtain.

Professor James P. Scherz is a great asset to the Civil Engineering department as well as to the community at large. He is an overflowing source of information on many diverse topics and is a very interesting person to talk to. □

Trudi Brown is a freshman intending to major in Electrical Engineering.

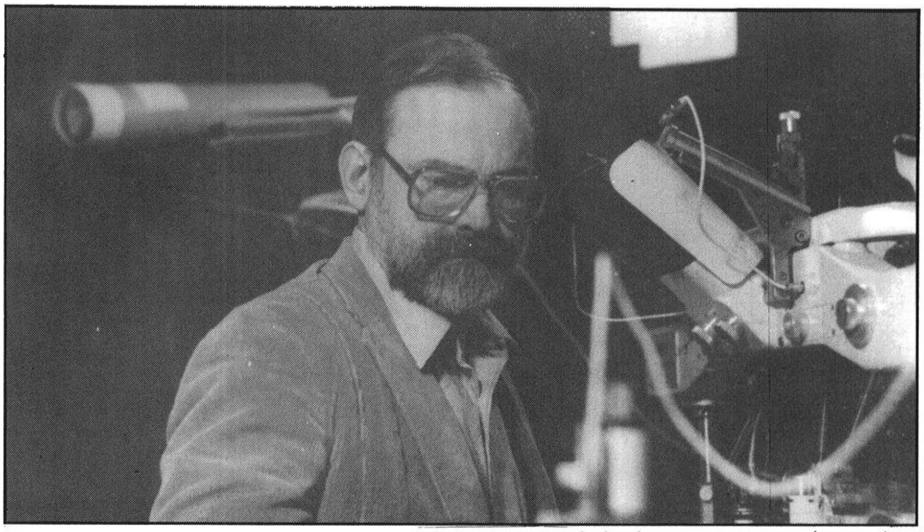


Photo by Gary Webster

James P. Scherz at work in the CE lab. His research interests include photogrammetry and surveying.

Expo Promises Diversity

by Courtenay Deniston

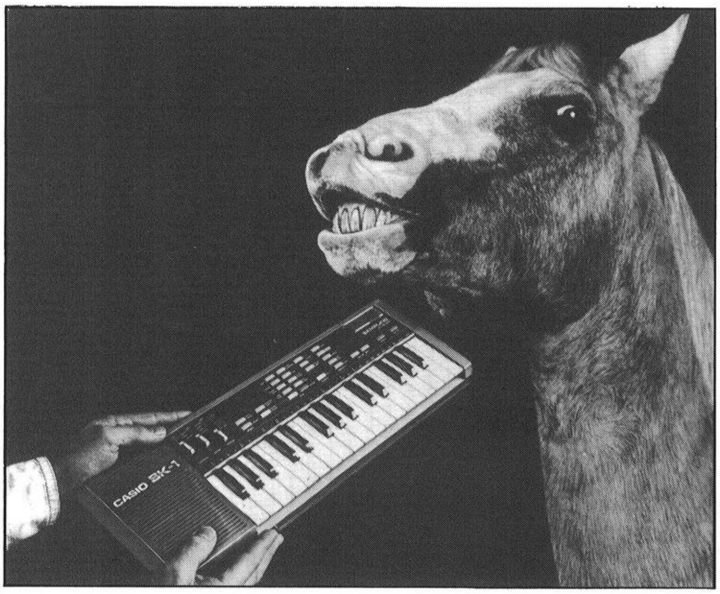
From computers to synthesized music to fur-lined wind tunnels, 1987's Engineering Exposition promises to be different than past Expo events. To begin with, this is the first year the students organizing the event have had their own office, let alone a private phone. Computers as well as telephones will make their debut as Expo personnel have access to several terminals which have been set up in the Expo office.

Computers seem to be a popular topic for the student exhibitors as well. Among the entries are two which will show in enlarged form the inner workings of the computer. One group is developing what will eventually be a large-scale version of a micro-chip. Spectators will be able to enter commands on a computer, then watch as the programs are translated into the computer's language. Kappa Eta Kappa, the professional electrical and computer engineering fraternity, is working on a similar project; a series of models which show, in great detail and size, how a computer works.

Another first for Expo is the introduction of a Special Exhibits section that will highlight engineering in everyday life. The focus of this section is music and engineering. According to Special Exhibits Coordinator James Riehle, "We want to show the public how much engineering actually affects their everyday lives. One of the obvious ways is the music we listen to and how we listen to it." The music exhibits will include displays and demonstrations of the latest technology in musical instruments and home stereos. Local retailers and national equipment manufacturers will be on hand to show and explain some of their pieces along with several UW students whose projects fit into the music/engineering category. The Society of Women Engineers' demonstration involving the digital-audio sound of compact discs is one such design. Another group of students is putting together a MIDI-interface between a saxophone and a synthesizer.

One of the most unusual projects of Expo '87 will be a fur-lined wind tunnel. Chemical Engineering student John Schoenherr will be covering the wind tunnel in the Mechanical Engineering building with fur. He intends to show how the movement of wind and water through the tunnel would affect the transfer of mass during animal metabolism and reproduction. John has been working on the problem all year as an intern in the zoology department.

From computers to synthesized music to fur-lined wind tunnels, 1987's Engineering Exposition promises to differ from past Expo events. Expo '87 will be held on April 3,4, and 5 on the engineering campus.



WE Photo File

Yes indeed, this year's Expo promises to be just a little bit different.

Students cite a number of reasons for entering the exposition. Some will receive upper level technical credits for their work while others hope to win some of the $5000 in prize money to be awarded at the conclusion of the event. Other reasons include the possibility of meeting company representatives and the chance to include the experience on a resume. Many students welcome the opportunity to put to use what they have learned in the classroom. The fact that they are creating and designing the exhibits themselves adds to the interest and excitement.

Expo '87 will be held on April 3,4, and 5 on the Engineering campus. □

Courtenay Deniston is a third year Journalism student. She's not on staff per se so we don't really know too much about her.

UW-MADISON
COLLEGE OF ENGINEERING

PRESENTS

EXPO '87

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- **Hear and see the latest in music technology as EXPO looks at " Engineering and Music"**
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APRIL 3 - 5

Friday April 3	Saturday April 4	Sunday April 5
9 a.m. to 7 p.m.	9 a.m. to 7 p.m.	10 a.m. to 5 p.m.

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EXPOse Yourself

by Gregg Schiwalski

Encounters with engineering technology occur everyday. Turning on a stereo system or starting the engine of a car are just a few examples of these encounters in everyday life. But in most cases, people never stop and think about the "behind the scenes" technology that went into starting the car or hearing the music projected from the stereo. As Industrial Exhibits chairman for Expo '87, I am participating in a unique challenge to bring the public in touch with this "behind the scenes" technology of everyday life as well as the technology of the future.

Because so many diverse things come from all aspects of engineering, Expo is represented by all departments of the College of Engineering. The route for Expo reflects this diversity by winding through the various engineering buildings on campus. As the public walks this route, they will experience just how deeply engineering reaches into their lives.

People of all ages attend Expo. Friday, April 3 is classified as student day for high school and UW students. The College of Engineering does not have class that day, giving engineering students added incentive to attend the event. The doors are, of course, open all three days to the general public, young and old.

This year's Expo theme is titled, "The Future Unfolds...". This theme shows the impact of technology and engineering on the future. Student and industrial exhibits will be demonstrating this impact with dynamic displays of tomorrow's technology. Expo '87 will also show how technology has expanded the world of music. Many recognizable devices in music will be presented with the "Behind the scenes" look at the technology involved. Expo will indeed be a stage for people to witness advancements in technology.

Over the years, Expo has evolved into a showcase for industry and students alike. The student exhibits show the public what is happening within the College of Engineering. The industrial exhibits demonstrate efforts made by corporate engineers to improve the quality of life for all. It is the combined effort of these two groups that helps spark a sense of wonder in the minds of the public.

The organization of Expo is as intriguing as Expo itself. The planning committee is formed at least a year and a half before Expo. This eight member committee is composed entirely of students. Ann Henry and Nat Zettel are the co-chairs. The remaining six members are Tom Franke (building and exhibits), Sherri Johansen (advanced promotion), Mindy Raterink (high schools), Dave Schwarz (student exhibits), John Taylor (publicity), and myself (industrial exhibits).

The Expo Executive Committee also seeks the help of other UW students. These students help with everything from phone calls and doughnut sales to envelope stuffing and organizational planning. All the involved students' efforts culminate on the three days of Expo, April 3-5, 1987.

Technology has even reached into the organization of Expo. Expo '87 has had the opportunity to use a number of personal computers. By using word processors, the Executive Committee has been able to get literature out quickly to companies and the public.

The committee has also written their own software. An Expo simulation program was written to run Expo on a computer before it happens so any problems can be detected early. Data base programs were also written to keep track of the number of exhibitors and the immediate status of he exhibits. Even Expo has its own "behind the scenes" technology.

Expo '87 has the support of the College of Engineering. The college helps underwrite expenses by providing loans for the promotion and production of the event. These loans are paid back when sales for Expo are completed. Any informational support is provided through a Faculty Advisory Committee which consists of the Expo Advisory Dean (Dean Wortley), other professors, and engineering clerical advisors. Without this assistance, Expo would never get off the ground.

In addition to the organization of the exhibits, there is a great deal of other planning that goes into Expo. To generate income and keep Expo from needing too many loans, there are a number of doughnut, t-shirt, and button sales throughout the year. The publicity staff comes up with interesting ways to spread the Expo word around. This is where the phrase "EXPOse Yourself" came from. One of the biggest tasks in Expo is the organization of the program booklet which is distributed at the event. With all this going on, it is easy to see why Expo takes over one and one half years to organize.

Expo is this university's way of showing the public the "behind the scenes" of the world of engineering. Expo demonstrates how technology is a part of our everyday life. It also shows how today's ideas become tomorrow's technology. The future will unfold on April 3,4 and 5. Become a part of it and "EXPOse yourself" to Expo. □

Gregg Schimalski has something to do with Expo. We really couldn't find any biographical information on him. Our best guess is that he's either a freshman or transfer student.

WBESS is A-MAZ-ING

by Bryant Davis


Bryant Davis works on his Expo project, "Pitch Player."
Photo by Jeff Molter

The Wisconsin Black Engineering Student Society (WBESS) has undertaken two very challenging Expo projects entitled, A-MAZ-ING and Pitch Player. A-MAZ-ING has practical applications for blind people while Pitch Player will serve as new creative tool for musicians.

A-MAZ-ING

A-MAZ-ING is a synthetic fiber-optic platform with an interface to a computer. A-MAZ-ING contains photo-diodes which are capable of detecting variations in light intensity. Consequently, this peripheral enables a computer to verbally communicate and display the location of individuals or objects on the platform.

A-MAZ-ING consists of two major components. The most important component is the photo-diode. This is the heart of the project as it is the primary sensor. A-MAZ-ING consists of a 12 ft. x 12 ft. array of photo-diodes. The logic state (high /low) is uniquely determined by the intensity of light present on the diode.

The other major component of A-MAZ-ING is the external controlling hardware. SSI and MSI Integrated Circuits are used to control the operation of A-MAZ-ING.

The development of A-MAZ-ING will require WBESS to organize into eight research groups specializing in a different branch of engineering. This is intended to give members experience in working in a simulated corporate structure. This project will give the members of WBESS a chance to experience some practical applications of their respective engineering majors.

Pitch Player

In addition to working as a group in the creation of A-MAZ-ING, WBESS members participate in the development of their own individual projects. Currently the Electrical and Computer Engineering Group is working with Kappa Eta Kappa (a professional electrical engineering fraternity) on a computerized music project equally as innovative and rewarding as A-MAZ-ING.

Many significant developments have taken place in the field of music over the past decade. The most revolutionary has been the introduction of the computer to control processes, such as digital sampling, digital signal processing, and automated sound reproduction.

When a musician wishes to incorporate a computer with music, he traditionally uses MIDI (Musical Instrument Digital Interface). Musical instruments such as digital sampling keyboards equipped with MIDI are connected to the computer. Digital signal processing takes place either in the computer or in the keyboard.

While MIDI is a common application of computers in music, the Electrical and Computer Engineering Group and Kappa Eta Kappa are investigating a new application for computers in music. They are presently in the process of designing and testing the Pitch Player. The Pitch Player is a device that recognizes the pitch (frequency) of a particular note on an instrument and transforms it into the MIDI standardized code. This transformation has revolutionary implications. It will now be possible for a saxophone, for example, to sound like a piano, drums, guitar, etc. using MIDI.

The Purpose

The development of both A-MAZ-ING and Pitch Player will give minority engineering students a chance to sharpen their engineering skills and gain practical knowledge in the field of engineering. The project Pitch Player will require substantial funding. Hopefully, these funds can be procured by corporate contributions in the form of equipment and or money. In return, the contributing corporations will receive substantial exposure for their product during Expo '87 at which time A-MAZ-ING and Pitch Player will be exhibited. □

Bryant is a fifth year senior majoring in Electric and Computer Engineering. He is active in WBESS and Expo.

Engineering Briefs

by Paula Grgurich

Mechanical Engineering

Research is a strong component of mechanical engineering and support for research continues to grow. Engine research funding from the Department of Defense has greatly enhanced research and graduate study in the Internal Combustion Engines Laboratory. Under the direction of Gary Borman, the laboratory emphazises research concerning combustion lubrication and new materials for engines.

Recognition also goes out to Ali Seireg who has been awarded honorary membership in the Chinese Mechanical Engineering Society. Seireg was one of five Americans at an international forum in Moscow addressed by Mikhail Gorbachev last year.

Metallurgical and Mineral Engineering

Max Lagally was appointed Bascom Professor of Surface Science and Technology. An expert in the use of diffraction for the analysis of surface structure, he helped develop the college's Materials Science Program. He is also director of the college's Thin–Film Deposition and Applications Center. The professorship is named for John Bascom, the UW's sixth president.

Richard Moll has been named a fellow of the American Society of Metals. Moll was selected for his work on product safety, liability prevention, and "failure analysis technique training."

Roger Boom received the 1986 Byron Bird Award for an outstanding research publication. He has published a series of papers and holds several patents on a superconducting magnetic energy storage system. The system uses a large electromagnet supercooled with liquid helium to allow it to hold large amounts of energy.

Henry Fuller, a Ph.D candidate in the Materials Science Program, won a Fulbright award for 1986–87. These awards are used for study abroad. He is now in Japan.

Dean Bollinger honored.

Dean Bollinger was installed as president of the International Institution for Production Engineering Research (CIRP) at its annual general assembly in Haifa and Jerusalem, Israel. CIRP, named for its French spelling, is composed of about 140 experts in manufacturing research and development from 30 nations. At the general assemblies, members and invited engineers present technical papers on subjects such as automation and robotics, metal cutting and grinding, machine tool design, and product quality. Bollinger is the 4th American president in CIRP's 35 year history.

Electrical and Computer Engineering

The ECE department is enhanced by a faculty of excellent teachers who also perform research at the highest level.

Allan Scidmore received the 1986 Benjamin Smith Reynolds Award for outstanding teaching of engineering students. He was cited for his continual efforts to provide a quality classroom education and for his development of innovative teaching materials, both written and visual, in rapid developing areas of electronics.

Willis Tompkins, John Webster, and Paul Bach–y–Rita are part of the $5 million NASA grant for a center in space automation and robotics. The robotics project's goal is to design a Maneuverable Anthropomorphic Robot System (MARS) that can be controlled from a distance. Besides robotics, center researchers are studying ways to mine a rare helium isotope on the moon. A project is also under way to examine the feasibility of putting a greenhouse in space.

Franco Cerrina recently was awarded a three year $400,000 grant from the National Science Foundation to study and model various aspects of x–ray lithography. UW–Madison's Alladdin storage ring is operating as one of the nation's best x–ray sources for this work. X–ray lithography holds the promise of shrinking the smallest features of integrated circuits to about one tenth of the current size in commercial chips.

C. Daniel Geisler has been working for the past two and one half years on Project Phoenix, a $5.5 million effort to produce the world's first digital hearing aid. The project has yielded its first product––a greatly improved device to test hearing impairments. The device is called Aurora. The prelude to the development of the "custom–fitted" digital hearing aid, Aurora should remedy problems common to traditional hearing aids such as uncomfortable loudness, difficulty distinguishing voices in a noisy room, and inconsistent speech clarity.

Hazardous Waste

Disposal of Waste,

by Pete Steinhoff

As technological advances sweep us from the industrial age into the information age, hazardous waste is accumulating to the point where it can be ignored no longer. Recently I talked with Professor Jey Jeyapalan of the Wisconsin Hazardous Waste Management Center (WHWMC) and Peter Reinhardt, the Hazardous Waste Supervisor of the University Safety Department, about managing our accumulating waste. This feature captures our discussions and will focus on the different types of waste, the treatment and disposal methods for waste, and the policy making decisions involving civil engineering.

The WHWMC is concerned with training Environmental Protection Agency (EPA) staff. Jeyapalan has been responsible for coordinating faculty and organizing the training of these individuals. He described to me four different types of waste.

1. **Non-Toxic Waste:**biodegradable waste, matter with low sodium chloride content, or solid waste.
2. **Hazardous Waste:**industrial waste such as used motor oil or some of the by-products from tire production and metal plating. Hazardous waste includes ignitable, corrosive, and reactive waste.
3. **Low-Level Nuclear Waste:**primarily research and biomedical waste such as hospital waste produced from cyclotrons, x-ray machines, and cancer research.
4. **High-Level Nuclear Waste:**waste from nuclear power production.

High-Level Nuclear Waste especially concerns the state of Wisconsin since it receives 40% of its power from nuclear power plants. Due to Wisconsin's granite rock surface formation, it has

Management:

not the Environment

Non-Toxic Waste	Hazardous Waste
Landfill Refuse Derived Fuel Incineration	Landfill Surface Impoundment Underground Injection Incineration Chemical or Physical Treatment
Low-Level Nuclear Waste	**High-Level Nuclear Waste**
Landfill Incineration Decay Containment	Landfill Containment

also been targeted as a possible disposal site for nuclear waste.

One of Reinhardt's responsibilities for the Safety Department is the management of hazardous waste produced by this University.

Most of UW-Madison's waste is produced by research. Peter described to me the treatment and disposal of waste. Treatment is concerned with the destruction or reduction of the volume of the waste. Once hazardous elements are removed, remaining materials may be recycled or disposed. Disposal is concerned with long term containment of hazardous waste. The following chart illustrates how the four types of waste are treated and disposed.

The most common waste management method uses surface impoundments. In an impoundment, waste is treated or disposed of by containment in a lined pond. The second leading waste management method is underground injection. In underground injection, waste is "Injected"into dry oil wells which consist of porous rocks such as sandstone, limestone, or dolomites at depths from 1,000 -6,000 feet. Less common is the landfill, in which waste is dumped into a low area of land. This area is then built up by alternating layers of waste and soil.

The remaining waste management methods are not as widely used. Refuse derived fuel is a treatment method where normal trash is converted into fuel for burning. Incineration focuses on decreasing the volume of waste before other methods are used to dispose of the waste. Chemical treatment concerns neutralization, precipitation, and oxidation\reduction of waste. A distillation process for recovering recyclable organics is an example of physical treatment. Decay is a characteristic of much low-level nuclear waste that reduces its concentration. For example, phosphorous 32 (used largely in biomedical research) has a half-life of 14 days. Wastes with short half-lives can be stored on shelves until harmless and then treated or disposed of.

Waste management is a very real, controversial issue today. In 1980 the Resource Conservation and Recovery Act detailed guidelines which must be strictly followed in hazardous waste treatment and disposal. These guidelines may be considered to be a battle line between market demands and civil engineering knowledge and EPA enforcement. "The technology is simple, but the policy-making is a tangled web," according to Reinhardt. The following steps are typical in licensing any waste management site.

Step 1 3-4 yrs

The EPA sets standards and determines how testing of the waste treatment and disposal will be conducted.

Step 2 2 yrs

The permit is written.

Step 3 1 or more years

Public approval of the site must be acquired in spite of NIMBY, an acronym for "Not in my backyard".

Civil engineering is helping meet the demands for more incinerators. Market demands are exerting pressure on the EPA to permit more and more waste management sites. Presently, the US operates 20 incinerators near capacity. Since the EPA may ban surface impoundment and underground injection, incineration will be a leading treatment method. How can even more waste be treated at these 20 incinerators? The civil engineering knowledge has been developed to meet present and future market demands for treatment and disposal of hazardous waste. In fact, present incirneration technology is relatively simple. The future holds two more methods for treating hazardous waste. The first is Plasma Arc, a process involving the burning of waste at temperatures up to 4,000° centigrade. The second is liquid incineration at sea. This method involves incineration of waste at sea with gaseous effluents naturally neutralized by seawater.

By refining existing technologies and developing new ones, the future will no doubt hold a safe and effective way of dealing with our hazardous waste. □

Photo by Gary E. Smith

Some thoughts about

From the Class of '86.

"It's really competitive out there. Different producers, different *countries,* after the same markets. And that's good because the more effectively we compete, the better our products become.

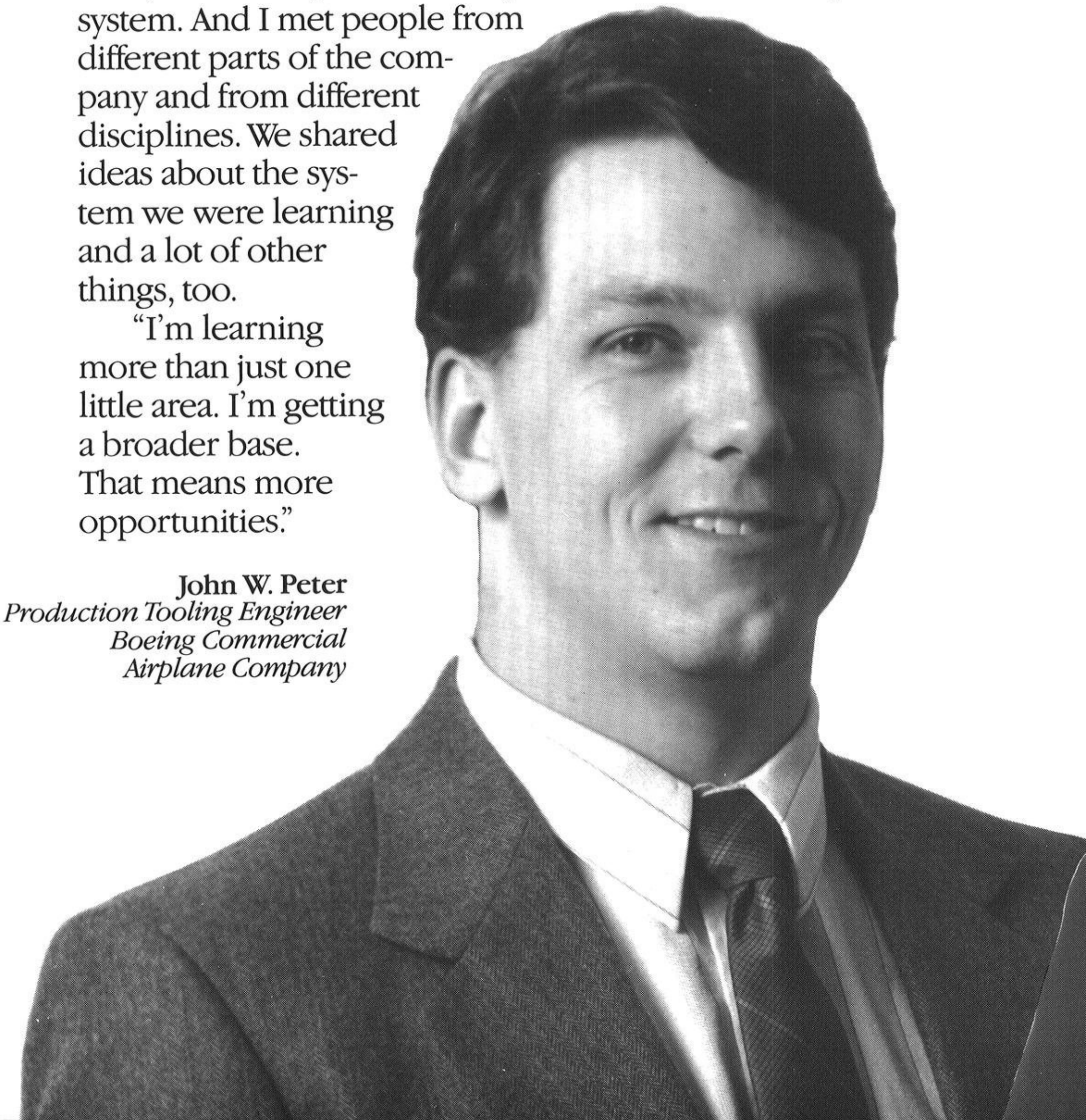
"We're working with the Japanese on a new airplane. It's a strong combination. Like us, they deal with ideas. They sell high quality, high tech.

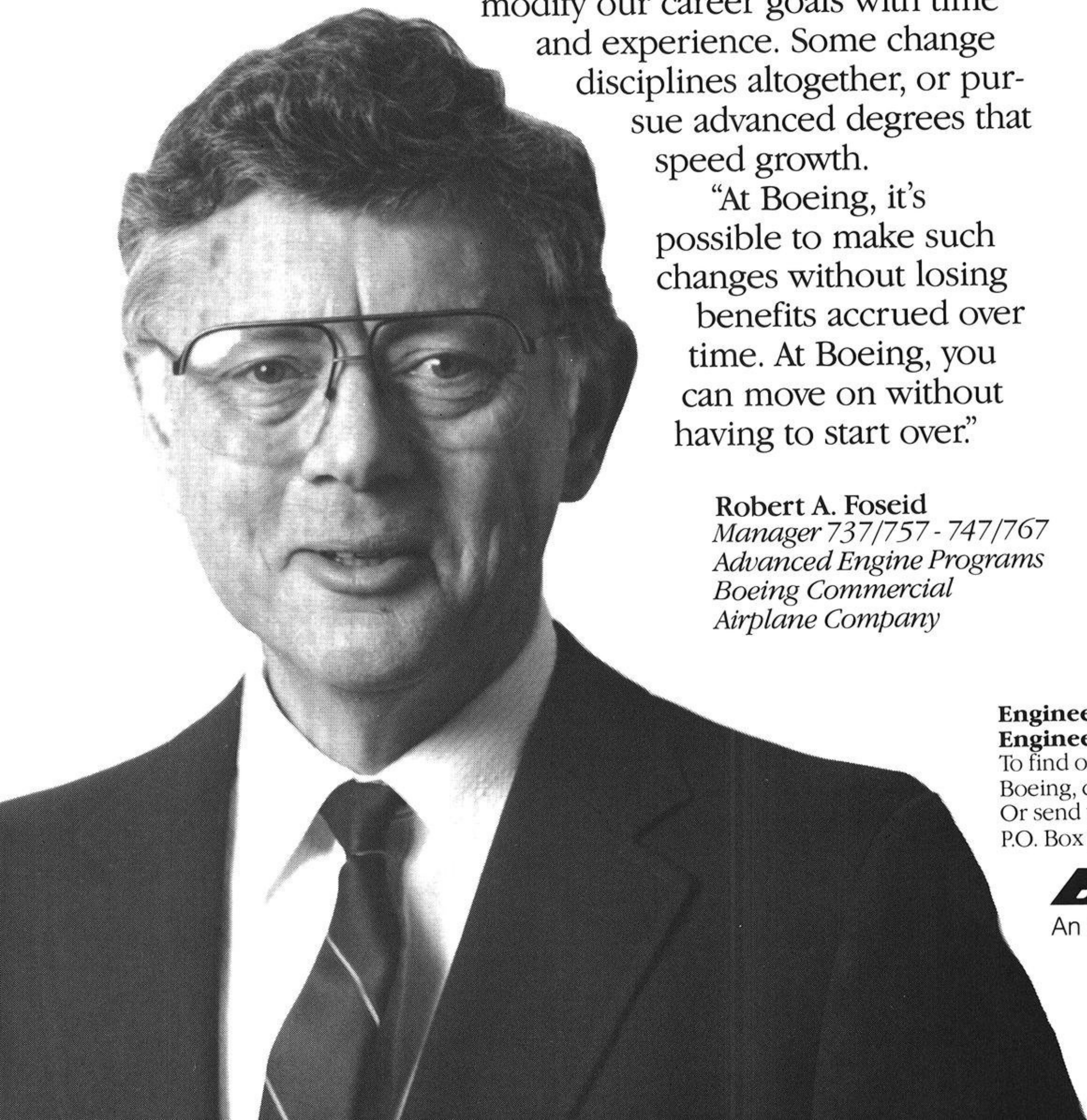
"I like the idea of working with the best people, no matter where they are in the world. And Boeing is exciting from the standpoint of personal growth.

"I took a Boeing computer class recently. An 80 hour class, two weeks, 8 hours a day. I learned a new computer system. And I met people from different parts of the company and from different disciplines. We shared ideas about the system we were learning and a lot of other things, too.

"I'm learning more than just one little area. I'm getting a broader base. That means more opportunities."

John W. Peter
Production Tooling Engineer
Boeing Commercial Airplane Company





Move Over Phil!

Buethling Moves Up at Donohue

by Eric E. Schaefer

Terrance Beuthling graduated from UW-Madison in 1968 with a degree in civil engineering. He is currently employed by Donohue & Associates Inc. of Sheboygan. I recently had a chance to talk with him about his career and asked him for his advice to current engineering students.

Q.Terrance, what is your position with Donohue?

A. I'm a vice-president in charge of the Madison office. I also manage the civil engineering division.

Q.What is the most rewarding aspect of your job?

A.When an idea becomes tangible. That's when it really pays off. Especially rewarding is when I go back and see work I have done. Another rewarding part of being a civil engineer is the variety of projects.

Q.Are you doing the type of work you planned on after graduation?

A.Prior to getting my degree, I took advantage of summer employment programs, so I was reasonably confident that when I got my degree I had made the right choice. I knew what I wanted to do. You have to make up your mind about what you are going to do and then do it.

Q.How is the job outlook for civil engineering?

A.Good. Public works has been one of the mainstays. When the country has money to spend, the government is going to build streets, sewage systems, etc.. When there is a recession, the government spends money to get people employed, so the field is really quite stable.

Q.I understand you worked in Saudia Arabia. What did you do there?

A.We designed the housing and maintenance facilities for a fleet of 800 garbage trucks for the city of Jetta. We did all of the survey work, sewers, streets, and designed all of the buildings.

Q.What was it like living in Saudia Arabia?

A.Great. I really liked it. It is a totally different culture. The people there were very friendly towards Americans. Saudia Arabia is a very safe country--I never felt threatened for a moment. It was a good time.

...what's going to land the job for you is experience.
If you can demonstrate that you have experience, you're much more atractive to the employer.

Q.Regarding your career, if you could do it all over again, would you change anything?

A.Yes, I would. I would have been much more willing to travel in the early years. I think civil engineering offers these opportunities more so than some other professions do.

To go overseas and be part of another culture broadens you. Even travelling in this country would broaden your perspectives so that you could get along better with people. This is important because engineers tend to be poor communicators, both orally and verbally. Engineering students will clearly benefit if they improve their communication skills.

Q.What advice would you give to students to help them prepare for the "real" world?

A.The most important thing would be to enter the "real" world long before graduation. . . by working both before and during their college years. These people come to us with a good work ethic and are well disciplined. I don't see this being developed so much these days.

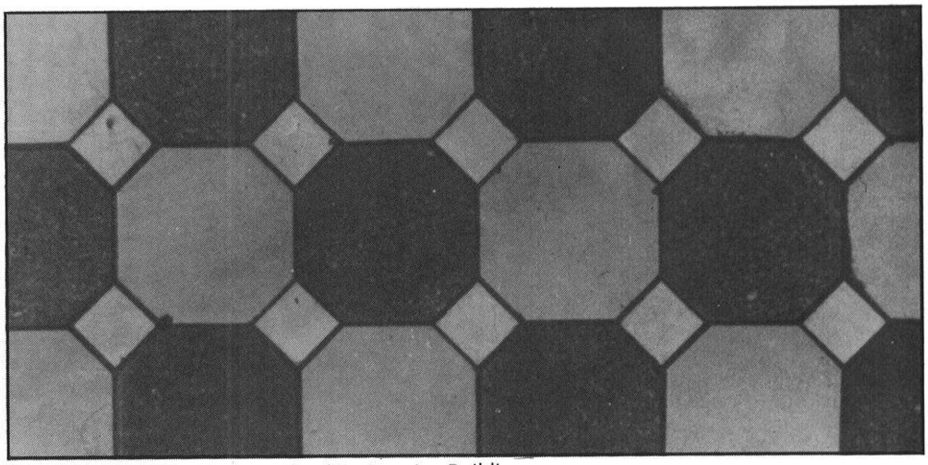
Q.What advice would you give to graduating students who are preparing for interviews?

A.We have many applicants coming into this office. It takes me less than two minutes to render judgement on someone. The first impression is critical.

There are three things I look at in a potential employee. The first is the person's appearance. Secondly, I look at how articulate they are. The third thing is their work experience. The first two criteria play the most important part in the first few minutes. I form some impressions that need to be overcome or reinforced. Many people don't realize how short a time it takes a potential employer to make up his mind.

However, what's going to land the job for you is experience. If you can demonstrate that you have experience, you're much more attractive to the employer. □

Eric Schaefer is a freshman Political Science major. Eric's middle name is Earl.



Attractive art deco bathroom tile of Engineering Building.

Photo by Gary Webster

The Engineering Campus: Architecural Eyesore

by Nathan Nyvall

Today began as any other day. I woke up, banged my head on the ceiling, and fell out of my loft. This day was far from ordinary, though. Today I awoke as a man with a mission. I was embarking on a voyage into a world filled with international adventure and suspense. I was taking my first trip to the ENGINEERING CAMPUS.

Being a Letters and Science student, there were certain questions and myths that arose in my mind about the "other side of campus." Finally it was time. I needed my own answers. Do all engineering students wear flannel? Do they all wear pocket protectors and carry slide rules? I honestly didn't know; and I have a feeling that there are more people out there with these same questions. I needed to get the facts.

I showered in the cold water so typical to dormitory living and proceeded to enter the realm of commons food. Normally, I like to eat with a group of friends (just in case the food makes a run for it), but today I ate alone. As I digested my last morsel of culinary hell, I had but one thought. Today I cross the Rubicon of Randall Avenue, not to stroll onto the familiar grounds of the stadium, but to enter a new world, a world of mathematically precise buildings and right angles.

I met my tour guide outside of Wendt Library, a very impressive building in its own right. I my opinion, it was the most aesthetically pleasing of all the engineering buildings.

My guide was a typical sophmore engineering student. He was quite enthused when I asked him to give me a tour of the campus, although he wasn't certain there was enough to see to warrant a full-blown "tour". When I asked him to just hit the highlights, he chuckled and pointed at Union South. "This is where a lot of the finer minds on campus take a moment to relax." I could see how a stimulating game of bowling was likely to breed some great, if not interesting thoughts.

Continuing our tour, we came across a building with a clever name that describes the campus perfectly, ENGINEERING. I have to admit that this building is impressively large. In fact, it is so large that I can see how it would be easy for seniors to get lost, let alone freshmen. The problem is compounded by the fact that every hallway is identical. The shortage of decorations on the walls doesn't help any either. Then there are the walls themselves, described by an industrial engineering sophmore as "pea soup green walls with lime sherbet trim."

Then there are the walls themselves... "pea soup green with lime sherbert trim."

To say the walls are totally void of any decorations would be inaccurate, though, as I noticed an abundance of waste paper receptacles embedded in the walls. In addition to the garbage cans in the walls, I was also very pleased to find art, yes art, in a very unusual place. The bathroom floor on the third level was done in a very nice art deco pattern that would have pleased Art himself.

Another interesting feature in the engineering building is the fact that every room is labeled, from the bathroom to the polymerization laboratory, with no apparent order at all; just numbers and numbers with seemingly meaningless plaques. In short, good luck on finding your class!

The engineering campus is however, not the right angles and dingy hallways I've described in this article. The real engineering campus is the people. Slide rules went out at about the same time as bell-bottomed pants. Today's average engineering student is not much different than those of us on the other side of Randall Avenue except that he understands calculus. This is an admiral fact in itself.

Indeed, my trip to the engineering campus was an enlightening experience. Whatever the buildings lack in appearance, the campus more than makes up for in the quality of its faculty and students. I know that I'm a wiser person for the trip, yet I still have one unanswered question about the engineering campus. What is a polymerization laboratory anyway? □

Nathan Nyvall is a 5'8" freshman in International Relations. He hails from Grand Rapids, MN.

ASCE:
More Than Just a Professional Society

by Dave Haznaw:

In engineering, as in any major, it is important to participate in outside activities to gain practical experience and career contacts before graduation. If your interest lies in civil engineering, or if you are merely curious about the field, then you may want to consider joining the student chapter of the American Society of Civil Engineers.

The 100–member group, under the supervision of faculty adviser Alan Vonderohe, held its first meeting of the semester January 29 at Union South. The group will hold five or six meetings throughout the semester, according to President Cary Lloyd.

Each meeting will feature a guest speaker who will discuss different areas of civil engineering. Paul R. Wolf, a professor in the department at UW, spoke at the Jan. 29 meeting on the topic of hydrographic surveying and mapping. The lecture included a slide presentation from Wolf's one–credit summer class on mapping lakes in northern Wisconsin.

Wolf teaches two sessions each summer; one leaves after final exams and another departs before the beginning of fall classes.

"Here's a project that has some real practical value," Wolf told members and guests attending the meeting. "Up there, there aren't any maps of lakes."

Don't let the professional–sounding name and the topics discussed lead you to believe that this group is all business. Meetings of ASCE are rather informal, giving ample opportunity for questions, comments and an occasional joke or anecdote.

According to Lloyd, the group is very social. In fact, one of the problems encountered by the club in the past is that it has been a little too social.

"It does become a social thing," Lloyd said. "Our main goal is social, but we do have a serious side too."

In addition to the meetings, which, according to Lloyd, often spill over to the Brat and Brau, ASCE is planning a golf outing and a picnic tentatively scheduled for the first weekend in May.

April 3 and 4, members of the group will travel to Purdue University for a student ASCE conference, which Lloyd sees as a chance to combine fun and business.

In the spring the group will install a wooden footbridge in Middleton, which will provide students with an opportunity for some practical application to techniques and concepts learned in their classes.

In addition to helping students, the project has other benefits. "It's a good community project," Lloyd said. The group is also thinking of incorporating the bridge project into Expo this year, but that is not yet final.

The biggest problem facing the group at this point is drumming up interest from freshman and sophomores. Lloyd attributed the problem to the fact that many students don't get their first civil engineering class until their junior year.

"I think it would be great to get more underclassmen to join the group," Lloyd said. He urges students to come to a meeting to find out what the group is like. Dates and locations of meetings are posted on the first floor of the Engineering Building about a week before the meetings.

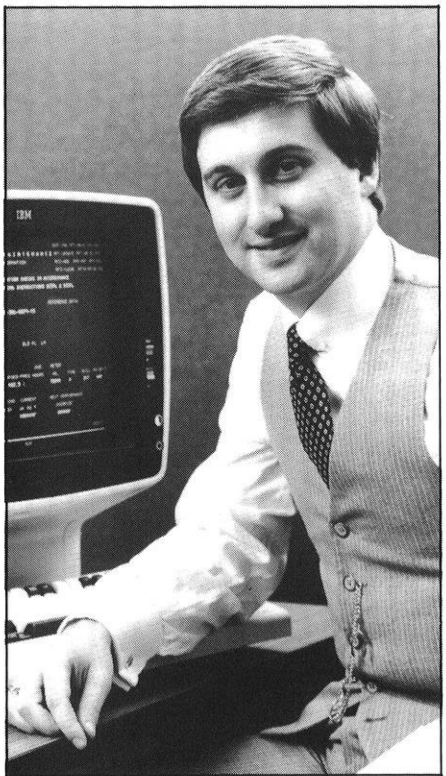
In addition to the experience and social advantages of joining ASCE, guest speakers can be good contacts for job opportunities.

If you're curious about the world of civil engineering and would like to meet some friends and have fun along the way, ASCE is one group worth considering.

Fees are $6 per semester, and meetings offer an enjoyable alternative to the pressure of the classroom. Those interested in joining the group can obtain additional information by contacting any of the officers: Cary Lloyd, president; Jon Hoekstra, vice–president; David Welmer, treasurer; Nate Jorgensen, secretary; Mike Mosbrooder, programming secretary; or Al Vonderohe, faculty advisor. □

Dave Haznaw is a fourth year Journalism student. Wow, that sounds like a fun major. You may have noticed Dave's previous work in the Badger Herald.

Follow In Their Footsteps



After graduation, you will want to use your knowledge, skills and creativity in an organization that will provide opportunity for personal growth and advancement.

Oscar Mayer Foods Corporation, the leading meat processing company in the U.S., has such positions for talented young people. We need good engineers to develop better production machinery, improve our maintenance administration, help manage our plants, and to work in the many diverse engineering jobs that are so vital to our company. The young engineers featured on this page have found rewarding careers in keeping us No. 1 in our industry. We will continue to need good young engineers to follow in their footsteps as they advance through our organization. You could be one of them.

P. J. Samson
Plant Engineering Manager
Los Angeles Oscar Mayer Plant

P.J. *graduated in May 1979 from the Illinois Institute of Technology with a B.S. degree in Mechanical Engineering and entered our six month Engineering Management Development Program.*

P.J. has held a variety of positions in Maintenance Administration and Maintenance Supervision. In addition to these plant assignments, P.J. also works on our Corporate Engineering Staff in implementing an in-house designed, on-line computerized maintenance management system.

P.J.'s most recent assignment is at our Los Angeles plant as Plant Engineering Manager. In this position, he is responsible for all engineering, maintenance and powerhouse activities at this location.

Oscar Mayer

Oscar Mayer Foods Corp.
Corporate Recruiting Office
P.O. Box 7188
Madison, Wisconsin
1-608-241-6897

Pat Molitor
Plant Engineering Manager
Davenport Oscar Mayer Plant

P*at started with the company in June, 1977, after obtaining a B.S. in Civil Engineering from the University of Wisconsin. He entered our six month Engineering Management Development program which provides the new engineer with a broad overview of the opportunities in the Engineering Division. The program also points out the significant role that the Engineering Division plays in the overall structure of the Oscar Mayer Foods Corporation.*

Pat has held various positions of increasing responsibility in the Maintenance Administration and Maintenance Supervision since graduating from the EMDP program. Pat's most recent assignment is Plant Engineering Manager at our Davenport facility. In this position, he is responsible for all engineering, maintenance and powerhouse activities at this location.

John Whines:

Humorous Hints for Administration

by John Oghalai

Have you ever been shafted by the University of Wisconsin? Red tape make you mad? Do high grade-point requirements bog you down? As a pre-engineer, I have many fears and worries. I suppose that most other pre-engineers have the same problems. Do you wonder whether engineering students who are already accepted in their department have any more problems, or is their life so simple that school is simply an aside to partying? Well, to all us pre-engineers, and to students who have departmental classification, this article is dedicated to explaining our worries to the PROFESSORS (who knows, maybe they'll make life bearable for us, hint, hint).

...Hewlett Packard require 3.2 gpa. GM requires a 3.5... Well, I guess it looks like graduate school. Why shouldn't everyone who wants to become an engineer be able to be one?

-- First of all, what's the deal with the incredibly high grade-point requirement? Why shouldn't everyone who wants to become an engineer be able to be one? After all, we already were accepted to the University. O.k., so a lot of people want to be engineers. Why not expand the departments with the highest demand? It seems simple enough, and unlike raising the grade-point, it would make a lot of people happy . Many students want to become electrical engineers. I am one of them. That means that I have to get a 3.5 gpa. Let's face it--that stinks. The grade-point requirement is not only outrageous, but it means that we have to study night and day. When do we get to have fun? Is it true that engineers are boring? It might be. Personally, I think the whole idea of engineers being introverted and quiet is bull, but there is a simple solution to killing the thought. Lower the grade-point requirement. Let the engineers party with all the english and journalism majors of the world. The negative ideas about engineers would soon be forgotten.

-- Talking about rumors, is the grade-point for Electrical Engineering (ECE) going to go up or isn't it? One of my friends told me that his professor said that it would go up to 3.75. If that's the case, I'd be out. I got worried, so I called up the secretary at the department office to find out what was going on. The lady said that it definitely was NOT going up. That was good news and I mellowed out. About a week later, a different friend informed me that the grade-point was going up. This time I got smart and called up an assistant chairman of the department. When I asked him if the grade-point was going to be raised, he said yes, it would be a 4.0 starting next semester. He then wondered what I thought about that. I asked him if he was kidding. Turns out he was. As far as I know now, it will stand at 3.5.

-- I'm worried about Comp. Sci. 302. The way I hear it, to use the computers, you have to go at two in the morning, because it's so crowded. Is this true? I wouldn't doubt it. Does the School of Music really need a new tuba? Come on, give Comp. Sci. a new computer. Give them another hundred computers. I don't know why they don't have enough funding for the facilities they need. We all pay our tuition, and I'm sure mine alone could buy them another five computers. Just think, if I was from out of state, they could buy more computers than they could ever use.

-- A group of classes that I'm nervous about are ECE 220, 230, and 240. All of my friends who have taken these classes say it is incredibly hard to get "A's". In fact, the way I hear it "C's"and "D's"are the most popular grades. This will be quite a change from the 3.5 that I needed to get into the ECE department. The way I understand it, there is absolutely NO partial credit given on test problems. In other words, if you spend twenty minutes on a problem, figuring out a circuit, using ten equations, and forget to put a negative sign on the answer, you get the whole problem wrong. On an hour test, you just got thirty-three points taken off. I ask you, does this seem fair? Maybe my friends were just scaring me, this seems awfully extreme. Do you know what else? They said that the professors are required to flunk twenty percent of the students. My friends did call these three classes "weed-out classes," though. I don't know whether this same situation exists in other engineering majors. I kind of doubt it happens in art school.

-- "What happens after these first group of 'weed-out classes,'" I asked some of my older friends. They said it doesn't get any easier, you just get used to working hard. This does not seem to be an acceptable alternative to me. I want easy "A's."

-- Once you get into the engineering department of your choice, all you need to stay in is a 2.0 grade-point. To get a job after you graduate though, you need a

"What happens after this first group of 'weed-out' classes?"

ett-Packard requires a 3.2 grade-point to get a job. GM requires a 3.5, but they might consider people with a 3.2. Well, I guess it looks like graduate school.

-- You know another thing that bothers me? Lunch hour. Not my lunch hour, I love my lunch hour. It's the administrative people's lunch hour that gets on my nerves. A few weeks ago, when I wanted to add a class, I went during my free period to the office in the Mechanical Engineering Building. But of course, they are closed for about an hour in the middle of the day. I peeked in the window and saw two ladies eating their lunch; obviously, they could help me. I knocked on the door and they ignored me. Being the poor sap that I am, I left and came back later. During my wait, I walked over to the Engineering Library to talk to the Co-op lady about getting a summer job. She was on her lunch break, so I ended up on the floor of the Union South Lounge watching a forty-five year old guitarist with a beer gut sing Simon and Garfunkel songs.

I'd be willing to bet that these thoughts have been in every pre-engineer's mind, and maybe even in a few students' minds who have departmental classification. I am scared about failing to get the needed grade-point. I am scared about "weed-out classes."But most of all, I am scared that I just can't cut it as an engineer, and that I'll have to transfer to Business School. Ugh! □

John Oghalai is an opinionated freshman who would like to someday major in Electrical Engineering.


CANCELLED
A VALENTINE FOR Mother AND Dad
WITH LOVE HONEY On Valentine's Day

RO•BOT

by Nick Denissen

Most people don't know exactly what a robot is or what it does. It is not a humanoid machine that outperforms people as many are led to believe. Neither is it an intelligent machine that reasons and thinks as Isacc Asimov has portrayed them in his science fiction work I Robot.

It is not easy to define a robot. Even robot manufacturers and vendors have difficulty in reaching a unanimous decision as to what exactly a robot is. Two definitions that industry uses to describe robots come from the Robot Institute of America and the Japan Industrial Robot Industry Association. The Robot Institute of America (RIA) believes that a robot is:

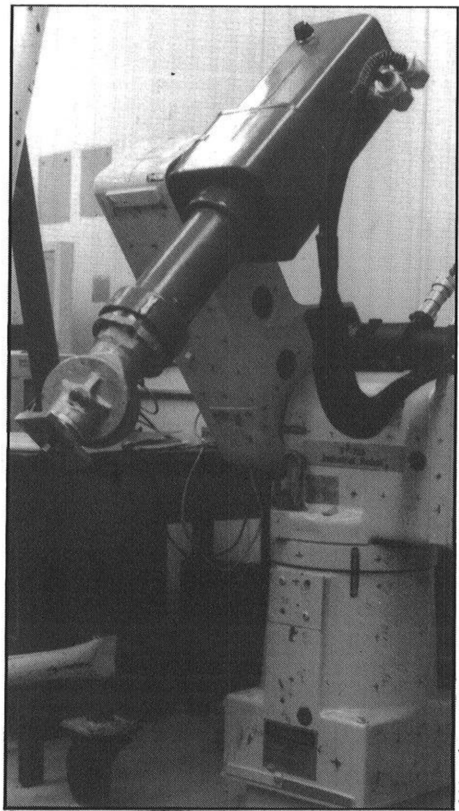
> A reprogrammable multifunctional manipulator designed to move materials, parts tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

On the other hand, the Japan Industrial Robot Industry Association (JIRIA) claims that a robot is:

> An all-purpose machine equipped with a memory device and a terminal, and capable of rotation and of replacing human labor by automatic performance of movements.

Obviously, these definitions vary. JIRIA's definition is not as specific as the RIA's; it includes manual manipulators and fixed sequence robots. Manual manipulators and fixed sequence robots are not considered to be robots by the RIA since they are not reprogrammable. It is confusing to say that a fixed sequence robot is not a robot. Situations like this exemplify the need for a universally accepted definition.

To form a definiton of what a robot is, it is best to start with a generic mental picture of what a robot consists and what it is capable of doing.



We Photo File

Some sort of robot. We're not sure what it does.

What does a robot look like?

Robots' sizes and appearances vary as much as their applications. Some robots, such as the Cybotech G80, weigh 12,000 kg and require 9 sq. ft. of floor space for mounting. Others, such as the Microbo Castor, weigh a mere 40 kg and require less than 1 sq. ft. of floor space for mounting. Whatever their size and weight, all robots have a basic common design. They consist of a number of links or joints, originating from the base. One link is connected to only one other link and at no time does any connection result in a circular connection of any kind.

What makes a robot move?

A robot may use hydraulic, electric, or pneumatic power. A combination of these kinds of power may also be used. Hydraulic powered robots are the most common since they are the most cost effective. They are usually driven by an electric pump that pumps fluids into pistons which in turn move the parts of the robot. The draw back of this form of power is that hoses may break or leak, allowing the fluids to spill into the robot. Electric powered robots are the most desirable. They are quiet and extremely accurate. Electric powered robots are driven by one of the following types of motors: servo motors, stepping motors, pulse motors, linear solenoids, or rotational solenoids. The problem with electric robots is that they are very expensive. Pneumatic power is often involved in operating the grippers. This form of power is relatively cost effective, but is very inaccurate.

Where can the robot move?

A robot may move anywhere within its work envelope. An average industrial robot has a work envelope whose shape corresponds to one of the following: cylindrical, spherical, joint-spherical, and rectangular. The work envelope is dependent on its physical structure and its joint limits. Joint limits are the maximum amount a joint may move, usually measured in degrees for rotational joints and in centimeters or inches for transitional joints.

How is the robot controlled?

Robots may be controlled in various ways. A robot may be hand taught. In this method, the programmer punches keys on a "teach pendant" (similar to a remote control) to enter commands that tell the robot what to do. For example, on Unimation's controller's teach pendant, the programmer hits a sequence of keys to tell the robot how it should move. If the programmer presses the button labeled "Joint", followed by the button labeled "1", the programmer could move the first joint of the robot. If the "World" button is pressed, followed by the "X", the robot would move along the x-axis with respect to its world coordinate system.

Some robots are controlled by "controllers," computers that tell the robot what to do. A programmer can command the robot by writing computer programs for the controller. These programs are written in languages that may resemble anything from FORTRAN to decision tree logic.

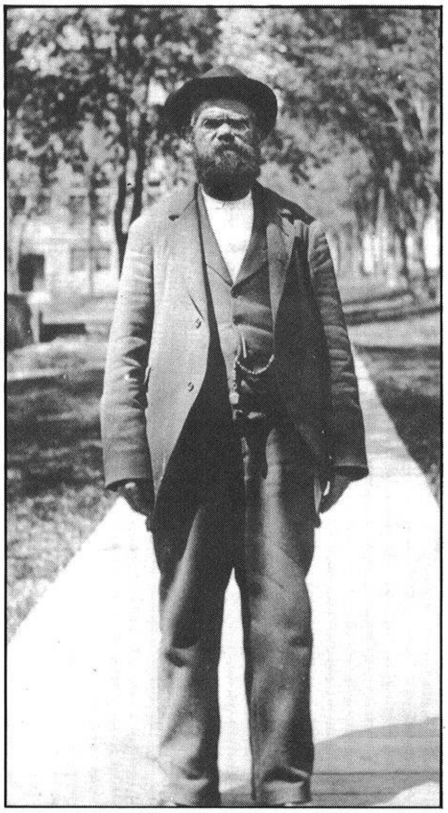
By now one should have a better understand of what a robot is. It is not important to be able to write a definition of what a robot is, but it is important to be able to recognize a robot. Having a mental image of what a robot is and an intuitive definition of what a robot is capable of doing is much more useful than a technically correct, often meaningless, concrete definition. □

Just One More

An ME Prepares for the Real World

by Gary Webster

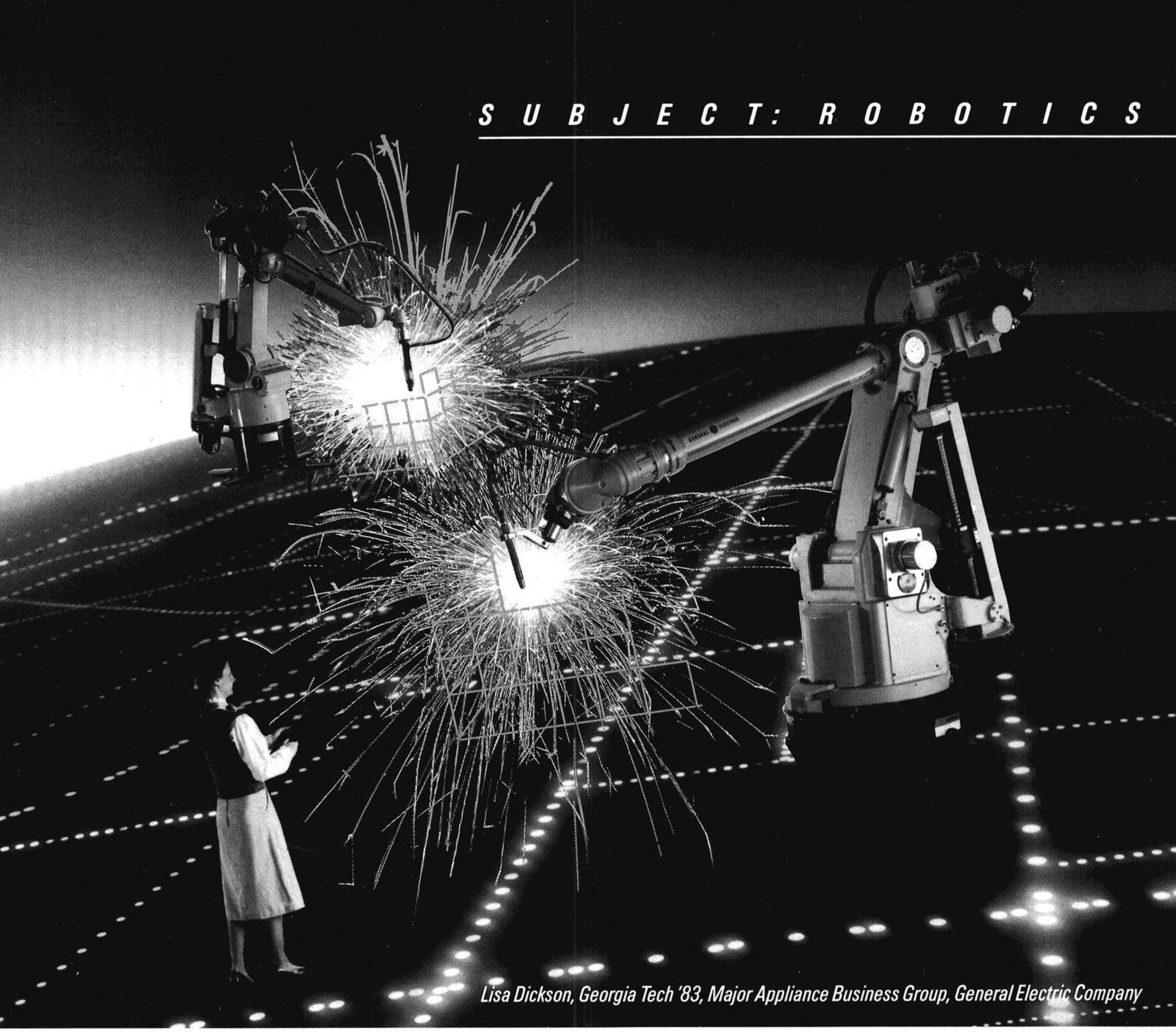
WE photo library



WE photo library

Yes folks, the sign sums it up! In May, I'm eligible for graduation (or is it parole?). My job situation? Well, the bottom picture sums that up! So if you don't want to see an ME, his wife, and his child starve, send all job offers to Gary Webster c/o Wisconsin Engineer Magazine.☐

Gary Webster, long-time WE photo editor, is a graduating ME major who would really like a job offer. Congratulations on a job well done, Gary.



Lisa Dickson, Georgia Tech '83, Major Appliance Business Group, General Electric Company

See Your Future Through the Eyes of a Robot

Lisa Dickson does! She's helping GE create tomorrow's robot systems. With "smart" robots that can actually see, touch, and sense heat or cold. "Adaptive" robots that can measure how well they're doing a job, or reprogram themselves in moments to take on new assignments.

Sound like sci fi? It's as close as your first career move. Because at GE, we're already using robots like these, for jobs that require decision as much as precision.

When GE adds vision capability to lasers and off line programming, robotics takes a giant leap forward. Just on the horizon are GE sight-equipped robots that guide themselves through intricate laser welding. What next? Tactile sensor pads to enhance GE robots with super-human dexterity. And computer brains for "trouble-shooting" robots whose thought processes come close to human intuition!

If you're fascinated by robotics, the new frontier is happening at GE. We not only design, build and sell robotic systems – we're using them in bold, new ways. Robots are an integral part of GE manufacturing processes, for everything from lightbulbs to locomotives.

So consider your future through the eyes of today's most exciting technologies. If you're that rare individual whose excellence is driven by the power of imagination, you'll find room with a view at GE.

If you can dream it, you can do it.

General Electric is an equal opportunity employer.