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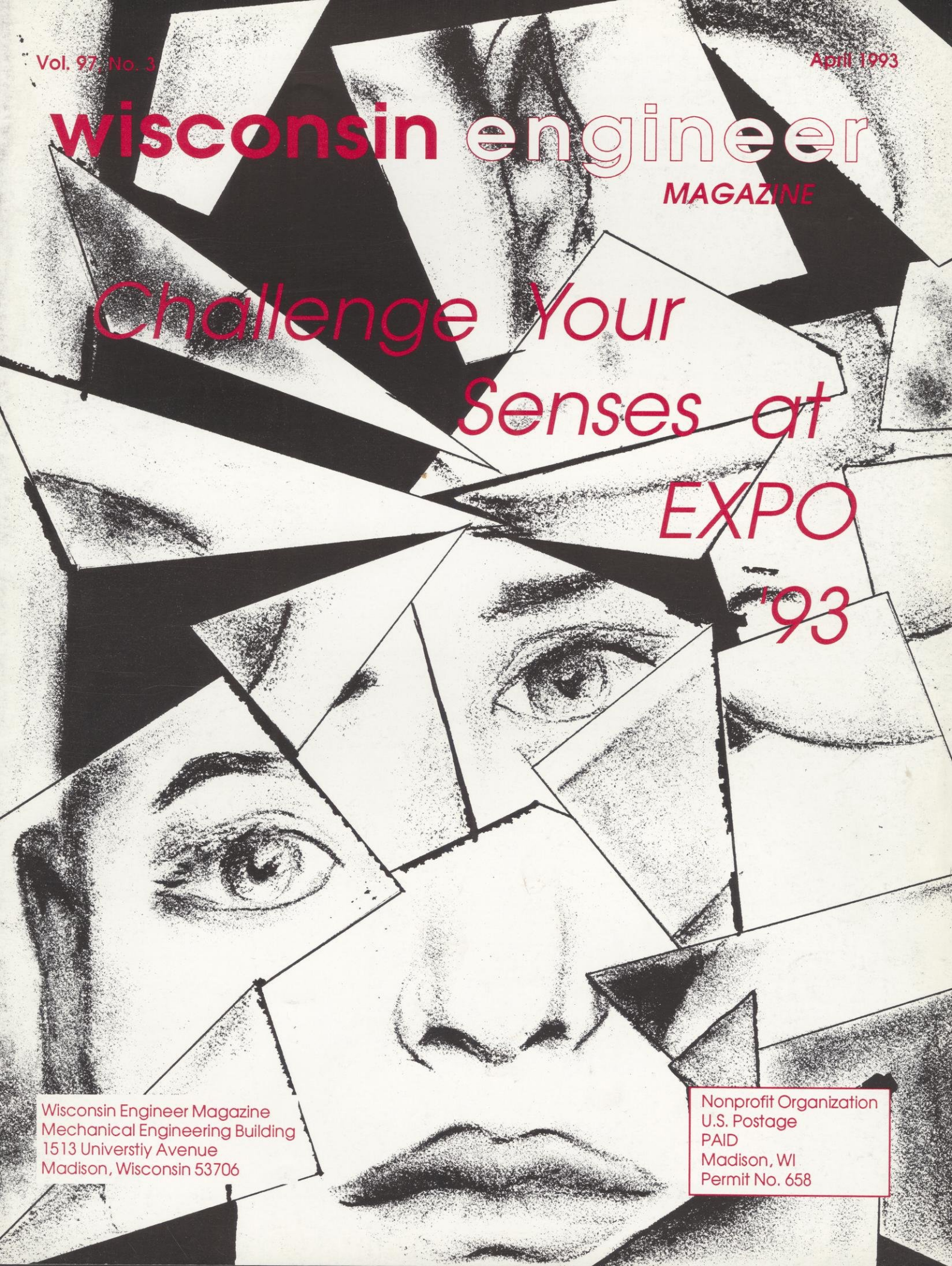
Vol. 97, No. 3 April 1993

wisconsin engineer
MAGAZINE



Challenge Your Senses at EXPO '93

Wisconsin Engineer Magazine
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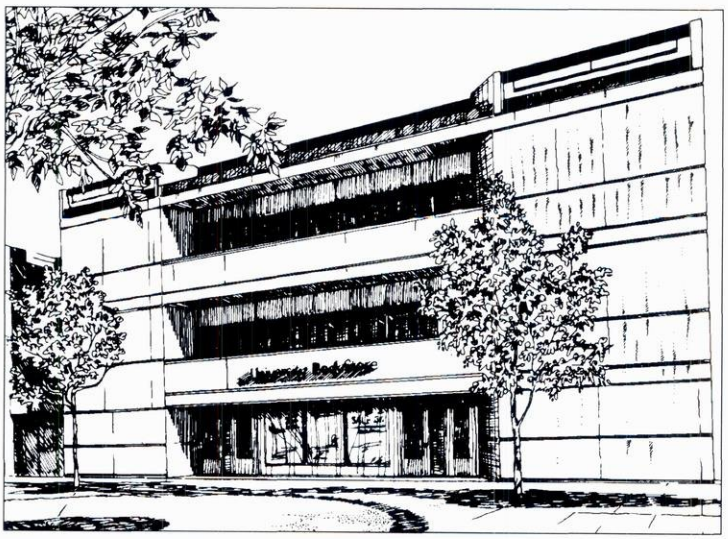

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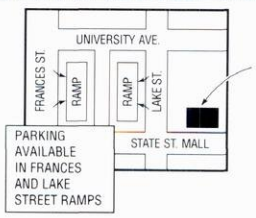

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wisconsin engineer

Published by the Students of the University of Wisconsin–Madison, April 1993

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The **wisconsin engineer** magazine, a charter member of the Engineering College Magazines Associated, is published by and for engineering students at UW-Madison. 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

Dinner and a Peek into the Future

Svetlana Zilist
Wisconsin Engineer Editor

FROM LIBRARIES AND classrooms we escape into a night of elegance to catch a glimpse of the world that awaits us. What crystal ball can momentarily wisk students away into the future? It's the Society of Women Engineers' Evening with Industry- a formal dinner where engineering students seeking employment meet recruiters from leading American companies.

I walk into a ballroom setting at one of Madison's finest hotels to find myself surrounded by groups of students who, like myself, are wearing business clothes, feeling sophisticated and a bit excited. They are huddled in circles around company representatives, apparently engulfed in business conversations. As I make my way among them a feeling of awe comes over me, accompanied by a couple of uninvited butterflies in my stomach. I take a really deep breath, gather all available courage, and walk up to a recruiter. She smiles and holds out her hand in greeting. A bit relieved, I introduce myself, and proceed to shower her with questions. She mentions that she graudated from UW Madison only three years ago. She speaks about the world wide operations of the company she represents, and of the responsibilities her own position involves. A young man next to me asks about entry level opportunities. Suddenly it hits me! He, only a few years older than myself, is about to step into the terrain of true engineering, to have that cherished, exalted thing that we all imagine somewhere in our future - a real engineering job! Listening to the recruiter speak it does not seem like such an abstraction anymore.

Gradually my anxiety disappears, and I meet more people at Evening with Industry. As I speak to recruiters and students like myself, I begin to realize the magnitude of this seemingly casual affair. Seeing representatives from the world's industry leaders here to meet us says a great deal about the value of being an engineering student at Madison. Sitting in a library in sweats and staring into a book, we are no less important and impressive than mingling here in business suits. In both forums we are striving, reaching for our futures as professionals. And in both forums we ARE the future, the not so distant future of these companies. Their presence at Evening with Industry is proof. They are here to invite us to step into industry, be it for a semester, a summer, or the rest of our lives.

The University of Wisconsin, Madison is one of the country's most respected institutions, whose college of engineering commands a great deal of respect. As engineering students we are known for occupying libraries at ungodly hours of the morning, holding slumber parties at computer labs, and scoring high on tests of stress. But as the business world has become more people oriented, it seeks the "well rounded individual" to be part of the engineering industry. We are ready to comply. Our calenders are brimming with extracurriculars such as the engineering student council, Polygon, and the nationally recognized University Marching Band.

Sometimes the calenders get too full, exams loom in the foreground, and we think the whole thing is about to explode. But somehow we make it through, and wait for the next rush to come. We work hard, preparing ourselves for something out there that can seem completely remote at times. Holding a calculator or delving into a seemingly endless subject, we sometimes start to believe that there is nothing in this world but midterms. It takes a night like SWE's Evening with Industry to open our eyes to what awaits. The work we put in now will let us step over the undergraduate frontier and with a bit of initiative step into the beginning of a career. At times maybe we all need to be reminded that it's not as far away as it seems, and its worth working for. ■

Editorial

Technical Communications Certificate

Mariah Steele
Wisconsin Engineer Editor

WHEN MY PEERS IN THE English department learn that I am in the TCC (Technical Communications Certificate) program, or that I write and edit for Wisconsin Engineer, they frequently respond with bewildered questions of "Why?" and "Isn't that kind of writing boring?" and "How does it feel to be surrounded by future engineers rather than Humanities majors?" I find that my responses have changed dramatically over the two years I have been involved with the TCC program, and especially since I began working on this magazine.

When I took my first two technical writing classes for the TCC, I was very intimidated. Though several English professors have told me I am a 'good' writer, I tend to question this. I had confidence in my abilities to communicate on paper, but I certainly did not consider myself a "good" writer. I went into my first technical communications classes not knowing at all what to expect. I knew the classes would be made up primarily of engineering majors - people with very broad and thorough technical knowledge. What intimidated me was the word "technical" in technical writing. I had no problem with the "writing" part, but I was convinced that as far as "technical" went, I would be at a loss. I even went so far as to take my professors aside to explain this problem to them, and told them that I would probably need a lot of extra help.

As it turned out, my predictions were accurate. In both my technical writing classes that semester, I was the only non-engineering major in the class. In addition, not long into the semester, I had to start thinking about a topic for a project called a "Major Technical Report." Once again, it was the "Technical" part the overwhelmed me. This was about the time I began to question my participation in the TCC program. It occurred to me that I really had no idea how to write a technical document - as far as I was concerned, technical meant dry and virtually void of style. I didn't think there was any way that learning technical writing would help my writing skills, in fact I was convinced it would hurt them.

Meanwhile, my English Department friends were not helping. They thought I was crazy to waste my time learning how to write software documentation and user manuals when I could be reading and writing about Chaucer or Shakespeare or Eliot. To some extent, I agreed. But I also knew that ultimately, technical writing would be to my benefit. I like to write and I want pursue a career in writing. The unfortunate reality is, however, that there are not a lot of job opportunities to be had writing about Eliot. I do want to go to graduate school, and my ultimate plan is to get a Ph.D. in literature, but that takes money that Shakespeare papers just aren't going to generate. I also sometimes feel that as much as I love to read and write about literature, it is an incredibly selfish pursuit. I do hope to teach someday, but in the meantime, I would like to return something useful to society, even if it is simply a software or operator manual that makes somebody'scome-ons life a little easier.

As far as my concerns about not improving or even damaging my writing skills, I quickly learned they were entirely unfounded. While I did find that technical writing demands a very different mind-set than writing about literature does, I learned that the writing itself is not all that different. Technical writing is writing about facts; writing about literature is more writing about thoughts and interpretations. Technical writing demands extreme clarity and conciseness. In my experience, so does writing about literature. There are few things harder to understand than someone trying to explain their thoughts and interpretations of a text in cloudy, confusing writing. Technical writing forced me to figure out ways to write as simply and clearly as possible, without miscommunication information or making the text boring. I

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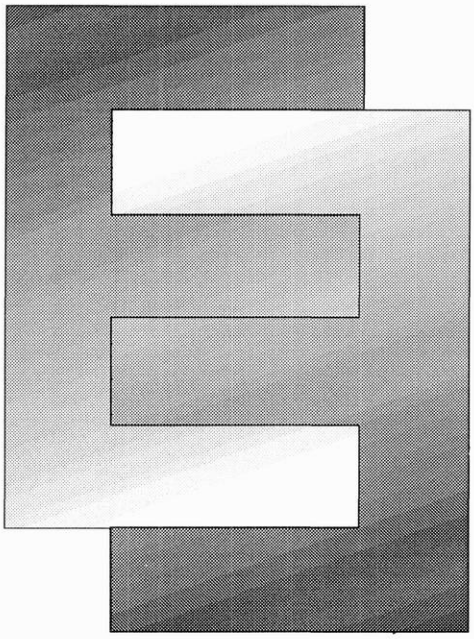

Challenge YOUR Senses at Engineering EXPO 1993

Exhibits are set up across the entire engineering campus and are viewed by an estimated 20,000 people

THE WHEELS started turning in the fall of1992. Two engineering students happened to see a notice inviting engineers to apply for the position of Chair of EXPO 1993. It struck their curiosities, and some weeks later Dave Aber and Tom Wiesen interviewed for the positions of co-chairs. The interviews were a success, and in no time the new co-chairs of EXPO 1993 began a publicity campaign to recruit seven other executive members to the EXPO board. Applicants were plenty. For three grueling days, Tom and Dave interviewed potential board members, trying to decide who had the appropriate experience, enthusiasm and the dedication necessary for this year-long undertaking. At last, seven executive members were selected to handle everything from planning student exhibits, to involving high schools, to coordinating volunteers. It became official at the first EXPO executive committee meeting, which gathered the nine engineering undergrads that were going to put together the entire University of Wisconsin-Madison College of Engineering Exposition of 1993.

The Engineering EXPO is a campus-wide event in which students from all engineering related disciplines get a chance to demonstrate their research. EXPO's aim is to give university students hands-on opportunities to gain design and problem solving experience. It is a way to demonstrate engineering technology to the public, and a perfect chance to educate youth about the perspectives of engineering. The event is a three day fair that takes place biennially in mid April. This year the new theme of *Challenging the Senses* takes form in a variety of projects. Exhibits are set up across the entire engineering campus and are viewed by an estimated 20,000 people. They will see projects created by students in undergraduate as well as graduate studies. Campus Organizations such as the Society of Women Engineers, Theta Tau and many others present the fruits of their teamwork. Even high school students from across the state have an opportunity to present smaller scale projects. And to top it off, about thirty members from the world of industry such as Ford send company representatives to exhibit products and technology.

Student exhibits make up the largest part of EXPO. Headed by Bernie Menachery, the committee of Students Exhibits organizes student registration, sets up judging criteria, and arranges for judging of the exposition. Menachery and his committee have pioneered a computerized registration system which tremendously simplifies the registration process. This year they are expecting 50-60 student exhibitors. The majority of these come from student organizations, while others are created by individuals. The ideas behind the projects often come from research in progress by professors around campus, or departments willing to fund specific projects. Others, of course, come from students' innovation. The EXPO committee offers financial as-

sistance to student projects through forgivable loan contracts, which provide loans that are 'forgiven' upon entry of a project in EXPO. This aid makes it possible for the 'starving college student' to develop a project to its full potential and to compete for awards and honor.

Younger aspiring engineers also get a chance to take part in EXPO. High School Public Relations Chair Debbie Zastrow explains, "We want EXPO to give students an idea of what engineering is about, and to spark their interest in engineering at Madison." The High School Relations committee contacts 384 schools from Wisconsin, Northern Illinois, and parts of Minnesota, inviting them to participate by bringing students on Friday, April 16, the designated 'Student Day'. The exhibits on that day are tailored specifically to young students. High school students are also encouraged to participate in a bridge building contest and a Rube Goldberg contest. Especially interesting is the Rube Goldberg contest, which requires students to build a complex, multi-step machine that can perform a very simple task. This year's task is to screw in a lightbulb. Both require that the high school students bring an entry to EXPO which is judged by engineering students.

Involvement in EXPO is not limited to students. A large number of exhibits are presented by industry. Companies such as General Motors set up exhibits demonstrating recent developments and technology. EXPO is a novel opportunity for leading companies to attract the top engineering students on campus. By displaying their technology to the 20,000 people who visit EXPO, companies take advantage of an excellent source of advertising on a more personal level. Organizations in all fields of engineering are invited to display their products, the processes involved in manufacturing and aspects of their current research in an EXPO exhibit. Some choose to support EXPO by sponsoring a student project. To involve industry in the exposition Industrial Exhibits, Chair Heidi Jorgensen contacts companies a year in advance. Some have been loyal EXPO participants for years. This year's Industry Committee is expecting 30 exhibits.

EXPO lets students get involved, experience and realize what they could be doing in the future

After the students have brainstormed ideas, slaved over development of their work, put it all together in stunning displays and explained the fruits of their labor to 20,000 viewers, they can let out a sigh of relief and wait. The next step is simply to anticipate the results of judging. Long before EXPO commences, the Student Exhibits committee arranges judges. The committee and its chair try to get government involvement by inviting senators to participate in judging. Engineers from various fields in the state of Wisconsin are also asked to judge, along with professionals from non-technical fields. Judges are split up into groups of four, two from industry, and one from the UW system. The fourth judge does not have an engineering background, giving the exhibitors the opportunity to communicate their project on a non-technical level. "To make it fair each group of judges covers the same category," explains Dave Aber. Each exhibit fits into the categories of Individual Exhibits, Small Group Exhibits, Graduate Student Exhibits, or Student Organization Exhibits. Bernie Menachery has set up the criteria for judging to include creativity, application of engineering principles and oral and visual presentation. Exhibitors must effectively answer questions posed by judges. Judges then award points to each exhibit. The scores are tallied by the executive committee, and winners are announced at the Exhibitor's Party on the night following the last day of EXPO. The public gets a chance to give its input by voting for a People's Choice award, and choosing the project that best fits the theme of *Challenging the Senses*. Winners of each categories will receive up to $700 for first place. EXPO '93 will be awarding a total of $7100 in prizes.

The Engineering Exposition is a huge commitment for the nine executives. They spend a year working side by side, each concurrently heading a different committee. Committee members are all volunteers, while committee chairs get three credits for their roles during the EXPO semester. But as Dave Aber remarks, "There are easier ways to get a three credit A." These people are involved because they see EXPO as a lot of fun along with the responsibility. It is a rare chance for a group of college students to coordinate a project of such magnitude. It is one of the few leadership opportunities of this scale on campus. Aber points out that "EXPO lets students get involved, experience and realize what they could be doing in the future. My reward," he adds, "is going to be to see this whole event go on, and people enjoying themselves!"

The Engineering EXPO Committee.

AUTHOR

As the summer approaches, Liz Zilist is looking forward to sunshine, no books, and wearing a business suit.

Injecting the Small Engine:

Changing the way you think of your small work engines

Ford Hybrid Electric Vehicle CHALLENGE

United States Department of Energy

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TO MANY PEOPLE, A FUEL injected lawnmower engine may seem a bit strange. The question from most would be, "A lawnmower engine is just a few cubic centimeters—what difference would fuel injection make?"According to the engine group from the Hybrid Electric Vehicle project, this argument has little validity. Today's small engines, like those used in lawnmowers, are some of the worst polluters of the atmosphere. These engines burn inefficiently, are often run for long periods of time, and have little or no pollution control. For this reason, when the HEV team decided to use a small engine in their project, they chose a fuel injected engine to improve emissions.

The engine the HEV team chose is a 600cc, V-twin, 20 HP Kohler utility engine. One generally sees this type of engine powering a log splitter, a generator or a lawnmower. Although this may not seem to be the sensible choice to power a car, the intended use is for constant speed, not acceleration. The engine engages when the car is at a constant speed. It can then deliver energy more efficiently than the battery could. It may seem that a motorcycle engine of the same size could perform better in this role, but the function of a cycle engine is to provide a wide range of acceleration at the expense of fuel efficiency. A work engine, such as the Kohler engine, provides what is needed: constant power at a constant speed.

The efficiency of the Kohler engine is boosted by adding the fuel injection system. The system chosen is from Injection Research Specialists (a division of Pacer Industries, which is part of the Echlin Group). The system uses standard port fuel injection mounted on a custom intake manifold and throttle body designed by HEV Engine Specialist Patrick Barber. The system itself is a prototype that IRS is letting the UW team use. Because the system is fully electronic, it can be hooked up to a personal computer and can be reprogrammed. This means that the average system user can give the engine a tune-up with the help of a PC.

Injection alone is not the only way the efficiency of the engine is being improved. Rather than using standard gasoline, the team has decided to use methanol M85. M85 is a mixture of 85% methanol (methyl alcohol) and 15% reformulated gasoline. This fuel has been refined above and beyond regular gas by removing many of the nonessential elements that are pollutants. Switching the fuel is not, however, as simple as filling up the tank with a new fuel.

Systems of this type are leading-edge, and are bringing automotive engine technology into the small/utility engine field

- HEV Engine Specialist Patrick Barber

The use of M85 introduces problems because of the very nature of the fuel. Most importantly, M85 is inherently corrosive to metals. This creates several difficulties in the way that the fuel is handled. To begin with, either a plastic or aluminum gas tank must be used, as well as all plastic fuel lines. This is where the easy solutions end. Since some components of the fuel delivery system are not available in forms compatible with M85, after about 150 hours of use the injectors, fuel pump and pressure regulator would all have to be replaced. The HEV team is avoiding this fuel pump problem by using a GM pump that is safe to use with M85. The HEV is a Ford Escort, which should send shudders through all diehards on both sides of the Ford vs. GM line. Versions of other products that are compatible with M85 are under development, and will be ready for production by the time systems similar to this one are in wide use.

"Systems of this type are leading-edge, and are bringing automotive engine technology into the small/utility engine field. The work we are doing here will show that this will be a feasible concept for the Small Engine Industry, " states Barber. This technology will be brought to the lawnmower engine in the year 2000, with even more developments to further reduce emissions. Such changes could include the introduction of catalytic converters to these engines.

During EXPO, the small engine display will be located in room 106 of the Mechanical Engineering building. Visitors to the display can see the engine set up on a test bed that allows it to be running. ■

AUTHOR

Len Rauth is an ECE-3. His hobby is rollerblading and his favorite music group is Rush.

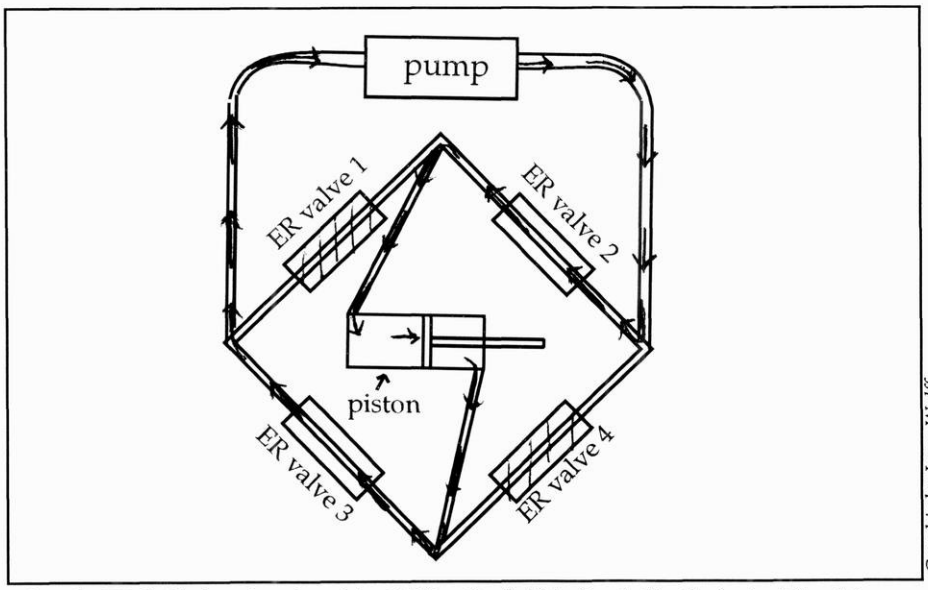
Smart Fluids

THE AUTOMOTIVE industry constantly needs new ideas and technologies to succeed in today's competitive international market. A smooth ride, fast brake response and accurate steering control attract modern consumers. These factors also affect a vehicle's safety, therefore their supporting technologies need continuous updating. At EXPO '93 three chemical engineering students are presenting a fascinating alternative to hydraulics, which controls mechanical movement in many parts of a vehicle.

Tom Roth, Matt Chudy and Erik Weingartner, under the direction of Professor Klingenberg of the Chemical Engineering Department, are presenting practical applications of Electro-Rheological Fluids. An ER fluid is a viscous fluid containing particles that are the same density as the fluid. Since the fluid and particles are of equal density, the particles remain suspended indefinitely in the fluid. The cost of good ER fluids can reach $400 per liter, but the project sponsored by EXPO uses an inexpensive combination of corn oil and silicon particles.

A unique quality of ER fluids is that they turn to solids when a high voltage of electricity runs through them. The first part of the EXPO exhibit is a simple illustration of this phenomenon. Two parallel metal plates a few millimeters apart are connected to a DC power source and dipped into a beaker containing the ER fluid. When the plates are removed, a solid bridge of solidified ER fluid connects them. This models what happens in an ER valve, the main component in the second part of the exhibit.

If you throw a baseball at a robotic arm, its hydraulics are too slow to catch it. With an ER fluid powered arm, the response time is so fast that the arm could easily make the catch



Graphic by Jesse Wolff

When the ER fluids in valves 1 and 4 solidifies, the fluid is directed to the back of the piston, forcing it to move out.

The second half of the exhibit incorporates a model crane that EXPO visitors can maneuver to pick up and move objects. Its control panel has two joysticks, one to lower or raise the crane's grappling hand, and another to extend or shorten its reach. Two pistons control these motions which depend on the status of eight ER valves. The valves are connected with clear tubing through which the ER fluid is pumped. When an EXPO visitor moves a joystick, electricity shoots into four of these valves. The fluid in the valves then turns solid, blocking the valves and directing the fluid to a piston. The fluid fills up one side of the piston causing it to move in or out. This forces the fluid on the opposite side of the piston back into the tubing, causing it to circulate back to the pump. The densities of the corn oil and the silicon particles do not exactly match, but constant circulation keeps the particles suspended.

It seems like a lot of trouble to go through to move a piston, yet the advantage of using ER fluids is their quick response time of under two millionths of a second. If you throw a baseball at a robotic arm, its hydraulics are too slow to catch it. With an ER fluid powered arm, the response time is so fast that the arm could easily make the catch.

According to Roth, Chudy and Weingartner, the key to the project is to build up enough pressure to move the pistons without the solid connections in the valves breaking through. This requires a power source on the level of five thousand volts.

Currently the automotive industry is developing ER fluid applications to use in shock absorbers in cars, since they respond faster and would react to changes in the road much more quickly than hydraulics do. The market may be seeing this new development put to practical use in the next few years. ■

AUTHOR

When not consumed by his studies, Jesse Wolff enjoys a quick game of Nerf basketball and a pint of Ben and Jerry's ice cream.

Give Blood!

The engineering campus spring blood drive will take place from March 29th to April 7th. The drive is being coordinated by POLYGON Engineering Council Secretary Shawn Steif in conjunction with the local Red Cross. Students interested in giving blood can stop by Youngblood at Union South during the two weeks (Monday-Friday) of the drive. POLYGON will recognize the top donating departments by percentage of students and total pints.

Engineering Briefs

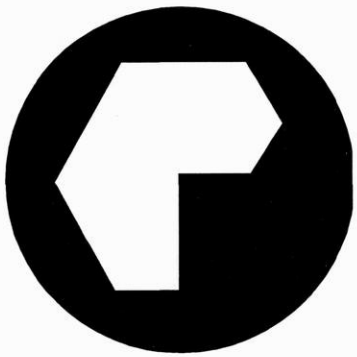
by Mike Waters

POLYGON Petitions for Parking

In early February, POLYGON Engineering Council began a petition drive to increase the size of a proposed parking ramp to allow for student parking. The proposed ramp would be located in Lot 17, north of Camp Randall Stadium. The current proposal calls for the construction of a 1500-car capacity ramp. The petition asks for the capacity to be increased by an unspecified number. The petition drive was initiated in response to a request by CoE Dean John Bollinger for help in convincing campus authorities to increase the proposed ramp's capacity to 3000. Authorities are also considering placing a football practice field on the roof of the ramp.

Dean Plans Engineering Mall

College of Engineering Dean John Bollinger is planning the construction of a mall area to be located between Computer-Aided Engineering (CAE) and the Engineering Research Building (ERB). The mall would consist of a statue and fountain (perhaps with a rivulet leading to a small pool), as well as trees and grass. The project is expected to cost approximately $500,000, which is being raised through private donations.



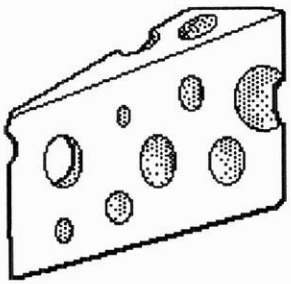
Industry Mentors Seek Students

POLYGON Engineering Council began an industrial mentoring program last spring to allow engineering students to have one-on-one communication with practicing engineers. Students are currently needed to be matched with volunteer mentors in industry. Interested students can contact POLYGON Industrial Relations Chair Deanna Schmidt via e-mail (Deanna@cae.wisc.edu) or leave her a note in the POLYGON mailbox in the Mechanical Engineering Building lobby.

POLYGON Joins NAESC

POLYGON Engineering Council recently became an official member of the National Association of Engineering Student Councils (NAESC). The NAESC was formed this past fall at the National Engineering Student Council (NESC) Conference at Purdue University. At this conference, a new constitution was ratified, thus changing the name of the organization from NESC to NAESC. The constitution also created an executive board for the organization. Former POLYGON President Mike Waters was elected NAESC Director of Relations. The purpose of the NAESC is to help engineering student councils to better serve engineering students.

AICheez



IMAGINE A WORLD without dairy products. What would cookies be without milk?

What would popcorn be without butter? And most important of all to the college student, what would pizza be without cheese?

Cheese is a favorite among the dairy foods the world produces. It would be nearly impossible to imagine all the different types of cheeses that are available to consumers around the world. But open an "average American refrigerator" and you are sure to find Kraft singles, or maybe Velveeta, both of which are forms of processed cheese.

What is processed cheese? What makes it different from regular cheese, and why does it take an engineer to make it? Twenty dedicated student members of the American Institute of Chemical Engineers are prepared to answer these questions and show EXPO viewers what processed cheese is all about. With a little help from a team of Kraft General Foods engineers, AIChe will *Challenge the Senses* of EXPO attenders, and give insight to the role engineers play in producing processed cheese.

The committee has also derived an equation, based on their own estimations, for determining the time it takes a certain piece of processed cheese to melt based on the specific properties of the cheese.

The EXPO team learned hands-on how the properties of the cheese product can be affected by changing certain process variables. In a trip to the Kraft plant in Glenview, Illinois, members varied ingredients, temperature and other process variables to make everything from mush to what Rob Rossi calls, "A virtually fireproof cinderblock!"

Rossi, head of the AIChe EXPO Engineering methods committee, says his committee emphasizes that chemical engineers are necessary in the cheese making process. They show how the complicated process of making cheese is integrated into a large plant environment. The committee has also derived an equation, based on their own estimations, for determining the time it takes a certain piece of processed cheese to melt based on the specific properties of the cheese.

The team has a Process Committee headed by Steve Marshall, whose objective is to show the constituents of the cheese, the unique properties of processed cheese compared to regular cheese and the initial reasons engineers began to make processed cheese. Also, for those who really want to challenge their senses, their eyes and taste buds will enjoy the taste test between white and orange processed cheese. The committee would like input on which type of cheese is preferred. Everyone is encouraged to participate, the results may be very interesting!

Now that the team knows what cheese is all about, their mission is to show the public what they have learned. The AICheez project will be displayed at EXPO '93 for all who are interested in what may be in the cheese you are eating, and in all sincerity, they hope you find it to be the Cheesiest!

AUTHOR

Lori Haase is a second year Chemical Engineer. She is anxious to get a taste of "real engineering" in her co-op that starts this summer.

editorial continued from page 3

feel that this has helped my writing and editing immensely. I do find though that is is often very difficult to go from a technical writing mind-set to a writing about literature mind-set, and haven't yet taken an English class in the same semester I have a technical writing class.

An added benefit I have received from my technical writing classes and my work on this magazine, is a new respect for engineers. I never really understood what engineering was all about, but I knew there was a lot of math involved, which is why it is a career I will never pursue. As I have been working closely with engineering majors, I have realized that the pursuit of this profession takes a lot of time, energy, dedication and motivation. I have yet to meet an engineering major who procrastinates like many of us in the Humanities do, and I particularly admire the future engineers I meet in my writing classes and who I work with at the magazine. I write all the time and still find it a very difficult process. I can't imagine coming into a writing class as a fourth or fifth year engineering student (many of the students in my technical writing classes are facing graduation and have admitted to me that they haven't ever taken any college writing classes). I realize that for some these classes fulfill requirements, but for others, and for the people on Wisconsin Engineer, writing is something they either enjoy or want to learn enough to spend a significant amount of time doing it.

I am currently facing graduation in another semester. As I look back on my last two years in the TCC program, I find that my confidence has increased dramatically. Because of what I have learned about technical writing from my professors and fellow students (who have been a very helpful resource when I have struggles with the "technical" part of technical writing), I can respond to the questions by my friends in the English department with answers that make a lot of sense to them and to me. I also feel very confident in my new role as co-editor at this magazine. Finally, and in some ways most importantly, I can tell people that it is likely that I will be able to find a job after graduation, and a job doing what I am "good" at and what I love. Which is more than a lot of my friends in the English department can say.

Recycling:

What Really Happens to Plastics?

The outer casings of many household appliances, such as boomboxes or coffee makers, are made using injection molding. - David DeHaan

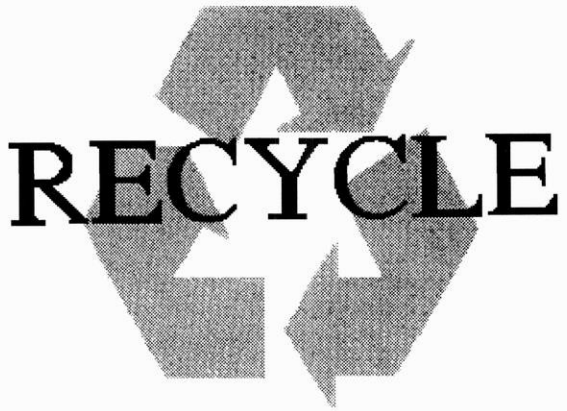
MOST PEOPLE ARE AWARE of the recycling effort that has grown over the last few years. It is part of our routine to rinse out milk jugs, laundry detergent bottles, soda bottles, and other plastic, aluminum, or glass items, and separate them from the rest of our trash. But most people do not know what happens to these containers after they leave the curb. Graduate student David DeHaan is leading a team that is trying to change that. At their EXPO '93 exhibit, DeHaan, Shelly Hoffland and Doug Endres show what becomes of our plastics when they are recycled. DeHaan and his team illustrates the benefits of recycling, along with some of the problems that are plaguing the industry.

While there are many products that contain recycled material, and many ways to produce these products, DeHaan's interests lie in the field of injection molding of recycled plastics. Injection molding involves heating recycled plastics, injecting them under extreme pressure into a mold, and allowing them to cool. To illustrate the use of this process, DeHaan will distribute Bucky Badger refrigerator magnets that are made entirely out of recycled milk jugs. He will also explain how injection molding is used in other industries. For example, automobile manufacturers use the process to make many products for cars, including dashboards and other interior trimmings. Also, DeHaan says,"The outer casings of many household appliances, such as boom boxes or coffee makers, are made using injection molding "

In addition to his own product, DeHaan is also displaying some rather innovative uses of recycled plastics. One exhibit shows a curb stop that is normally made of cement, made entirely of post-industrial diaper scraps. During the production of diapers, the diaper is cut out of a square of 'diaper fluff'. Normally, the scraps from this process are discarded, but are now being used to create curb stops. Not only do these curb stops diminish waste, they are also lighter and more resistant to corrosion than their cement counterparts. DeHaan is also demonstrating a bait bucket made of recycled green soda bottles. He hopes to have more exhibits illustrating the uses of recycled plastics.

Most people do not know, that many of the products they take time to recycle end up in land fills.

While DeHaan and his team show many positive results that have already come about because of the recycling effort, they also point out many problems with the process. As most people know, only plastics with a number 1 or a 2 on them are currently recycled by most communities. Most people do not know, however, that many of the products they take time to recycle end up in land fills,



since no uniform color can be obtained by recycling different colored plastics. Dye must be added to turn plastics black, but there is only a small market for black plastics. Therefore, plastics must be separated into different colors before they are recycled. Separation is a very labor intensive operation, and thus very costly. Many communities chose to avoid this cost by only recycling green and clear plastics. As a result, despite our best efforts, many laundry detergent bottles and other plastics never get recycled. There is hope though -- recycling is a fairly new industry, and with people like DeHaan and his team working on innovative new ways to use recyclable materials, it won't be long before the today's recycling problems will be solved. ■

AUTHOR

Dan Kosednar is an senior in English. He is graduating in May and is trading apartment hunting for job hunting right now. He loves sports, poetry and Kimberley. We all call him Tuna.

Virtual Reality in the Palm of Your Hand

WHILE MOST EXPO projects are focused on *Challenging the Senses*, Adisak Pochanayon's project is designed to fool them. The project takes a new and exciting approach to Virtual Reality, the interactive computer simulation popularized by such movies as *The Lawnmower Man* and *Tron*. Pochanayon's lower cost system makes virtual reality a true reality in any home.

Virtual reality fools the senses by giving participants the feeling of movement and action in a computer generated world. This environment is viewed through a special helmet or directly on a computer screen. With Pochanayon's system, EXPO '93 visitors are able to move and use a virtual hand in a three-dimensional environment simulated on a computer screen. When the user wears a special glove, an outlined picture of the hand on the computer screen follows the actual motion of the visitor's hand.

The glove chosen to control the system is the Power Glove by Mattel, used primarily with the Nintendo Entertainment System. This choice of hardware keeps cost down when compared with other virtual systems which use the $10,000 Data Glove. The glove normally supports only low resolution motion which allows horizontal, vertical and rotating motion. For the glove to move in the three dimensional virtual environment, Pochanayon wrote software in the programming language C and Assembly Language. The software allows the glove to support high resolution motion which permits forward and backward movement and the ability to move three fingers. Having the glove in high resolution allows the hand on the computer screen to move in the same way human hands move in reality.

Ultrasonic positioning detects the glove's location. Ultrasonic refers to high pitched sounds that we cannot hear, sounds that are only detected by special microphones. Two small speakers on the glove send out ultrasonic sounds to three microphones mounted in a unit on top of the computer screen. The computer relates the timing between these sounds, and as a result can follow the motion of the glove. Electrically resistive strips in the fingers of the glove also allow the computer to sense finger motion.

According to Pochanayon, the most difficult part of the project is getting the glove to work in high resolution. The actual graphics design and programming of the virtual environment does not pose a problem. Actually, Pochanayon comments that this part is very entertaining.

An exciting part of the Virtual Reality exhibit is that the user not only moves through the simulation, but also interacts with it. Certain objects in the simulation, when triggered, set off musical samples provided by a Roland SC-155 sound module. This encounter with one of the most fascinating fronts in technology today makes for an exciting EXPO '93 visit.

AUTHOR

Jesse Wolff is a second year mechanical engineer.

Fantasy d'LIGHTS

IN ADDITION TO *Challenging the Senses*, EXPO '93 also hopes to *appeal to the senses* of those who attend.

Perhaps the most visually appealing portion of EXPO '93 is an all-new laser/computer/video show entitled "Fantasy d'LIGHTS." The purpose of the show is to orient viewers to EXPO '93 and to the University of Wisconsin-Madison College of Engineering (COE). Information on the COE is included in the show to recruit high school students and to inform the general public about the role of the COE in the state and the community.

The show begins with a camera-guided tour across Lake Mendota to Memorial Union, then continues west across campus and down Henry Mall to Engineering Hall. A computer simulation leads viewers through Engineering Hall to the auditorium where the show is presented. Next, a laser-generated segment features the COE logo, the EXPO '93 logo and theme and various engineering-related images.

Following the laser segment, a video clip highlights COE research, academic opportunities, and UW graduates and the companies who hire them. Another computer-simulated, laser-enhanced segment then guides viewers through the EXPO '93 routes, highlighting selected exhibits. An additional portion of the video highlights EXPO '93 sponsors, voting booths, the Hybrid Electric Vehicle (HEV) project, and non-judged exhibits. The show ends with a laser finale to send viewers off with excitement.

Despite the enormous amount of information presented and the technical complexity of the program, the show is only about 15 minutes in length and will be presented approximately every half hour throughout EXPO. At a cost of approximately $8500, the laser show is a combined effort of the COE Audio-Visual Services, the UW Graphics and Visualization Lab, the Nicholas Ryan Group and Laser Artistry. EXPO '93 Publicity Chair Pat Christian coordinated the production of the show.

AUTHOR

Mike Waters is a senior in mechanical engineering. Mike *challenged* his better *sense* of judgment by staying in Madison over spring break to work on the magazine.

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Let's go Logrolling!

IMAGINE TWO PEOPLE standing on a log in the middle of a lake. They begin to run on top of the rapidly spinning log, trying not to fall in the water. The person who loses is drenched. If you have never seen this sport before, you may be rather puzzled. This is the exciting sport of logrolling, which demands excellent balance, concentration and stamina.

Logrolling requires constant practice, which usually means access to a lake. Wisconsin weather does not make this too feasible.

As with all sports, logrolling requires constant practice, which usually means access to a lake. Unfortunately, Wisconsin weather does not make this too feasible. Logrolling enthusiasts in states plagued by long winters often search for a way to practice that does not depend on the availability of water or a large log. Two senior mechanical engineering students at UW-Madison have developed just such a method.

Kent Kallsen, a professional logroller, and Steve Dingle worked together to design a mechanical device to practice logrolling. The training device is designed to be a very realistic simulation of actual logrolling on water.

The logrolling simulator is an 8 ft. long metal cylinder with a non-skid coating. The cylinder is mounted on a centerline shaft, and the whole thing is attached to a rocking frame. The rotation, translation and rocking of the log are accounted for by using a cylinder and bearings. The buoyancy force is supplied by springs and dampers.

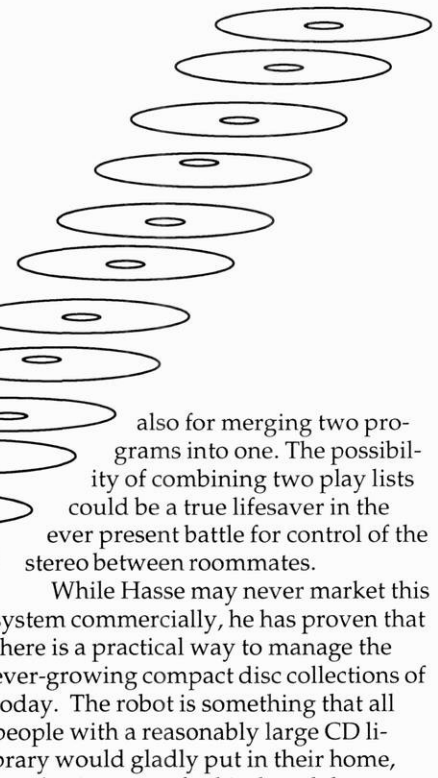
The simulator is designed to be used by one person, a beginner or an expert. The expert mode provides full range of motion, whereas the beginner mode has fixed translation. The simulator is designed to be lightweight and safe, as well as easy to store, transport, assemble and disassemble.

This development is a great asset in training for logrollers, and allows them to stay is shape year round. ■

AUTHOR

Amy Erickson is a fourth year Electrical and Computer Engineer.

Robots+CDs=10,000 Hours of Continuous Music



DOES MUSIC AFFECT your mood? If you are like most people, it does. You enjoy one kind of music while working but another while relaxing. This is the driving force that led Electrical Engineering/Computer Sciences senior Scott Hasse to the idea for his EXPO '93 project: the Robot Compact Disc Changer.

The changer behaves much like a CD jukebox, but with several important differences. Most importantly, if you want to hear a song, it doesn't cost a dollar. Actually, the biggest difference is the complete programmability of the system. With a library of approximately 200 CD's, the user is able to make custom programs of any length, from two songs to a week of continuous music. With this range of versatility, there are bound to be more than a few obstacles to overcome to make the system user-friendly.

Hasse's first problem was deciding how to control this system. He arrived at a solution by choosing to write control software that would run on his PC (an IBM 286). In order to make the program easier to use, Hasse decided that the user interface would be a touch-sensitive screen. The screen runs "Windows" and the individual touches are programmed to be interpreted as clicks of the mouse.

The second problem was getting the discs into the player. Here is where the 'robot' part of the name comes from. Starting about mid-summer, Hasse began to collect the parts that he needed to build this machine. The main components of the robot are brass and Plexiglass. Movement is made possible by several stepping motors (motors that move a pre-determined amount when they receive a pulse). Since the robot must have easy access to 200 CD's, it is located in the center of an array of storage units that hold the CD's. When one song is playing, the robot is programmed to go to the storage racks to pick out the next disc and place it on an "on deck circle" (similar to that in baseball). This ensures that even when the next disc is located far from the player, there will be no significant time delay between successive tracks. The player itself is mixed in with an array of storage racks so that the robot has easy access to it as well.

The versatility of this system is not in the hardware alone. The software that manages the system not only allows for playing long, successive programs, but also for merging two programs into one. The possibility of combining two play lists could be a true lifesaver in the ever present battle for control of the stereo between roommates.

While Hasse may never market this system commercially, he has proven that there is a practical way to manage the ever-growing compact disc collections of today. The robot is something that all people with a reasonably large CD library would gladly put in their home, but this is a one-of-a-kind, and the owner is well deserving of the end result. ■

AUTHOR

Len Rauth is an ECE-3 and is a new writer for the magazine.

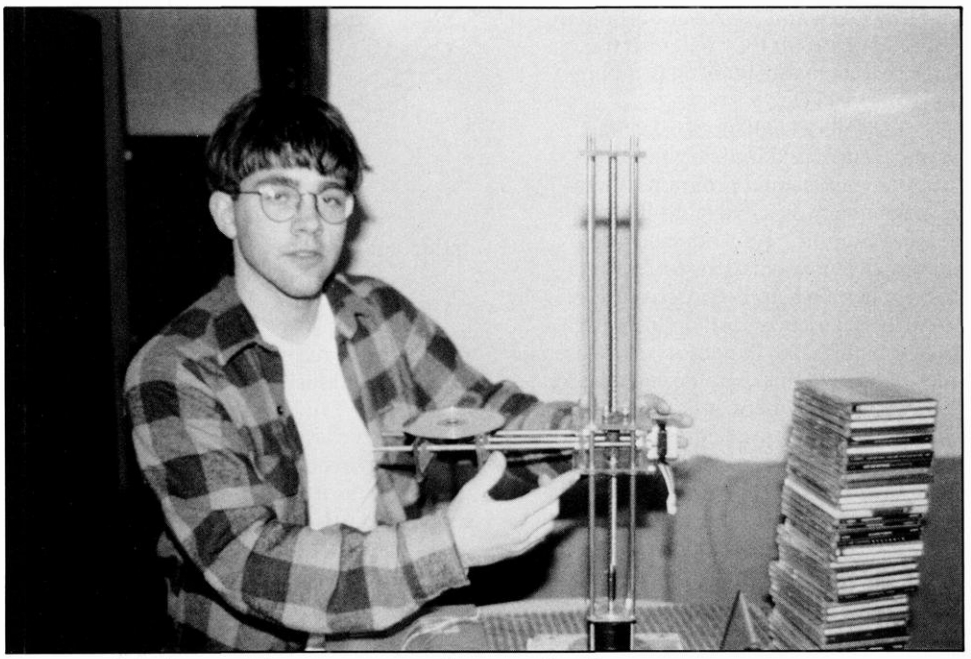


Photo by Shaun Burke

Hasse explains how stepping motors are used to move the robot.

Society Spotlight: Tau Beta Pi

A Piece of the "Pi"

HOW CAN ENGINEERING students show perspective employers that they are more than just walking engineering degrees? How can they learn about the business world? How can they teach young people about engineering? Tau Beta Pi is an engineering honor society that helps engineering students do all these things.

"It's difficult for people who study a lot to get involved on campus," says Marci Zietlow, a senior and president of Tau Beta Pi. Involvement is what Tau Beta Pi is all about. Each semester, members of Tau Beta Pi go on road trips to industry sites to see engineering in action. In the past, the group has gone to the Miller Brewing Company in Milwaukee and Nestle in Burlington, WI. This semester they will visit the Trek bicycle manufacturing company in Waterloo, WI.

Tau Beta Pi enhances its contact with business and industry through company-sponsored programs. Organizations such as General Mills, Proctor and Gamble, and Anderson Consulting give presentations to Tau Beta Pi members to help them get a feel for what an engineer's position in an organization might be. In addition, the companies often give tips on interviewing strategies and employment options available for different engineering degrees.

Why are business and industry so attentive to Tau Beta Pi members? We all know that companies are always looking for the best and the brightest employees. These companies know that Tau Beta Pi is where they can find them.

Tau Beta Pi has a rigorous procedure for choosing new members. Only the top 20% of seniors and top 12% of juniors across all areas of engineering receive letters of invitation to attend the new recruits meeting. These candidates must also submit a letter of recommendation from a professor and then interview with current members of Tau Beta Pi. About 300 students receive letters of invitation each semester. On average, only 50 of these 300 make it to the initiation ceremony. The strict standards for acceptance make Tau Beta Pi one of the most prestigious engineering honor societies on campus.

THE SEAL OF TAU BETA PI

"It looks great on a resume," says Zietlow. In fact, she heard from a past president of the honor society just how impressed employers are by membership in Tau Beta Pi. When the employer noticed that the interviewee had been a member of Tau Beta Pi, Zietlow explains: "He said 'Wow! You were a member of Tau Beta Pi?' Then he told him that when he was in college, he had the grade point to get in. But," Zietlow adds with a grin, "they told him he didn't have the moral character needed."

Another part of Tau Beta Pi is socialization. "It really brings the College of Engineering down to a friendly size," says Amanda Ward, a junior and Vice-President of Tau Beta Pi. One of the groups activities that is particularly important is making "bents" — the Tau Beta Pi honor society symbol — for all new initiates. Every year, the group makes the paperweight-size symbols from scratch. The tasks involved range from making molds to pouring molten metal. "We're the only chapter left that makes them by hand," says Ward proudly,

Finally, Tau Beta Pi has a very aggressive outreach program. Many times each semester, members travel to Madison area junior and senior high schools to teach kids about what engineers do, and to encourage them to consider studying engineering. "So many people think that engineering is too hard for them. We want to tell them that almost anyone who wants to be an engineer can—it just takes discipline!" exclaims Ward. ■

AUTHOR

Joy Grapentine is a senior majoring in English with a technical communications certificate. She will hopefully be graduating in June, and wants a job. If anyone is interested.

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