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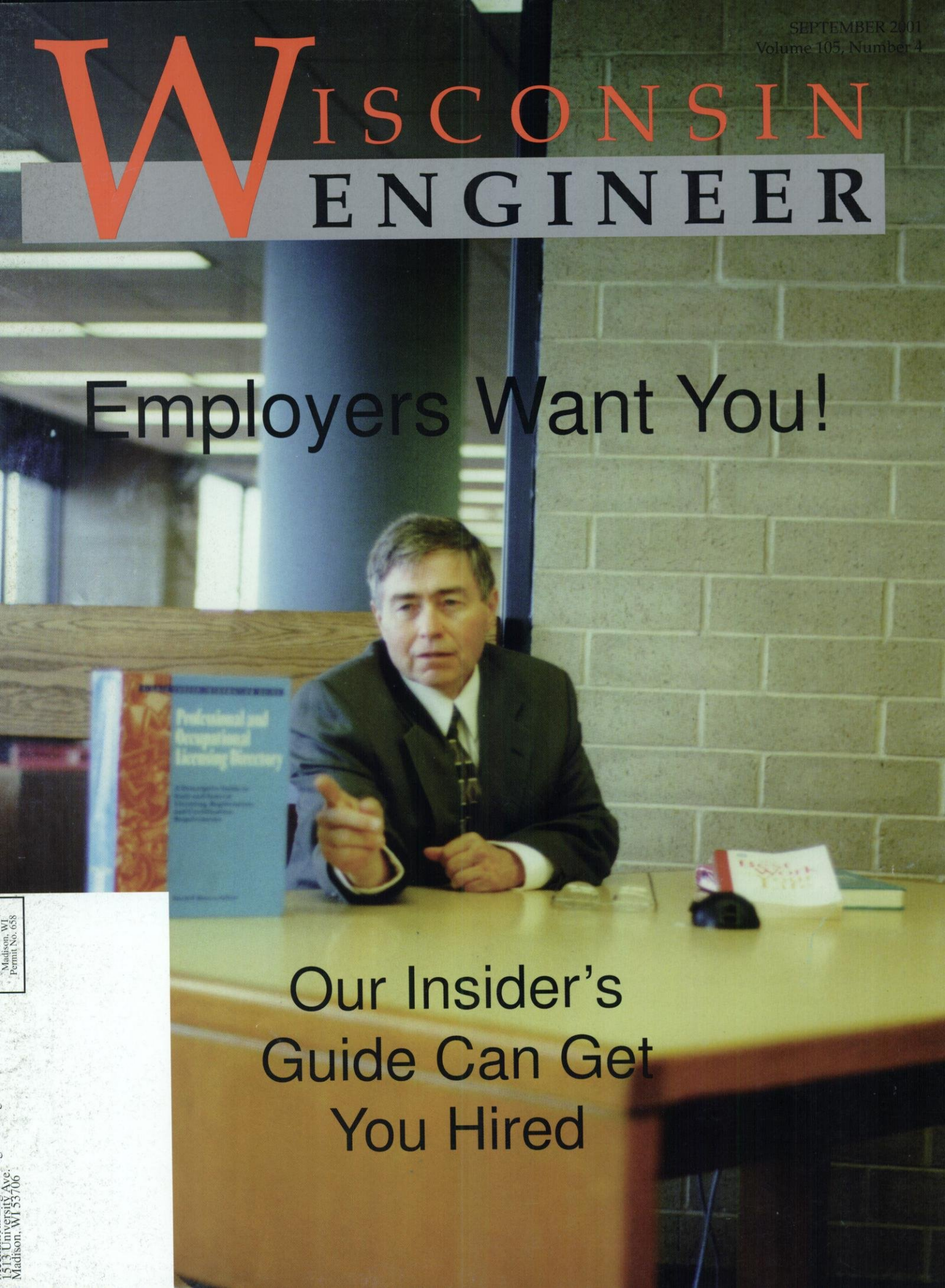
WISCONSIN ENGINEER



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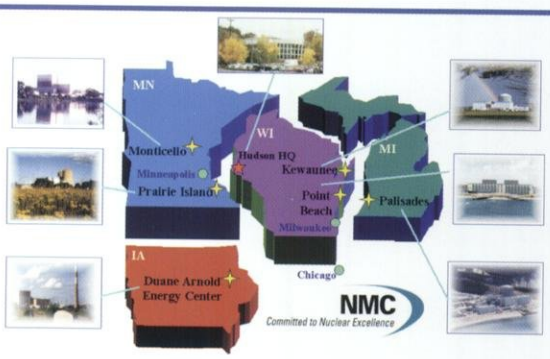

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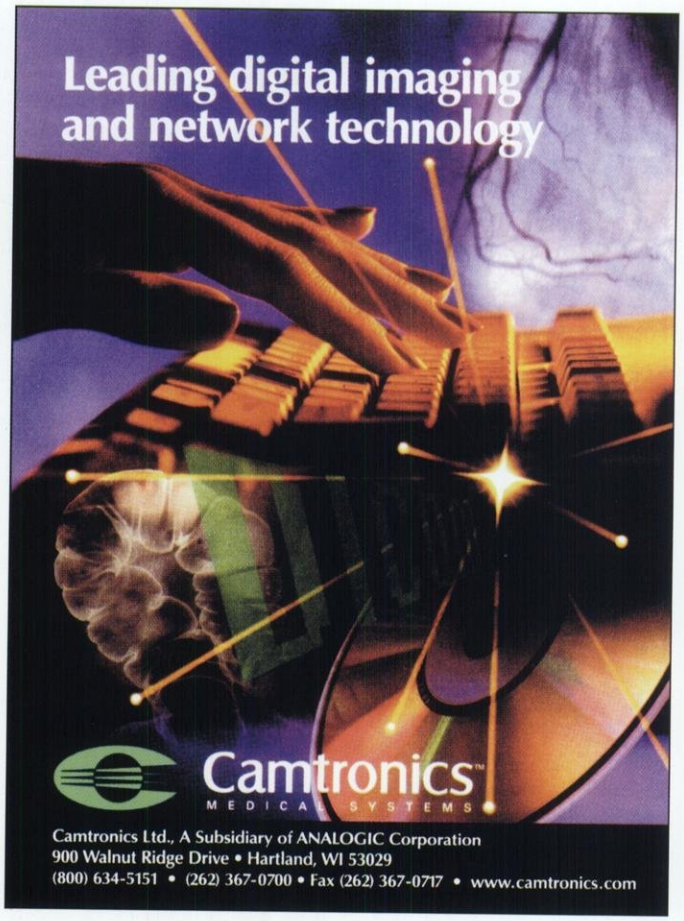

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WISCONSIN ENGINEER

Published by the Students of the University of Wisconsin-Madison VOLUME 105, NUMBER 4 September 2001

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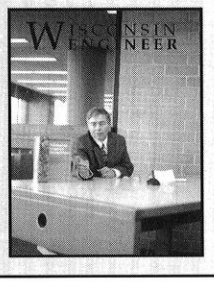

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Recruiters look for key qualities in future employees. Find out how to look stellar for interviews with our 'Study Guide' inside.

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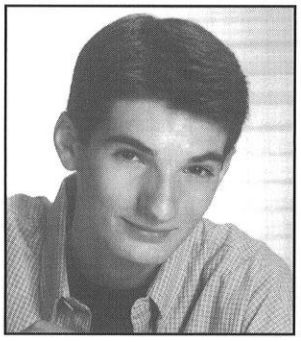

A Muppet at a Birthday Party

Hello. If you're an avid reader of this fantastic magazine, you may notice that I've never written an editorial before. That's because I haven't ever been the writing editor before. Now that I am a genuine editor, I look forward to presenting readers with some of the thoughts—some relevant, but mostly weird—that are constantly whizzing around in my head. For my first editorial, however, I decided to introduce all of you to a guy named Ryan Sydnor (me). In an attempt to make this a little more interesting than watching mold grow, I had the brilliant idea of replacing various adjectives, verbs, nouns, etc. with random words obtained from other students. Think of it as an anthropological study of sorts, rather than a ridiculous bunch of nonsense. And so what if some guy named Mad Lib already came up with the idea.

I'm a second-year Apple Cinnamon Cheerios major with dreams of improving brain-hunting technology. I might also like to just chill for NASA, designing slow-roasted space mulch and smarmy astronaut poodles, but I'm kind of Swayze[1] about the government's policy of requiring –4/ e vision in order to become a muppet at a birthday party. In the movie Space Cowboys (which I suggest you avoid spooning at all costs), one of the lubricated badgers manages to cheat the system by memorizing the oatmeal chart. Perhaps I'll try that.

Aside from my Bowflex aspirations, I also plan to erotically prance around in Japan during my 90210th year. I'm taking 3rd turtle Japanese this fall, a 6-credit crack head that takes up even more time than my engineering courses. I'm hoping the ability to speak Hmong will come in handy in my career, but I'm having a pantypalooza of fun with it regardless. Have you ever fallen in love with one of your TA's?

You may wonder how a trippin', midgety titmouse Reddiwhip Honey Bun playa such as myself ended up as an editor/writer for the Wisconsin Engineer. Well, I joined the staff as a freshman, seeking an opportunity to write about something other than Mick Dundee. I loved the experience, so I stuck with it, and I plan to remain on the staff for a while. When asked if I would take over as writing editor, I pensively said "Zesteey." I appreciate your readership, and I'll do everything I can to help this magazine remain one of the best around.

This project has provided an intriguing look into the general concerns and thought patterns of the average UW-Madison student through the words they choose to blurt out. The message that can be drawn from the above is clear; I feel that to explain would be to insult your intelligence. For those of you that were hoping to get something meaningful out of this editorial, all I can say is that the next one can't possibly be any worse.

[1] Sway·ze adj. Exhibiting the physical and characteristic qualities of Patrick Swayze.

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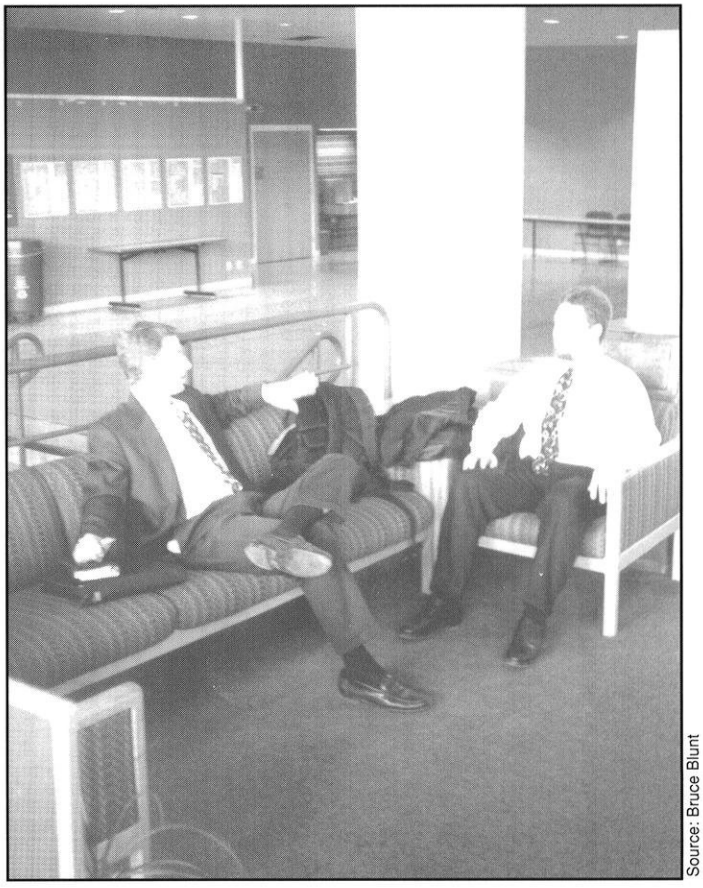
Studying for the Job

By Erica Brewer

Put down your calculator. Stop chugging espressos during late night cram sessions. Your 3.5 Grade Point Average (GPA) may catch the eye of a recruiter, but if you don't know what companies expect from a University of Wisconsin-Madison engineer, you may as well stop studying.

What can you do to start preparing for your interview session? One way to start preparing is to develop a strong resume. Mark Berg, Human Resource Manager for Green Heck Fan, recommends that you include all the necessary information such as your GPA, your major, your work experience and your outside experience. "Make sure it's easy to read, there isn't too much or too little on the page," said Berg. "Also, do not use a functional resume. Functional resumes list certain skills. I don't like those because it doesn't tell me where they [students] gained it from."

Brad Turpin of National Instruments (NI) Leadership Program and his colleagues, Naren Salem and Bill Allai, agree that students should include important details like experience and extracurricular activities. "Extracurricular activities give a good window into the personality of the candidate and should definitely be included on a resume," Turpin said.



Source: Bruce Blunt

Rob Schellin (left) and Dave Thaler (right) converse while waiting to be interviewed. Talking before an interview can help relieve anxiety and help to warm up speaking skills.

Once recruiters have narrowed down the possible job candidates, they come to UW-Madison to interview students. Berg interviews 12-13 students per day and narrows it down to one or two students. He thinks that it is more competitive for the employers to hire students, rather than the students competing for a job. "Typically students will walk out with five offers," said Berg.

Turpin said that interviewing for his company is very competitive. "The goal is for the recruiter to find better people than himself. Candidates aren't competing against each other; they're measured against the current employees of NI," said Turpin. "Bear in mind that time is extremely limited during a typical on-campus recruiting trip, and one has to choose not to talk to every candidate who might be suitable. You have to hone in on the ones who are most likely to be a match for the position you're trying to fill."

When Turpin looks for job candidates, he goes through two processes. He determines whom to interview on campus and then narrows it down to who makes it to the next step in the process. "Our standard situation at NI is to bring back as many qualified full-time candidates as we can find," Turpin said. "Some trips you recommend a lot of candidates for a plant trip, and other trips you only recommend one or two."

So, what are companies looking for in recruits? "We're looking for it all, and we prefer to find it all in each candidate," said Turpin.

Berg said that recruiters from his company look at how well students can speak. "Typically, we look for the [student's] communication skills in the interview," said Berg. "Some [students] are great problem solvers, but if they can't communicate, they're not going to help us."

Both Berg and Turpin agreed about the characteristics that recruiters look for in a student. Both companies value communication skills, leadership, teamwork and problem

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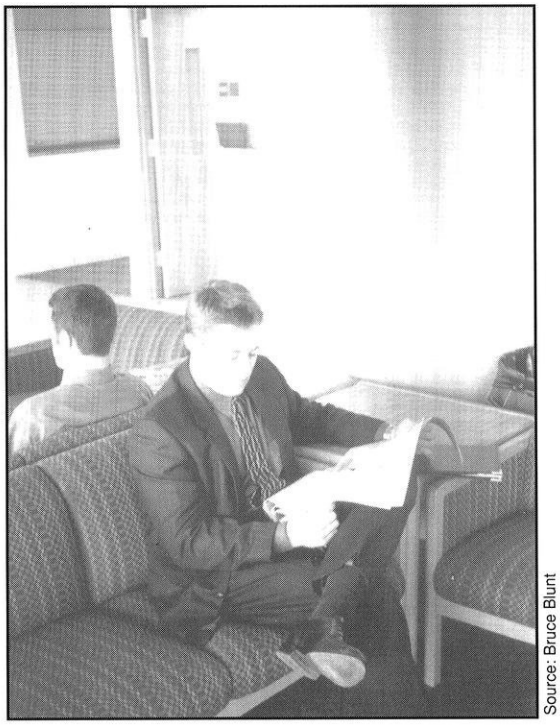
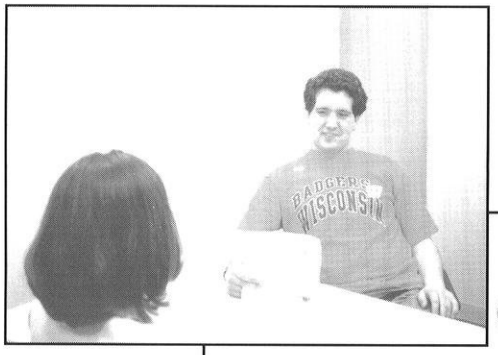
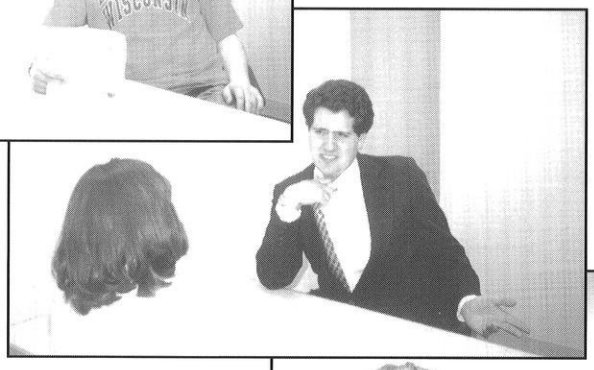


Source: Bruce Blunt

Another interviewee relaxes by reading a newspaper while awaiting his interview.





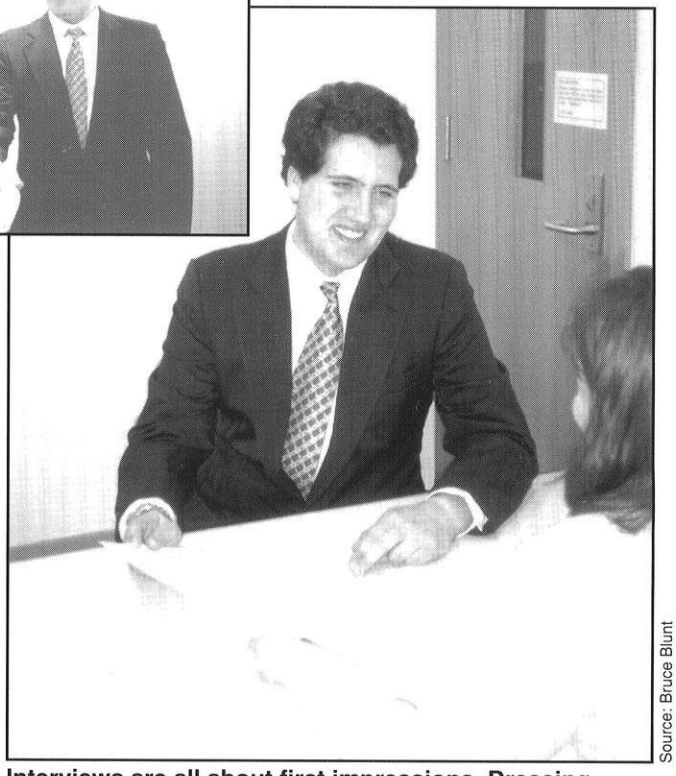
solving skills. Turpin recommended showing enthusiasm for the company you are interviewing with. "Have a good answer for the question, 'Why are you interested in working at NI?' Look at the company website. Your excitement about the job opportunity is a major factor that plays into your evaluation, and it's one that is completely under your control," said Turpin.

Berg and Turpin also examine your academic success by looking at your GPA. "I look at the overall GPA and how they progressed," said Berg. "If they had a rough freshman year and brought it up, I am more forgiving."

When recruiting, Turpin views factors that affect GPAs as well. "Interviewers worth their salt will of course bear in mind mitigating circumstances which affect GPA such as working part-time or even full-time while going to school, a death in the family, etc.," he said.

Turpin feels that a GPA is a good statistical measure of academic and intellectual quality. "I've interviewed 4.0 candidates who were completely unsuitable in their technical abilities and candidates with a 3.2 who were absolutely stellar," Turpin said.

Besides having a good GPA and effectively communicating during an interview, Turpin and his colleagues also suggest that you know as much as you can about the particular position that you're interviewing for. "Be ready to explain why that would be the best place in the company for you to start in," said Turpin.



Source: Bruce Blunt

Interviews are all about first impressions. Dressing sloppy, not having a well-prepared essay (far left), and fidgeting (left) are things to be avoided. Being confident, courteous, and having a good resume (above, above left) will help an interview go smoothly.

For some students, interviewing can be nerve wracking. What should you do if you get nervous? Berg recommends that you try to recover as quickly as possible. "In most cases, it is not held against you," said Berg.

Turpin offered another way to beat the interview nerves: "You will be a lot less nervous if you make up your mind to be yourself, be completely honest and treat the interviewer as a co-worker you're working on a project with," said Turpin.

One reason students do get nervous during an interview is because of the questions the recruiters ask. "We ask very specific questions," said Berg. "Students aren't used to giving a specific example. We look at experiences from the past as an indication of the future," Berg said.

Turpin and his colleagues tend to ask behavioral and technical questions. An example of a behavioral question would be to talk about a time when you exhibited a certain trait and then talk about that particular life event. "What you're looking for is a compelling example," said Turpin. "My experience has been that often candidates have better examples in their lives than they sometimes come up with on the spot. My advice to the candidates would be to allow yourself the luxury of a little more time to reflect before you pick an example."

Technical questions look to see how well you tackle the problem and if you already know all the answers. "Ideally, the candidate

Engineering Career Services

Engineering Career Services provides you with several information sheets about topics such as:

- Resume writing
- Potential interview questions
- What you should ask potential employers
- How potential employers rate you during interview sessions

If you do have more questions about upcoming career fairs or want information about how to speak with employers, visit the ECS website at *http://www.engr.wisc.edu/services/ecs/* or call 262-3471.

would enter into a discussion of the problem posed, ask clarifying questions, then build the solution up logically, taking each step one at a time and learning from the previous steps to figure out the next one," Turpin said. "If the candidate doesn't know all the aspects of the question, it's important that they demonstrate the ability to learn them during the interview, and are able to articulate the technical concepts back to the interviewer."

According to Berg, students who do not have an answer to a question tend to stand out in a negative manner. "As you go through 12 to 13 students, it is difficult to remember who said what. The ones who were more negative tend to stick out," he said.

Turpin says that a student will stand out if he or she demonstrates an interest in the position being offered. "Interest is often demonstrated by attending on-campus events and asking questions of the recruiters during career fairs and information sessions," Turpin said. "Technical prowess is, of course, always eye-opening, both on paper and in an interview."

Despite how well students may think an interview went, some have to be turned down. According to Berg, some reasons that a student will not get the job are based on characteristics that they lack. "If you don't have good communication skills or experience, or a poor GPA and no reasons why, students will get turned down," he said. "It's very easy for students to find internships, and it stands out if they have no experience," Berg said.

Turpin rejects students based on two factors: technical ability and culture fit. "Within the technical realm, you need to have a baseline of existing knowledge for the position you're applying for, and you need to have the ability to quickly learn new skills and analyze new concepts," said Turpin. "On the culture fit front, we at NI look for team players who enjoy solving problems, who want to be excited about what they do and what their company is accomplishing, who are naturally friendly and helpful to customers and co-workers."

Turpin said candidates are often turned down for culture fit reasons because they like to complain, are non-communicative and are too focused on personal gain and gratification at the expense of others. "Basically, would you want them in your work group?" Turpin asked.

As challenging as interviewing for a position can be, Turpin offered one simple idea: "Be yourself. This is like a date, you want to be embraced or rejected for who you really are, not some front you're projecting of what you think we want."

Author Bio: Erica Brewer is a senior in Communication Arts and Family and Consumer Journalism, with a certificate in Technical Communications. She will soon be going through the interview process herself when she graduates in May 2002.

ABET STAMP of Approval

By Greg Joseph

There exist in this world concerned parents, selective employers and license certification boards. The connection may not be obvious, but there is one. These are the major forces that create the demand for ABET – the Accreditation Board for Engineering and Technology.

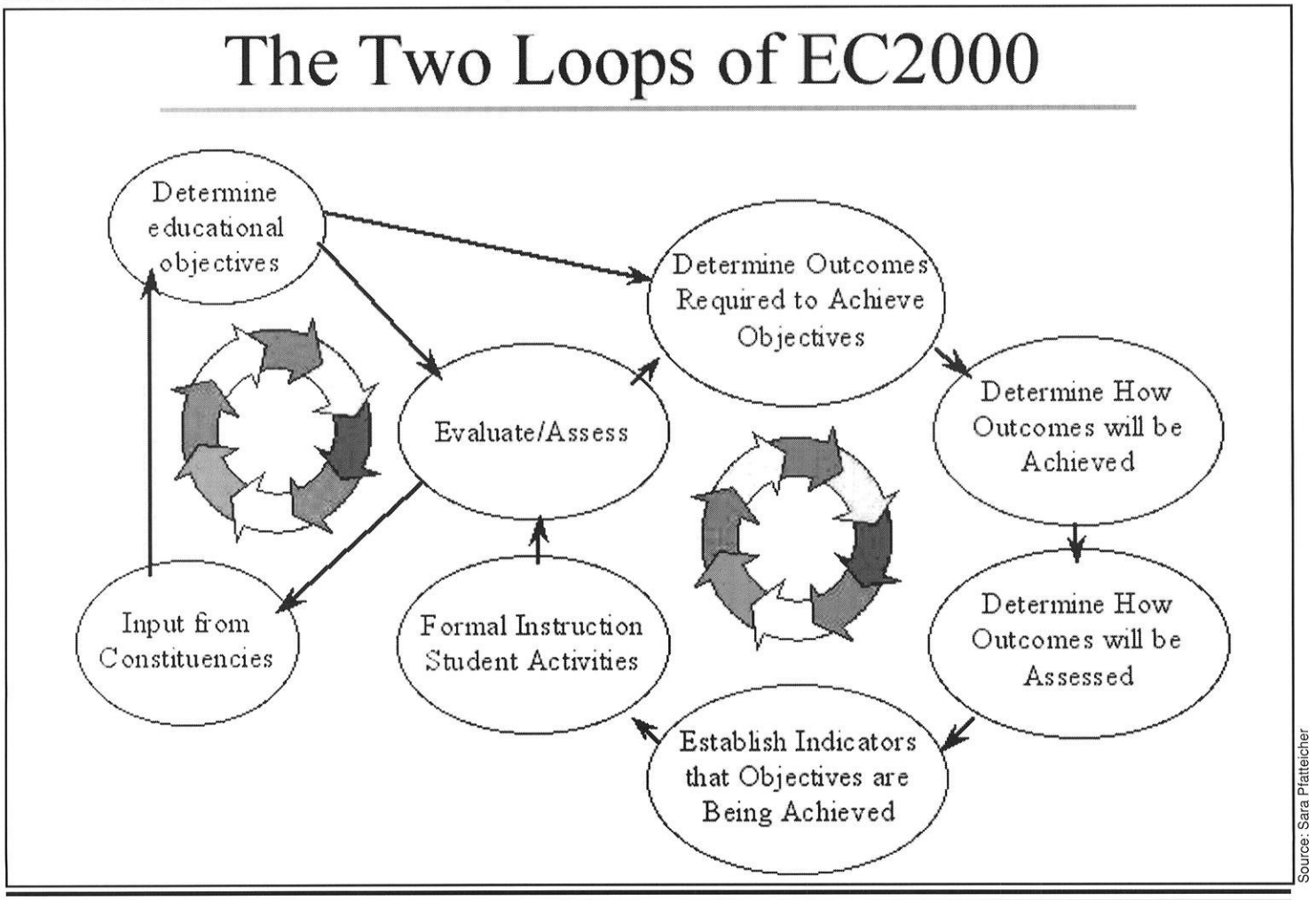
ABET is a non-governmental organization composed of representatives from 31 professional societies that offers a voluntary service to degree-granting programs across the country. The service they offer is accreditation – certifying that an educational program meets certain standards.

Accreditation assures that students who receive a degree are actually ready to participate professionally in their field. It also lets prospective students see if a school they may be interested in meets a certain level of educational standard. Programs don't get a ranking – they either meet the base standards or don't. Over 300 engineering schools are accredited by ABET.

Accreditation is essential for engineers who want to receive a state license. In order to receive the title of Professional Engineer, most states require that students receive a degree from an accredited program. And even though most engineers don't get licensed, it is crucial for those who do.

The organization was formed in 1932 as ECPD — the Engineers' Council for Professional Development. Initially, their focus was the enrichment of engineering education and support of the engineering profession in general. Then in 1980 they shifted their focus to accreditation and changed their name to ABET.

In order to better understand ABET, I spoke with Sarah Pfatteicher, Director of Assessment for the University of Wisconsin-Madison College of Engineering Accreditation Team. She dealt first-hand with the process of accreditation through ABET, leading the team of UW-Madison staff that prepared for the November 2000 visit.



Source: Sara Pfatteicher

So why would a school want to be accredited? She says that a smaller school wanting recognition would benefit greatly from ABET's stamp of approval. Also, since ABET only checks if a program meets minimal requirements, a school might receive a bad reputation if they refused accreditation. Pfatteicher mentioned, "People might question you if you decline accreditation." It would be bad public relations.

This new process evaluates what students take away from a program, not what the program offers them

ABET comes to the UW-Madison College of Engineering every six years, evaluating all of its degree programs. According to Pfatteicher, the team that gets everything ready for ABET begins preparing two to four years prior to the visit. The preparations have become very intense in the last year.

The visit from ABET to UW-Madison is an involved process. Initially, representatives from ABET spend two and a half days here. An informal reaction is presented to the Accreditation Team shortly thereafter. It does not end there, however. For the next six months, ABET and the UW-Madison Accreditation Team sends three or four responses back and forth. They do this to ensure that ABET doesn't miss anything important in their reports of the degree programs.

There was a major shift in how ABET accredited programs. Prior to the mid 1990s, ABET would send each degree-granting program a check-off sheet that showed how many credits of specific topics each student had to take in order to receive a degree. Pfatteicher says that there was a lot of number crunching, but a satisfactory evaluation was almost guaranteed, since you knew if you checked a certain amount of boxes, you would pass accreditation.

Recently, however, things have changed. The new way ABET accredits programs is by instructing each specific program to come up with educational objectives and show that they succeeded. They do this by viewing sample student assignments, conducting interviews with exiting seniors, alumni and employers, among other things. Then, if ABET feels that the program succeeds in completing their objectives and prepares students for work in their professional fields, they grant them approval.

In support of this change, Pfatteicher says that it is "important that we allow for flexibility and variability." This new process evaluates what students take away from a program, not what the program offers them. In her words, it measures the output rather than the input. However, she commented that the more vague and less secure nature of this new method causes accreditation recipients to be more nervous.

ABET supplies a service that the UW-Madison College of Engineering accepts every time it is offered, even though the process of accreditation is a lengthy and energy-consuming task. It is more than likely that one day you will feel the benefits of accreditation directly. That day, try to remember the efforts of everyone involved in the accreditation process.

Author Bio: Greg Joseph is a sophomore looking to major in journalism but surrounding himself with engineers in hopes that one day, when they're all making too much money, he can mooch to his heart's content.

Engineering Fraternities:

They're Not Your Typical 'All Boys' Club' Anymore

Source: Bill Skovsted

By Jeannine Washkuhn

Utter the word "fraternity," and instantly images of huge keg parties, drunken men running around in togas and pledges being paddled jump into most people's minds. Does "Animal House" ring a bell? Well, throw that stereotype away because the three engineering fraternities at the University of Wisconsin-Madison can offer you, whether you are male or female, a valuable and unforgettable experience that is beneficial for not only your social life, but for your professional career as well.

Two fraternities, Kappa Eta Kappa (KHK) and Theta Tau, are professional fraternities, with both male and female members. Triangle, on the other hand, is an all male, Greek, social fraternity that actively participates in Greek activities with other fraternities and sororities who belong to the InterFraternal Council (IFC). All three fraternities offer a variety of leadership roles, ways to become involved in community service and professional development activities that complement your engineering education. Although these organizations have their similarities and differences, one common belief they all share is that one of the most important things to think about when joining a fraternity is whether you truly like the group of people who are members.

Kappa Eta Kappa

KHK is exclusively an Electrical and Computer Engineering fraternity, but it is open to both male and female undergraduate students. They have 24 members: 21 men and 3 women. Members participate in a variety of social events throughout the year to get to know each other better, such as bowling, paintball and parties. Community service activities that they have recently participated in include blood drives at Union South and the creation and distribution of Easter baskets to the cancer patients at St. Mary's Hospital. One of their favorite professional events is their faculty social where members and faculty get a chance to meet and talk in a more causal atmosphere. A large variety of leadership positions are available, ranging from President, Vice President and Treasurer down to Social Chair, Pledge Trainer and Computer Chair. There is a monthly fee of $30 and a $10 once-a-semester national fee.

KHK's chapter house is located at 114 North Orchard Street, less than a block from Wendt Library. Jason Koering, the president for Spring 2001 added, "A lot of people live here, we have 13 rooms…so it's easy to come over and find someone to just talk to them, get help on homework, anything else you need."

Their rushing process, steps that a person must take before becoming initiated into the fraternity, is semester long and primarily consists of attending fun events to get to know the current members. Also, there are weekly meetings to attend, a certain number of written tests to take and a house project to complete with your pledge "brothers." No hazing is involved and drinking is completely optional. Koering remarked, "When I pledged, I didn't drink at all and I went through the entire pledge process not drinking."

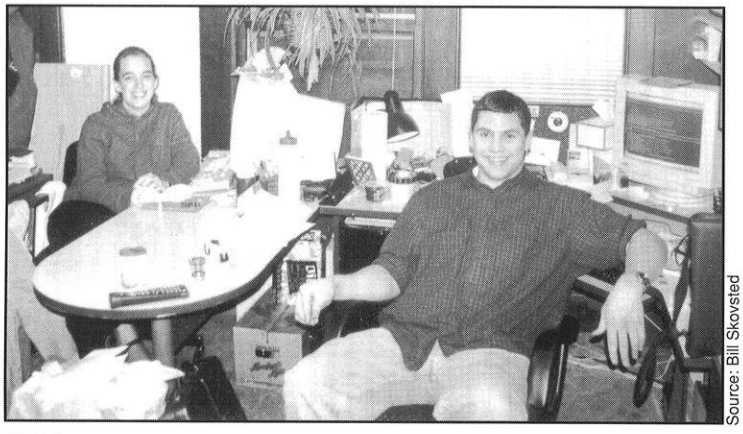
When asked why he joined KHK, Koering replied, "The people." He also added that there are a lot of fun people and that the "kind of people that are attracted to the fraternity are the kind of people that are fun to hang out with and like to do fun things."

Theta Tau

Theta Tau is a professional fraternity for men and women, undergraduate and graduate students and is open to all of the engineering majors on campus. They have 25 members, 12 male and 13 female. Steve Buck, Spring 2001 Regent, stated that Theta Tau tries "to stay pretty involved in the engineering campus and stay involved in things that other engineering organizations set up," such as E-Week (Engineer's Week) and Engineering Expo. There are a number of community service events that they participate in such as "Trick-or-Can" in the fall, where non-perishable food items, instead of candy, are collected on Halloween. They also participate in Adopt-a-Block, where they clean a section of their neighborhood block a few times a year.

...the most important things to think about when joining a fraternity is whether you truly like the group of people who are members

Buck added that on a professional development level the fraternity takes plant trips to different places around Madison and Wisconsin, and once a semester they invite a speaker to talk to the fraternity about a professional topic. A long list of leadership positions are available, including the Regent, Vice Regent, Corresponding Secretary who is in charge of alumni communications, Community Service Chair, Social Chair and



Source: Bill Skovsted

Joining an engineering fraternity is a great way to meet and study with friends who share common classes and interests.

Birthday Chair. A $30 pledging fee is required, along with a $150 one-time initiation fee and $200 a semester for dues, which includes the national fee.

According to Buck, "The pledging process involves simply coming to some rush events that we set up, and that's just an opportunity for members of the fraternity to meet people that have shown an interest in joining a chapter like ours." He added, "Then we do some more social type activities and some professional activities that show the prospectives ... the spirit of our fraternity and who we really are and what we really do." There is an eight-week pledging period where weekly meetings are held, Theta Tau history is taught and pledges work together on various projects.

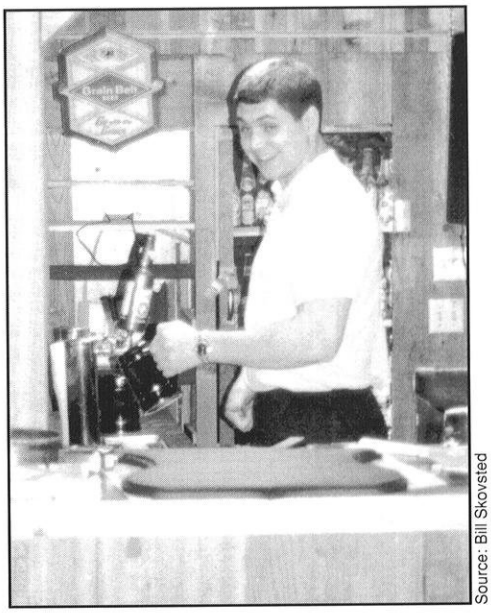
Their chapter house is located at 1633 Monroe Street, about 2 blocks from the Fieldhouse. When asked what people can gain by becoming a member of Theta Tau, Buck replied, "This is a very well-balanced organization. You have every aspect of things that you need to learn to become a successful engineer, right here."

Triangle

Triangle consists of male undergraduate students who are engineers, architects and scientists. Since they are a social fraternity, as opposed to a professional one, they do not allow women in their chapter. Mike Mayer, the Spring 2001 President of Triangle, explained that the all-male atmosphere provides a more relaxed setting and that the interaction between the members is more open. Triangle is a Greek fraternity, which means that it belongs to the InterFraternal Council (IFC). They participate in Greek activities, such as homecoming and philanthropy events, with other sororities and fraternities in the IFC. Their main community service event is their annual Haunted House that they create in the fall, with the proceeds going to Briarpatch, a local crisis management organization for teens and their families. A large variety of leadership positions are available. Mayer emphasized "right away, from the start, people are able to get involved in smaller roles which help ... them get involved in the larger roles, like executive offices." All pledging fees are reimbursed; membership fees are $50 per month with an annual national fee of $51 per member. They have two houses located at 148 Breese Terrace, behind Randall Stadium.

When asked why he joined Triangle, Mayer said because of the people and that he "thought it would be a good experience, a good way to get involved on campus." He also added, "A lot of people have joined for a lot of different reasons," from extensive exam files on the academic side, to being able to hang out with a great group of people that share a lot of similar interests on the social side.

The rushing and pledging process for Triangle is similar to the previous two fraternities with weekly meetings and activities to help in getting to know the members. When discussing Triangle's alcohol policies, Mayer stated that they are "a part of IFC ... you have to participate in dry rush which means that we're not able to lure people with alcohol." He added, "It's fair, otherwise it comes down to who can throw the biggest bash and you're not getting quality guys that way." As with the other fraternities, Mayer confirmed that there are no pressures to drink. "We have guys that don't drink and we totally support them, it's not a big deal. If you don't drink, you don't drink. If you drink, we're not going to stop you and we're not going to make you."



Source: Bill Skovsted

This member of the KHK fraternity shows us that engineers, despite many stereotypes, really know how to have a good time.

No matter what you are looking for in an engineering fraternity, there is bound to be one that you will click with. All three groups emphasized the importance of feeling completely comfortable with the group of people before you decide to join because members are "brothers" for life, through thick and thin. Even though each organization has its advantages over the other, there is an amazing similarity in the leadership opportunities, academic support and the strong bonds of friendship that are found in all three. These people aren't uppity, they're not pretentious and they're not loaded with cash. They're normal engineering students like you and me. If you are interested in mixing academics with fun, check out these three groups for an unforgettable addition to your college career.

Author Bio: Jeannine has been a member of Theta Tau for two and a half years and has loved every minute. She encourages everyone who is interested in joining a fraternity to check out their websites and to attend kickoff meetings in order to get a more detailed view of fraternity life on the UW-Madison campus.

UW Engineering Fraternities

Kappa Eta Kappa
- Co-ed Professional Fraternity
- Who can join: Electrical and Computer Engineers
- Gender: Male and Female
- Age: Undergraduate students
- Current Size: 24 members (21 male, 3 female)
- Total cost per semester as a member: $160
- Web page: http://www.cae.wisc.edu/~khk/

Theta Tau
- Co-ed Professional Fraternity
- Who can join: All engineering majors
- Gender: Male and Female
- Age: Undergraduate, Graduate students
- Current Size: 25 members (12 male, 13 female)
- Total cost per semester as a member: $200
- Web page: http://www.cae.wisc.edu/~thetat/

Triangle
- Male Social Fraternity
- Who can join: All architects, scientists and engineers
- Gender: Male
- Age: Undergraduate students
- Current Size: 36 members
- Total cost per semester as a member: $351
- Web page: http://www.cae.wisc.edu/~triangle/

The Man Behind the Textbook: Dr. Paul Treichel

By Matt Feirer

Nothing seems to arouse the curiosity of the typical University of Wisconsin-Madison student more than the most curious of species, the professor. Whether you love or hate them, they can be quite peculiar. The chaotic waxing and waning of understanding and utter confusion constantly perplex us. Who are these unique individuals? Want to know more about that seemingly alien creature at the head of the class?

All engineering students have passed through those annals we call general requirements: statics, calculus, chemistry and communications. At some time, most of us have had to take chemistry. Perhaps you've had Chem 103 or 104. By some chance, you may have had Dr. Paul Treichel.

THE STATS

Treichel is a 1958 UW-Madison grad and returned to his alma mater after receiving his Ph.D. from Harvard in 1962. He's been teaching general chemistry since 1963. Perchance not having him, you may be more familiar with his textbook, used by many university students in their general chemistry courses. Reading through it the other day prompted me to investigate more into the man behind the author.

HIS EDUCATION

After receiving his Ph.D., Treichel spent a year at Queen Mary College in London. Queen Mary College is one of many academic institutions collectively known as the University of London. It is located in the east end of London, which happens to be the harbor district that was heavily hit during the German bombing raids of World War II. He impressed his surprise at the amount of rubble that still remained in 1962. As I sat in his office, he enthusiastically shared some fond memories of this experience. He was married at the time, and he and his wife brought their car, an Austin Healy Bug-Eyed Sprite, with them upon leaving the United States. They booked passage on the second voyage of the S.S. France; it cost them $300 to take a car along as a regular passenger cargo item.

"More than anything else, writing in the book has lead to my teaching being better"

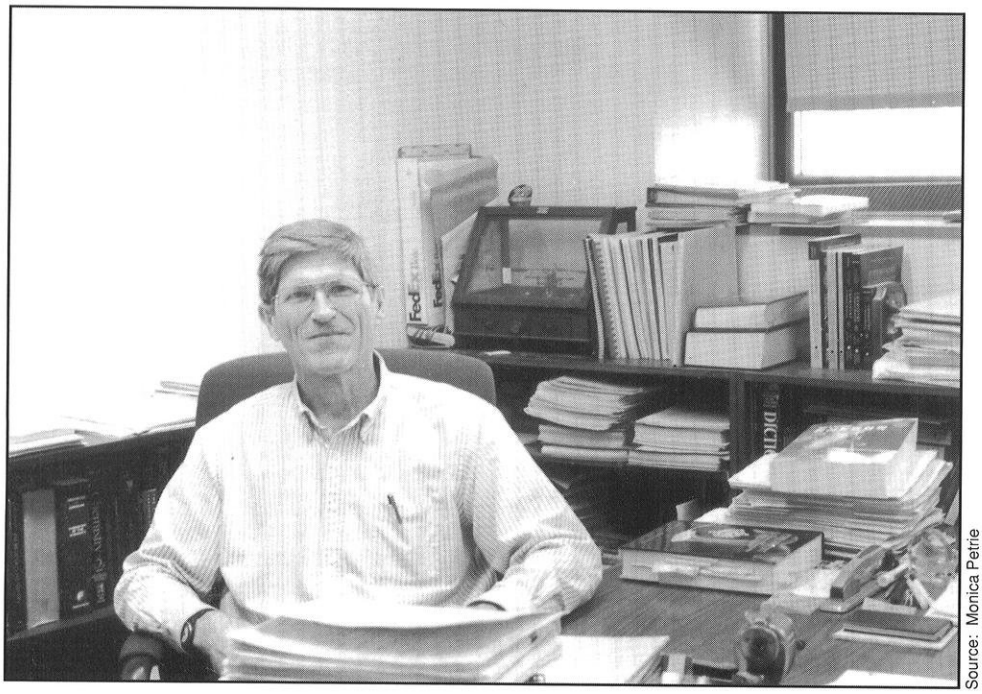
MAN'S BEST FRIEND

Treichel is a lover of dogs. A St. Bernard he owned while in London had a little drooling problem, but it served as a social "ice breaker" to their traditionally personal English neighbors. He currently owns a poodle, which he acquired after its dog show career ended. Adapting to a relaxed home life was a bit trying for the dog, but it behaves like a charm on walks!

Another of his interests is his cabin on an island in Lake Huron's Georgian Bay. This side of Lake Huron is very unique as it harbors approximately 30,000 islands. The island is approximately 300 acres in size and lies one-and-half hours north of Toronto. From Wisconsin, it's a 700-mile drive and a 16-mile boat ride. He and his wife have bought another place on the island and plan on renovating their old one for an eventual resale.

THE PROFESSOR

After delving on personal interests, the conversation turned back to his role here at UW-Madison. Treichel was the department chair from 1986 to 1995, which was a wonderful experience for him. Treichel's current research is in the area of chemical synthesis. In his earlier days at UW-Madison, he focused on organometallic chemistry. Organo-



Source: Monica Petrie

Dr. Paul Treichel is a chemistry professor and also the Director of the Instrumentation Center at UW-Madison.

metallic chemistry involves the study of compounds with carbon bonded to metals, which essentially is a bridge between organic and inorganic chemistry. New compounds could be made from the bonding of the carbons and metals, producing catalysts. While "hot" then, things have shifted to his current area of synthesis of metal cluster compounds.

THE TEXTBOOK

I've always wondered what it takes to write a book. The current version of the book, Chemistry & Chemical Reactivity, is the fourth edition and was co-written by Treichel and Dr. John Kotz of SUNY College at Oneonta, New York. Kotz has been involved in all four editions, while Treichel came on originally as a consultant for the third edition and switched to co-author midway. Presently, they're working on the fifth edition, which is planned to be ready for use in the spring of 2002. At each revision, a lot of the original information gets rehashed. The fourth and fifth editions contain approximately 700 figures. Each figure (as well as each photo) requires permission from the owner and negotiating for rights and fees. I could sense the frustration at balancing the conflicting demands of the publishers, reviewers and their own visions. Problems are especially time consuming to write, with each edition containing around 2000.

While we conversed in his office, Treichel showed me copies of his books in Korean and Portuguese. As we closed the interview, he said, "More than anything else, writing in the book has lead to my teaching being better." It forces you to rethink the presentation of your material and how it translates to the student. He commented that it has been a tremendous compliment to his teaching.

He and his wife brought their car, an Austin Healy Bug-Eyed Sprite, with them upon leaving the United States

As a student, I can attest to the preceding statement. Treichel's classes were a great way to break into my freshman year. We've enjoyed many interesting (and surprising) experiments and anecdotes during lecture. If you have the opportunity, take a class by Treichel—you'll enjoy it!

Author Bio: Matt Feirer is currently a sophomore with interests in Zoology and Ecology.

Source: Monica Petrie

Dr. Treichel's textbook, *Chemistry and Chemical Reactivity*, has also been published in Portuguese and Korean.

Engineering at UW-Madison: Where Do You Stand?

By *Wisconsin Engineer* Staff Writer

Engineer" is a term which encompasses a broad range of disciplines, and usually conjures a particular image. For some of us, it is "a person in a hard hat surrounded by steel beams," says Lauren Meisnitzer—a pre-business major. To my ten-year-old sister it is "a train conductor." However, an engineer is, oh, so much more. Whether it is the cup that holds our morning juice or the pencil which produces lead at the click of a button, engineering plays a sometimes subtle, but critical, role.

The University of Wisconsin-Madison's College of Engineering takes that role quite seriously. The pre-engineering requirements are rigorous at best, and this, Dean Donald Woolston confirms, "is no accident." While UW-Madison is accredited, the College of Engineering is also accredited by ABET (Accreditation Board for Engineering and Technology). Every year ABET comes in, makes observations and determines if the school meets certain standards concerning faculty, rigor of classes and other set criteria. Following this tense period, the school is either given or denied accreditation.

So, are all the engineering programs within the UW System the same? No, there is an enormous difference in not only course work, but environment as well. As admission into UW-Madison becomes more and more competitive, some students find that a smaller UW school may enter into their plans, followed perhaps by a transfer to UW-Madison. However, transferring is not as easy as it may seem. "Many of our students come from UW-LaCrosse and also our two year campuses," said Ann Morris, admissions coordinator. UW-Madison shares a dual-degree program with UW-LaCrosse, a four-year college in western Wisconsin. According to Morris, a student attending UW-LaCrosse will "stay there for three years and transfer to UW-Madison. Upon receiving an engineering degree, they will also receive a Physics degree from LaCrosse." While transferring is difficult, Morris is quick to assure that "students' GPAs often drop ... it is definitely an adjustment, however students who transfer here are usually very focused and do quite well."

Although students tend to do well, Morris and Woolston do not deny that there are important differences between UW-Madison and a school like UW-Platteville or UW-Eau Claire. "The curriculum," says Woolston, "may be the same in many of these schools, but is there a difference between UW-Madison and UW-Platteville? Yes." For example, UW-Platteville does not have a graduate school, which can change the dynamics of the school.

Another important difference between UW-Madison and some of the smaller schools is the teaching style. Where a student at UW-Eau Claire may learn through hands-on experience daily, engineering students at UW-Madison "will learn fundamental theories that will ensure that they have a lifetime of productive engineering," said Woolston.

It is not to say that UW-Madison students do not have the opportunity to do research. Students in any discipline may find a variety of research opportunities, some which may even lead to future jobs. Morris' advice for successful transfer students: "Plan early and stay in contact with our college."

So, what is engineering? A book called Tips for Transfers sums up this question the best. No matter what school you graduate from it means the same—"Engineering - building a better world."

Source: *Wisconsin Engineer* Archive

Two students work on homework at Engineering Hall.

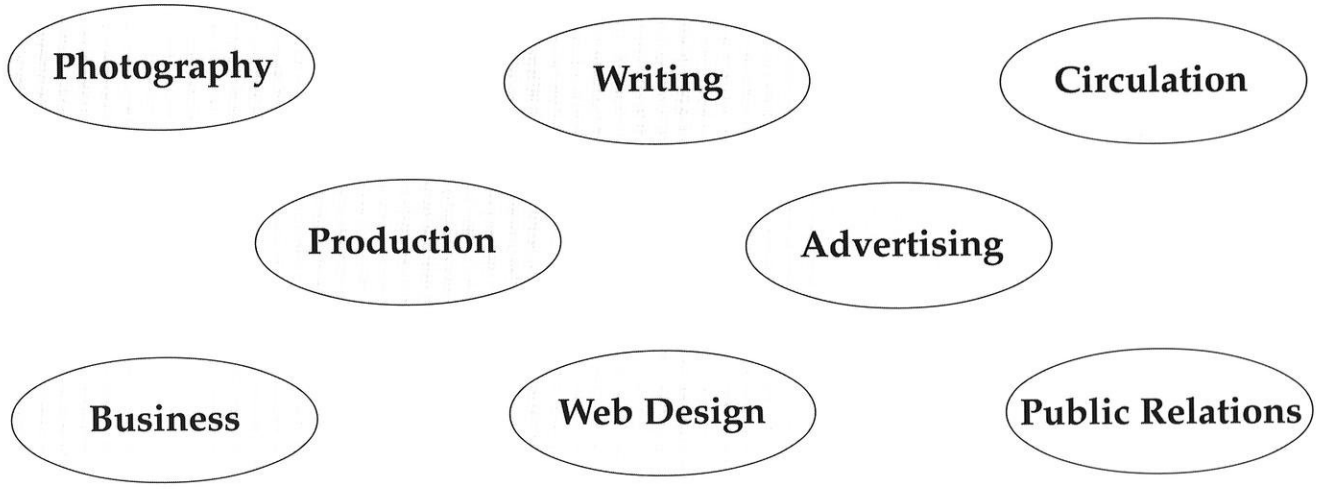
Get Involved....

Build Your Resume....

Meet Students of All Majors....

WISCONSIN ENGINEER

Opportunities in:



Join us at our meeting:

Date: Wed. September 19th
Time: 7:00 p.m.
Place: 2309 Engr. Hall

No Pain, No Gain?

Think Again

By Dana Mott

Have you ever heard the old saying, "No pain, no gain?" Well, in today's workforce that saying is becoming a thing of the past. One of the biggest causes of physical pain on the job is a class of injuries called musculoskeletal disorders, or MSDs. These are health problems with the muscles, joints, nerves, tendons and other related body tissues. Some of the most common MSDs include lower back pain, tendonitis and carpal tunnel syndrome. Injuries like these affect about one million workers each year. This translates into a cost to businesses of around $50 billion annually.

What is being done to reduce these figures? The answer is ergonomics. Although the term sounds lofty, ergonomics simply refers to tactics that make work less stressful on the body. There must be a way to make sure that people know about and follow such methods, right? That is where the Occupational Safety and Health Administration, or OSHA, comes in.

OSHA Facts

- Congressional act of 1971
- Free consultation program for businesses started in 1975
- 12 Education Centers established for OSHA training courses in 1992
- Workplace fatalities cut by half and illness and injuries cut by 40%, since 1971
- 2,370 staff members and a budget of $426 million, as of 2001
- 26 states with own OSHA programs
- OSHA on the web: *http://www.osha.gov*

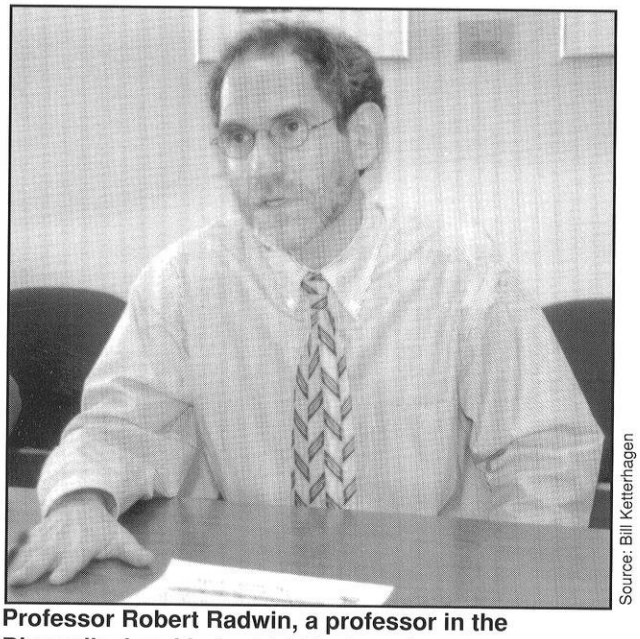
Since 1971, OSHA has been working to ensure that American workers have safe and healthy work environments. OSHA's work has greatly reduced the number of job-related deaths and injuries. The many standards that OSHA has set and enforced have been the main tools in accomplishing this; however, there are some things that inevitably slip through the cracks. For this purpose OSHA has a "general duty clause," which states that if OSHA finds unsafe conditions or too many injuries, it can fine the business regardless of whether there is a standard to govern the situation.

In the past, OSHA has used the general duty clause to fine businesses that had excessive numbers of MSDs reported. However, as incidences of ergonomic-related fines increased, OSHA realized that it needed a new standard to govern ergonomics and MSDs. Some businesses, unsure of the scientific data behind ergonomics, asked Congress to commission a study of the knowledge gathered on ergonomics and MSDs.

The group of researchers selected to conduct the study was charged with evaluating current data on MSDs and ergonomic strategies. It found that back injuries are associated with bending, twisting, lifting and vibration of the whole body. It also noted that disorders of the arms, wrists and hands seem to be affected by repetitive movements, force and vibration. The team recommended that a better system be developed for gathering and tracking data on MSDs.

The carefully selected 19-member team included Professor Robert Radwin of the University of Wisconsin-Madison. Radwin is a professor of Biomedical and Industrial Engineering and is the chair of the Department of Biomedical Engineering at UW-Madison. He has performed extensive research and has published articles on MSDs. Radwin is optimistic about the effect of ergonomic methods in workplaces.

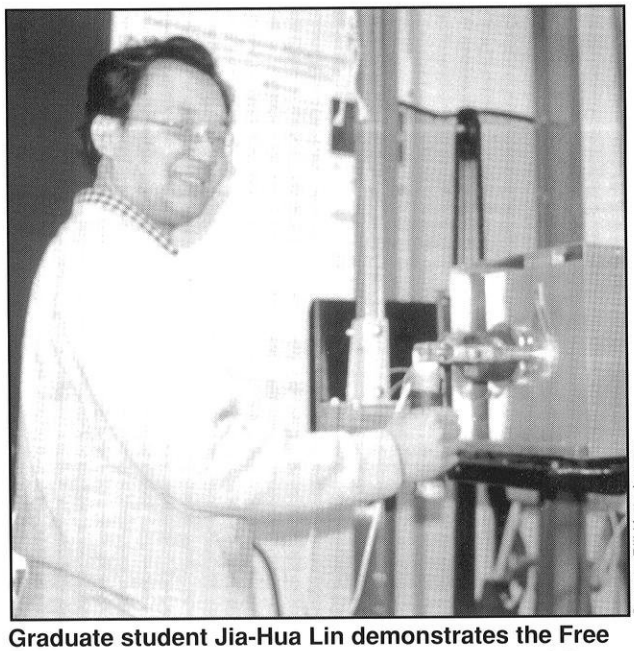
Among the examples he gave of ergonomic changes already being implemented were hoists, platforms, improved or modified tools and revised techniques for carrying out procedures. He says there is no question that ergonomics can improve workers' situations.



Source: Bill Ketterhagen

Professor Robert Radwin, a professor in the Biomedical and Industrial Engineering Departments, explains the benefits of studying ergonomics.

Radwin stressed the importance of cooperation by employers in implementing ergonomics. "It is essential that employers are committed to making ergonomic programs work," he said. It is also important that workers commit to the program. Radwin said that ergonomics is a win-win situation with businesses and employees. The businesses save money by avoiding fines, excessive worker's compensation payments,



Source: Bill Ketterhagen

Graduate student Jia-Hua Lin demonstrates the Free Vibration test which helps to characterize impulsive responses of operators while using power tools and other machinery.

lost work time and decreased productivity due to injuries. "Ergonomics is really not that expensive, especially compared to the cost of fines and injuries," said Radwin. Workers benefit by having a safe and healthy job atmosphere.

There is another side to ergonomics and MSDs. Psychological factors can play a role, said Radwin. If a worker does not have job satisfaction, or relations with the boss or coworkers are strained, then existing problems with MSDs can worsen. Ergonomics not only improves the physical aspect of things but the mental aspect as well. With ergonomics in place, workers are more likely to increase their productivity and be satisfied with their job. As Radwin put it, "If your work is pleasant, and you are not worried about being injured, you are going to do a better job."

Since OSHA only monitors businesses with nine or more employees, some small businesses may not be aware of the extent of the problem with MSDs and the solutions that ergonomics has to offer. So what can a person working for one of these businesses do? Radwin suggests that people in this situation educate their employers on the importance and benefits of ergonomics. There are plenty of sources for

"It is essential that employers are committed to making ergonomic programs work"

information about ergonomics. OSHA itself offers information and training to small businesses interested in adopting ergonomic policies. The job of making the workplace more efficient and more productive is a never-ending process, but with advances in ergonomics at least it will be more comfortable.

Author Bio: Dana Mott is a sophomore majoring in Chemical Engineering. She enjoys dancing, singing, cooking and, of course, writing for the Wisconsin Engineer. This is her second article.

Water, Water Everywhere... Or Is It?

By Jessica E. Shoemaker

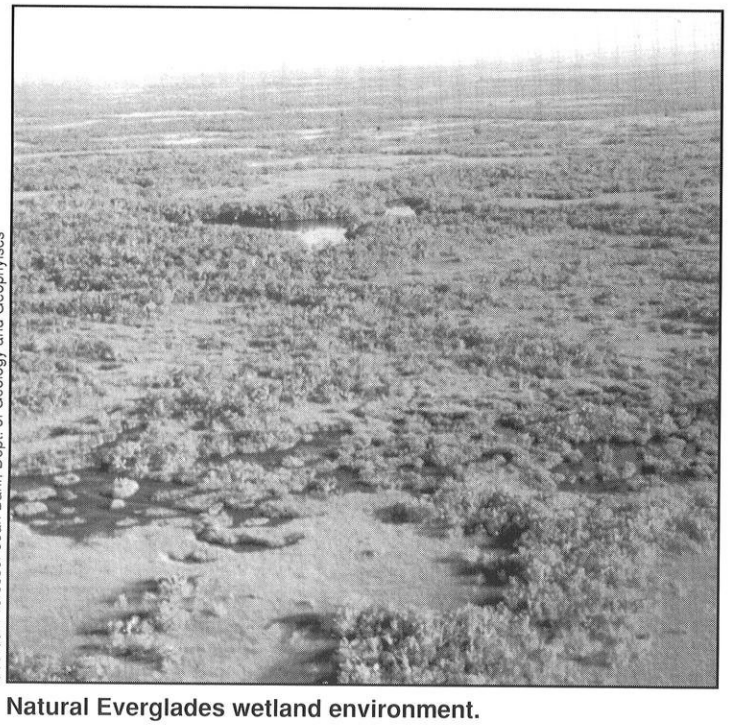
Water conservation is hardly the first thought to enter your mind when you hear the Greater Everglades mentioned, if it is thought of at all. Water plays a vital part in the Everglades. Without it, the Everglades would cease to exist, as all life depends on water. The lack of attention paid to water conservation is endangering the wildlife and plant life of Southern Florida, as well as the existence of the Everglades itself.

Water once flowed from Lake Okeechobee down through the southern tip of Florida, which was once completely covered by the Everglades. The southern end of the lake was then diked so the land in that area could be used for agricultural purposes. To maintain flood control, canals were built to carry rainwater out to the estuaries, where fresh and saltwater mixed. This increase of freshwater in the saltwater bodies caused problems for marine and plant life because they were used to a very well kept balance. The Everglades also suffered because it was no longer receiving its supply of rainwater during the wet season.

The water that still manages to make it to the Everglades, despite man's manipulation of its original path, now collects in deeper pools, and less water goes into the ecosystem when it is needed most

To add to the problem, the East Coast began to urbanize, with the tremendous growth of cities such as Miami, Ft. Lauderdale and West Palm Beach. Because people do not like their houses flooded, more canals and dikes had to be built to maintain flood control, yet freshwater still had to be brought in for the habitants. The water that still manages to make it to the Everglades, despite man's manipulation of its original path, now collects in deeper pools, and less water goes into the ecosystem when it is needed most.

Because of the competing demands of humans, animals and plants for water, procedures have begun to correct the damage that has been done thus far. The U.S Army Corps of Engineers has drawn up several plans to help correct the ecological problems occurring in the Greater Everglades. Several objectives are of great importance. One is to maintain flood control for both the urbanized and agricultural areas and to balance out the water levels. Other objectives are to capture the freshwater being carried out to the estuaries and store it either in surface water reservoirs or in underground storage tanks. The storage facilities will then be responsible for timing the release of the water into the Everglades while allowing the appropriate quality of water into the fragile ecosystem. Because of the agricultural area



Source: Professor Jean Bahr, Dept. of Geology and Geophysics

Natural Everglades wetland environment.

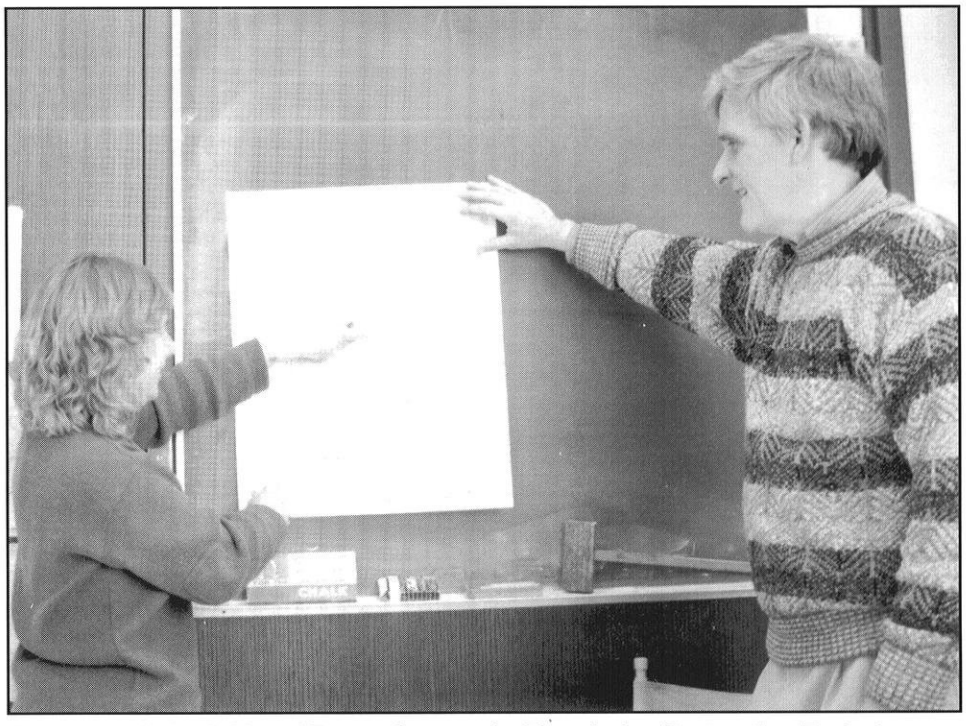
Source: Professor Jean Bahr, Dept. of Geology and Geophysics

Similar environment after the construction of waterways to allow for agriculture and transort of water to urban areas.

south of Lake Okeechobee, the engineers are concerned that excess nutrients in the water will create changes in animal and plant life.

The Committee on Restoration of the Greater Everglades System was formed to look over these plans and give input and advice on certain aspects, but not to collect any data. The committee meets on average four times a year in Florida where they go over ideas, plans and questions. The University of Wisconsin-Madison is fortunate to have two members of its staff on this committee, Dr. Jean Bahr, a hydrogeologist, and Dr. Kenneth Potter, a professor of civil and environmental engineering. Both contribute their knowledge and expertise in helping the restoration of the Everglades.

The main purposes of the committee, which has just entered its second year, are to put out a report on its findings, suggestions and advice. The committee asks questions that force the scientists and engineers to explain verbally their present and future plans. Asking questions makes the researchers think about their plans and also helps clarify thoughts and ideas. Bahr said that they had only "given them advice" and had not done any actual data-hunting themselves: the committee is more of a review board. She also said that the people working on the project were very pleased with the advice and were taking it. After the committee reviews the data, it makes a report, which goes to agencies such as the U.S. Army Corps of Engineers, the Everglades National Park and the U.S. Geology Survey.



Source: Bill Ketterhagen

Professors Bahr (left) and Potter discuss the Everglades Restoration Project.

The restoration of the Everglades is not an overnight project. Eight billion dollars will be used over a period of 20 years, and a 30-year plan horizon has already been created. Continual maintenance and operation costs must also be factored into the equation. While the project is primarily based on engineering, the attempts at an ecological restoration and the measuring of the success of the workers are also important. Because ecological restoration is such a new science, the scientists must learn as they go. Potter states that the restoration is a "challenging project over the long haul." Hopefully, the Everglades will attract visitors for years to come.

Author Bio: Jessica E. Shoemaker is a junior double majoring in English and French and hopes to be a professional writer one day.

Restoration of the Greater Everglades Project

Man is the main cause of the problems in the Everglades. While trafficking the water away from the Everglades for his own purposes, he is disturbing an ecosystem that had functioned smoothly for hundreds of years. Without considering consequences, dikes, canals, and cities were built, shrinking the Everglades while at the same time cutting its life source down to a bare minimum. Many creatures have declined dramatically in number and some have virtually disappeared. The Restoration of the Greater Everglades Project is finally a step forward after taking so many steps back. The project may be slow in proceeding and the results might not work out as planned, but at least people have finally recognized the size of the problem and are taking responsibilities for their actions.

For more information:

- The Everglades National Park home page offers a variety of information on the park:
  http://www.nps.gov/ever/

- The National Academies home page is the source assigned to the Restoration of the greater Everglades Project committee's web page. Typing "Everglades" in the search box will produce a variety of links:
  http://nationalacademies.org/

3G - Changing the World Through Broadband Wireless Networking

By Adam Roth

In the future, using your cell phone to actually make a phone call may be a rare occasion. Released in May 2001 in Japan and within the next few years for the rest of the world, the next big jump in wireless networking will be 3rd Generation (3G) technology. Jim Healy, the chair of Global System for Mobile Communications Association (GSM), said during his opening speech at the 3GSM World Congress, "Close your eyes, and count to ten. You are now experiencing second-generation communications." He was referring to today's generation of digital mobile phone systems, which are based on technologies such as Code Division Multiple Access (CDMA) or GSM. "Now open them," said Healy. "That's 3G."[1]

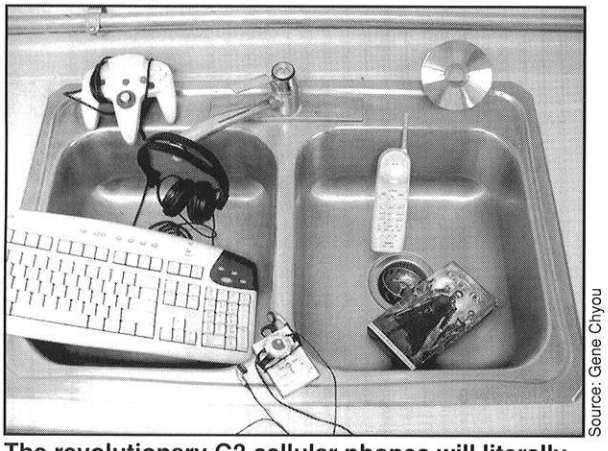
Source: Gene Chyou

New developments in cellular technologies will take wireless communications to the next level in the near future.

...the U.S. lags behind under a 2G system

Imagine pulling a device out of your pocket, snapping a picture and then sending that picture via email to a friend. You then feel a little hungry, so you jump on a popular website and find a good restaurant in the area, along with directions on how to get there. You want to see a movie afterwards, so you watch the previews of a couple of flicks on a small color screen. After deciding to call your mother, you ring her up and talk while you both see each other's faces in live teleconferencing. At the same time, you then stroll along jamming to a recently downloaded MP3. Now imagine doing all this on the same device. Many companies are already promising devices that do this and more powered by 3G technology.

But what exactly is this new 3G system? The most important new feature is its blazing fast speed. True, there are currently cell phones that can browse the Internet, but only if you don't mind waiting with connections that are slower than most home PCs. 3G systems will offer speeds much faster than this, about the same as DSL and high-speed cable connections. This will allow you to easily transfer movies, music and other large data files on the go.



Source: Gene Chyou

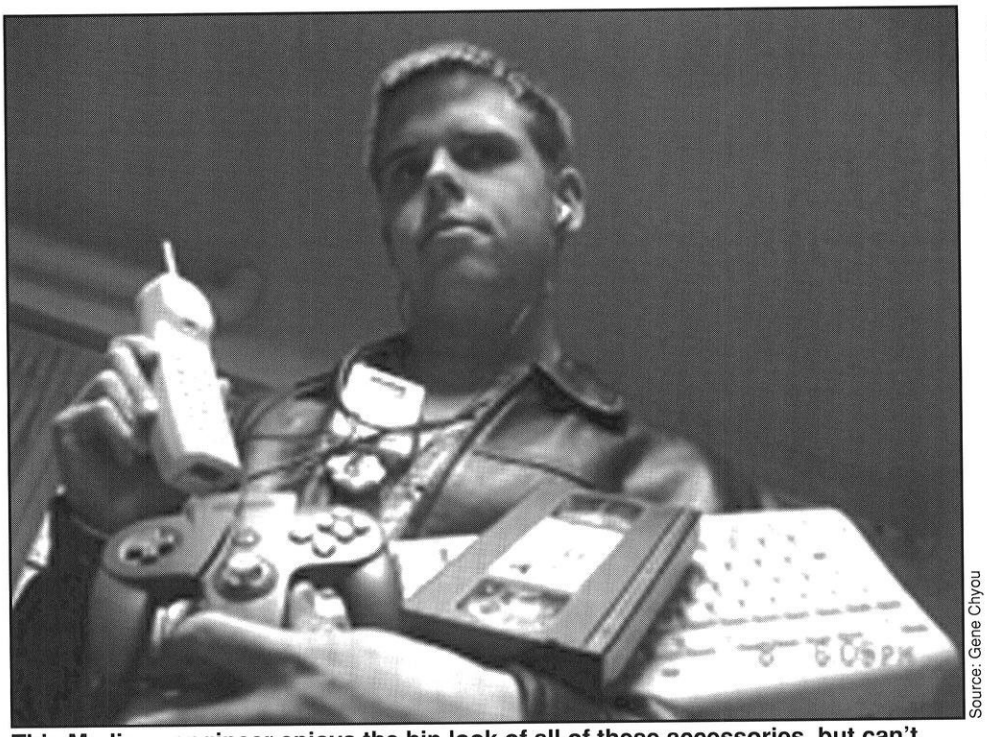
The revolutionary G3 cellular phones will literally be equipped with everything but the kitchen sink.

Other interesting applications include "voice portals" that will let people command wireless devices merely by speaking. A device may ask you, "What stock?" and you can simply reply to the question verbally. Another interesting feature is that 3G will run under one unified system, a solution to a problem that plagues the U.S. A person will be able to use the same cell phone from New York to Tokyo.

Currently in some countries, it's possible to buy a soda from a soda machine using your cell phone. Dial a number and enter your choice, and the system will relay a message to the vending machine with your purchase and automatically bill your account. Companies are already looking into more applications of this sort, such as purchasing movie tickets and ordering dinner.

Another big jump is that your device will always be connected to the network. There will be no need to dial into the Internet, as you are always online. The instant somebody sends you an email, your phone will alert you that you have an incoming message. There are also plans to tie the technology in with Bluetooth, another emerging wireless technology that will enable connectivity

Matsushita is working on a digital wristwatch with a full-screen display and built-in camera, much like what Dick Tracy used



Source: Gene Chyou

This Madison engineer enjoys the hip look of all of these accessories, but can't wait for the ergomomic feel of an intense new phone soon to hit the market.

between electronic devices such as mobile phones, personal computers and digital cameras, within a range of 10 meters, eliminating the need for cables.

Developers are already drastically changing the functionality of wireless devices, allowing people to do things much easier and cheaper. Sharp Corporation already has on the market the $120 J SH04 phone with an embedded digital camera that will permit instant transmission of snapshots by email

But what exactly is this new 3G system? The most important new feature is its blazing fast speed.

to personal computers. Matsushita is working on a digital wristwatch with a full-screen display and built-in camera, much like what Dick Tracy used.

Sony Computer Entertainment and NTT DoCoMo, the company that is releasing the system in Japan, have signed a series of deals to build mobile Internet gaming platforms for users of Sony's PlayStation video game console and cell phones around the world. Together, the companies plan to build a series of new network services for PlayStation users that will enable people to access services and play PlayStation games via their cell phones. Even Motorola Inc. and Palm Inc. are teaming up to develop a "smart phone" that will serve as a wireless Internet device, phone and personal organizer.

Don't start saving your money just yet. The U.S. won't see this technology until about 2004. In terms of wireless technology, the U.S. is at least a few years behind the Asian market. Experts have said that "wired" phones are much cheaper in the U.S., so there's less incentive to buy cell phones. Also, Americans can easily use the Internet on home computers and find it easier to use than a small handheld device. The U.S.'s three conflicting wireless systems have also led to a more fragmented market. While much of the world is currently under a 2.5G system, the U.S. lags behind under a 2G system. We must first pass through this 2.5G phase before we can see the light of 3G.

Though the transmission to 2.5G in the U.S. seems to be going pretty smoothly, experts believe changing the system to 3G will prove much more difficult. 3G requires a much wider radio spectrum than existing wireless services, and this can create many problems. Countries are currently auctioning off their spectrum to phone companies for huge sums of money. The phone companies may find themselves without enough money left over to build the new networks. Last year, more than $100 billion was spent in Europe just for the rights to the airwaves necessary to implement 3G service. Analysts say it will cost another $80 billion to upgrade their existing network.

The U.S. has an additional problem – all of our potential 3G airwaves are currently in use, some by the U.S. Defense Department and some by universities. If 3G is going to move in, those other services have to move out. Despite the problems and the difficulty in implementing 3G, many companies are already hard at work. NTT DoCoMo Inc. has already been making investments all over the globe, including purchasing 16% of AT&T Wireless.

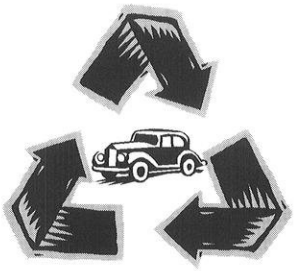
A person will be able to use the same phone from New York to Tokyo

3G is going to change what it takes to access the Internet from a thousand-dollar computer to a couple hundred-dollar device. You will be able to make phone calls, use the Internet, take pictures, play games and more all with the same gadget. However, reaching that point may prove more difficult than companies hope.

[1] Information taken from *www. IDG.net*

Author Bio: Adam Roth is majoring in Chemical Engineering and Japanese and will be studying abroad in Japan all next year. Though he wishes he had a cell phone, he is too cheap to buy one.

Green Machines: Making the Air Cleaner and the Future Brighter



By Ryan Sydnor

Go to the window right now and look outside. Assuming you're not reading this while sipping martinis on a cruise ship, I bet you see at least one car. You probably see numerous cars—a whole swarm of them, tirelessly zigzagging across the landscape. Chances are that you participate in that ridiculous parade of motor vehicles on a regular basis, as either a passenger or a driver.

On average, every car you see produces about 11,000 pounds of these pollutants every year

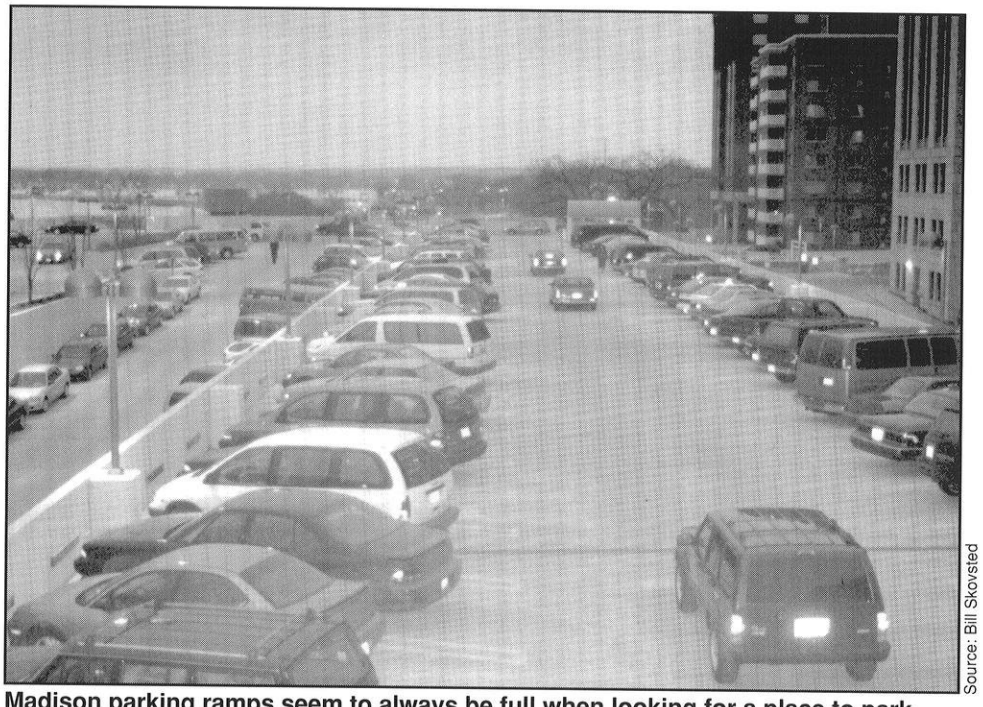
Now think about the sound each of those cars is making—the familiar hum (for some, the hideous rattle) of the internal combustion engine, thriving off the energy released from thousands of small explosions per minute. Consider the copious amounts of invisible pollutants continuously spewing from each tailpipe. On average, every car you see produces about 11,000 pounds of these pollutants every year. Combine this with the fact that about 35,000 cars are added each day to the estimated 600 million worldwide, and we clearly have a problem.

Luckily, somebody is working on that problem. In fact, many very smart people have been working on it for quite some time, and they've devised some ingenious solutions.

Although most of these solutions involve alternatives to gasoline power, some, like the Nissan Sentra CA, simply burn gasoline cleaner than previously believed possible. The CA stands for "clean air," which is more-or-less what the car emits from its tailpipe. While the Sentra CA's exhaust isn't exactly a fresh mountain breeze, on a smoggy day, it could be cleaner than the air into which it is released. Nissan didn't work this apparent miracle with a fancy new engine design; they did it solely through modifications of a normal 2000 Sentra with a 1.8-liter 4-cylinder engine. The exhaust manifolds (the chambers where exhaust is collected) are double-walled, and 3 hydrocarbon-trapping catalysts effectively scrub out the worst of the emissions. Other modifications include a sealed, zero-evaporation fuel system and an electronic swirl valve that minimizes emissions during startup. Nissan's claim: the Sentra CA releases fewer emissions in a 20-mile trip than does a normal car while sitting with its engine off for the same amount of time. This is one mean, green driving machine.

Even with the advent of such clean gasoline-powered vehicles, the days of the internal combustion engine's reign are clearly numbered. Tremendous global competition is centered on the application of fuel cell technology to automobiles. In an individual fuel cell, a polymer membrane separates chambers of hydrogen and oxygen. With the help of a catalyst, hydrogen nuclei shed their electrons and cross the membrane to join with the oxygen on the other side. The hydrogen and oxygen combine to create water, and the electrons are exploited as electricity. When many fuel cells are placed together in a stack, they can generate enough electricity to power a car.

Nearly every carmaker out there now has at least one fuel cell powered concept that is being continuously tweaked and improved in the face of fierce competition. Honda's FCX-V3 concept uses compressed hydrogen as fuel to achieve exceptional emissions. The FCX-V3 also carries the macho appeal of a sophisticated ultracapacitor that absorbs power during braking and provides an additional boost during acceleration. As a practical alternative to the hydrogen-powered



Source: Bill Skovsted

Madison parking ramps seem to always be full when looking for a place to park your car. Just imagine how many pollutants were put in the air around this lot this year alone.

Source: Bill Skovsted

Above: The UW-Mdison Future Truck Team displays their electric-diesel hybrid 2000 Chevrolet Suburban on campus earlier this year.

FCX-V3, Daimler-Chrysler recently unveiled its Necar 5 prototype, a smooth-driving Mercedes A-Class hatchback with a driving range of 300 miles and a top speed of 80 mph. Because pure hydrogen is difficult to store and inconvenient to obtain, the Necar 5 is equipped with a fuel reformer that extracts hydrogen from methanol—which can be easily dispensed from a modified gas station pump.

Because fuel cell powered and purely electric cars are expensive and inconvenient to recharge or refuel, hybrid electric vehicles (HEVs) will most likely be the first "tree-huggers" of the automotive world to enter our daily lives. The Toyota Prius and the Honda Insight recently cruised onto the scene as the first commercially available HEVs in the U.S., and several American hybrids—including the Ford Escape HEV and GM's Precept and ParadiGM models—are following close behind. These vehicles employ a combination of electric and either gas or diesel power to enhance fuel economy and reduce emissions. An electric motor provides initial propulsion, and the engine kicks in gently as the car increases its speed. The battery is recharged with energy that would normally dissipate through braking—a process known as regenerative braking.

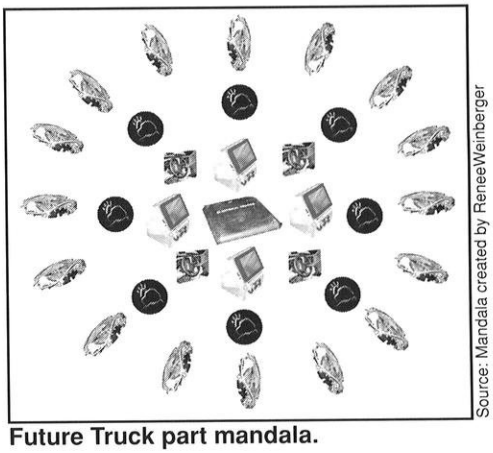
While the Insight meets California's Ultra Low Emissions Vehicle (ULEV) standards, the Prius has earned the coveted Super Ultra Low Emissions Vehicle (SULEV) certification—an addendum that became necessary when ULEV standards were unexpectedly surpassed. Toyota achieved this superior emissions rating largely through the use of a second electric starter/alternator that drives the wheels and allows the Prius to run for short intervals on purely electric power. The Prius' fuel economy is further boosted by a toroidal continuously variable transmission (CVT), which employs metal power rollers to achieve completely stepless, silky-smooth shifting. Although lacking a CVT, the 5-speed Insight burns less fuel than the Prius (70 mpg versus 45 mpg on the highway, based on a road test performed by Popular Science magazine), making it possible to drive from Madison to Niagara Falls on just a little over one tank of gas.

Powerful automakers like GM and Toyota aren't the only ones turning heads in the competitive world of hybrid vehicle design. University competitions such as FutureCar and FutureTruck challenge teams of students to transform normal cars and sport utility vehicles into more efficient and environmentally friendly, yet marketable, automobiles.

Ted Bohn, former team leader of the UW-Madison Future Car team and present FutureTruck official, has high hopes for a UW victory at this year's competition. The team of UW-Madison engineering students has incorporated an electric drive train and a 99 kW diesel engine into the first truck ever produced with a completely aluminum frame (2000 Chevrolet Suburban).

Bohn believes hybrid electric technology will play a key role in the future of automotive design. One of the most important features of hybrid automobiles, Bohn explains, is that "with a hybrid vehicle, you can start moving totally on electric power. The engine starts gently... without a spark." Starter/alternator devices such as that used in the Toyota Prius bring a car's engine up to about 1000 rpm before any fuel is used. In a normal engine, combustion at initial startup is incomplete, resulting in dirtier exhaust. As Bohn explains, "In a starter/alternator system ... there are no partial combustion cycles, and hence much better cold start emissions." Bohn recognizes the potential for enormous fuel savings in the "stop-and-go" capabilities of hybrid electric systems—especially if applied to large trucks and buses. "You ask about cars of the future..." he says, "I think this [hybrid technology] is going to make a huge difference."

These engineering marvels are not merely naïve daydreams of imaginative engineers. They are the products of years of research and advancement, and in many cases, they are already on the road. We could have filled this entire magazine solely with the latest innovations in "earth-smart" automotive technology, and engineers around the world are devising more of them as we speak (or read). Cars propelled by compressed natural gas, lightweight materials, advanced diesel engines and clean-burning diesel fuel, "super engines" designed by computers, astonishing aerodynamics... the list goes on. But there is no need to describe all of these things here. You'll see them soon enough.



Source: Mandala created by ReneeWeinberger

Future Truck part mandala.

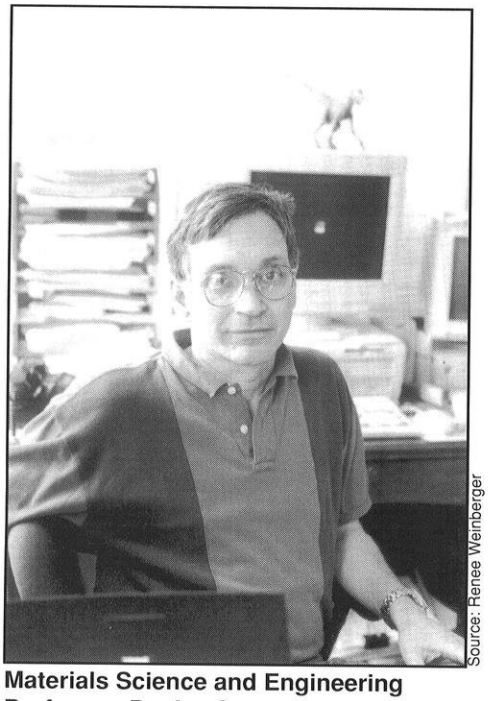
Author Bio: Ryan Sydnor is looking forward to taking on the role of writing editor for the Wisconsin Engineer—a magazine he has grown to love over the past two years. While this year he plans to focus on not screwing up the magazine, his long-term goals include spending a year in Japan and eventually working with brain imaging technology. He would also like to enter the Peace Corps somewhere down the line.

The Future of Metals

By Amy Li

You see them everywhere—in the classroom, on the road, in your living room and even in your refrigerator. Metals are staples of everyday convenience and necessity, and new technology is constantly making them more useful. For example, according to a December 2000 report by the Foresight Program, consumers may see production of aluminum cans that can chill themselves, using hydrofluorocarbon gas. Just push a button on the base of the "Chill-Can" and after 90 seconds of hissing and fizzing, you have a drink that is 30° cooler .[1]

Despite the usefulness of metals, new alternatives hit the headlines every day. There are biodegradable plastics, electrically conductive ones or strong and durable polymers like Teflon and also many cheap all-purpose plastics.



Source: Renee Weinberger

Materials Science and Engineering Professor, Dr. Jay Samuel, teaches an introductory course on metals and other engineering materials.

However, heavy industries prefer the traditional and simple material – steel. High strength and durability are the normal qualities associated with steel. Steel is also a superior material in terms of its consistency, uniformity and predictability. More than with any other material, engineers know that when they design with steel, they'll get what they expect.

Galvanized steel resists decay, corrosion, fire and floods. It has been part of many great achievements in history. Railroads that created a nation out of frontiers, the backbones of bridges, the skeletons of skyscrapers and the frames of automobiles are all made of steel. In housing, galvanized steel is stronger, more affordable and more resilient than wood. In the space shuttle's solid fuel rocket motors and coated precision surgical instruments used in hospital operating rooms around the world, we also find steel. In addition to all of its good properties, steel is inexpensive. A pound of steel costs less than a pound of butter or potatoes.[2]

Dr. Jay Samuel of the University of Wisconsin-Madison Mechanical Engineering Department revealed that there is a lot of current research in the area of metals. "Although many of the basics about metals have already been discovered, we are now focused on improvements in the processing of metals."

A new method called the "loss-foam process" makes metal casts by first making a Styrofoam model, embedding that in sand and then pouring molten metal into it. The Styrofoam evaporates completely, and after cooling, a metal version of the Styrofoam object is left.

In terms of market competitiveness, aluminum is a close runner up to steel. America produces 3.7 million tons of aluminum per annum and imports an additional 3.5 million tons.[3] Long-term supply agreements signed by U.S. automakers and North American producers in 1998 ensured aluminum's growing place in automotive applications for a long time to come. In 2000,

Source: Renee Weinberger

These models are demonstrations of different casting and molding techniques availible to engineers.

the average family car has 41.8% steel, whereas back in 1977, 86.2% of a typical car was steel.[4] Aluminum and its alloys were substituted for steel in roll cages, support rods and decor. Aluminum is lightweight and aesthetic in appearance, making it extremely popular.

In addition to all of its good properties, steel is inexpensive. A pound of steel costs less than a pound of butter or potatoes.

Aluminum and steel may be useful and popular, but the extraction process of metals is often costly and not environmentally safe. Production of aluminum cannot escape the Heroult-Hall electrolysis process, which uses a lot of energy, on average 15kWh per kilogram of aluminum purified.

Mining of metals has long lasting negative impacts on the environment. A neglected copper mine in Montana has now become the deepest acid lake in North America. The lake could jeopardize residents of Butte, Montana, by the acid poisoning underground water supplies or damagingthe town if the lake overflows.

To lessen such damages and costs, recycling has become a big issue for metals. Recycling aluminum saves three times the energy needed to produce the same amount from ore extraction. In general, Americans recycle threefold as many aluminum cans as do Europeans.[5]

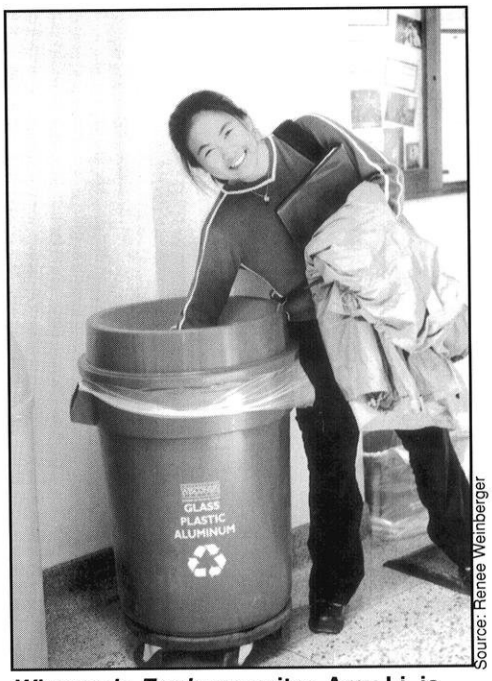
Samuel reassures that "the recycling of aluminum will not affect the pricing of aluminum in industry because the industry is huge enough to absorb any amount of input generated by recycling."

When ranked by percentage of recycling, steel is the No. 1 in North America, not aluminum. While consumers are not actively involved, virtually every car taken off the road is recycled. More than 200 million Americans have convenient access to steel can recycling through curbside, drop-off and buyback programs. Every ton of steel recycled saves 2,500 pounds of iron ore, 1,400 pounds of coal and 120 pounds of limestone.[6]

Yet, even with recycling, metals are not always the first choice anymore. For many products the switch to plastic means longer life and less maintenance, which translates to lower cost over the life of the product. Compared to a steel automobile fuel tank, the plastic fuel tank is easier to package, lighter for better fuel efficiency, cheaper for vehicle manufacturers and does not corrode.[4]

Advanced research of metal processing will give us enhanced properties of metals, decreased production costs and reduction in energy consumption. We can foretell that many heavy industries will continue to use metals such as steel and that aluminum will be most favored by aerospace and transport sectors. New processing ideas coupled with recycling efficiency will be the key to competition against the plastics industry in the future.

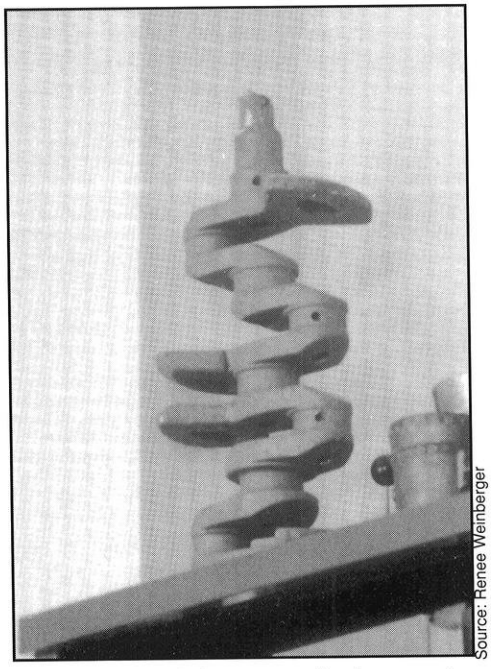
[1] *www.futech.com/info.htm*
[2] *www.steel.org/information/future.htm*
[3] American Metal Market from industry reports *www.amm.com/ref/carmat98.htm*
[4] "Enhanced materials recovery from end-of-life vehicles" ©2000 Daimler Chrysler.
[5] "Meltdown" Engineering Journal p41-42.
[6] The Steel Recycling Institute *www.recycle-steel.org/index2.html*



Source: Renee Weinberger

***Wisconsin Engineer* writer, Amy Li, is pleased with how recyclable metals are.**

Author Bio: Amy Li is a sophomore in Biomedical Engineering. She notes that the computer used to write this article has gold, silver, lead, copper, nickel, aluminum, cadmium and steel components in it. Yet, it is all worth less than $6 after recycling.


Source: Renee Weinberger

This crankshaft is an excellent example of steel's use as a material for engine components.

The Facts on Nordic Ski Wax

By Karen Mandl

Ahh! Nordic skiing—the sensation of swiftly gliding over packed snow with winter's wind whipping across your face, speeding through the woods and trekking across fields, climbing steep hills to get the gorgeous view at the top and finally flying down the other side with minimal effort. There is nothing I would rather do during a frigid, white Wisconsin winter than strap on my skis and hit the trails. But before I can lace up my ski boots, I have to wax my skis. Waxing is a less glamorous aspect of skiing, but it is still very important. For years, scientists have been developing products and procedures that will allow skiers to go as fast as possible. You can take advantage of their hard work by correctly waxing your skis to get the most from your skiing experience.

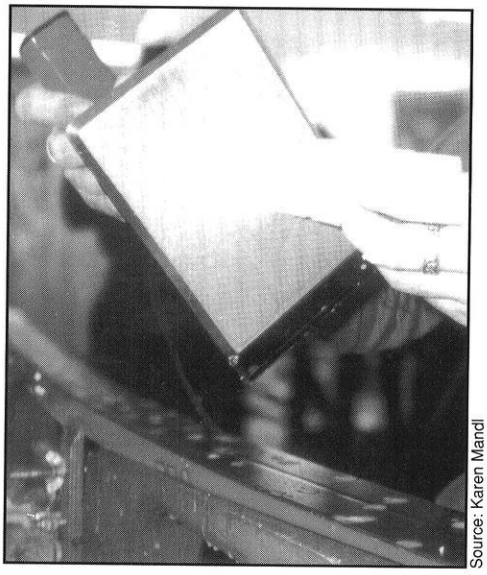
Why Wax Your Skis?

Waxing your skis helps you ski faster. A waxed ski glides better because its base is smoother than an unwaxed ski. Waxed bases also last longer because the risk of minor damage that disturbs the ski's performance is reduced. Even skis that are not used are subject to oxidation through UV radiation and oxygen. Waxing also protects equipment during transport, particularly during the summer break.

Step One: Choosing the Wax

The science of waxing skis begins with picking the correct wax. The type of wax that is used depends on the type of snow, air or snow temperature and air humidity. New snow is sharp and pointed, allowing the finely grained crystals to penetrate into the wax. Because of this, friction is usually high with this type of snow. Old snow has lost its crystal structure. It can be damp and full of water or ice.

How snow crystals interact with each other depends on temperature. Warmer temperatures give wetter, stickier snow, while cooler temperatures give drier, more powdery snow. Each requires a different type of wax. When the air is humid, there is excess water on top of the snow. Using a wax with fluorocarbons in it helps the skis repel the water and glide over the snow faster.



Source: Karen Mandl

Dime sized drops of wax are dripped about every inch along the ski.

To avoid having to make waxes for all possible conditions, it is recommended to mix different waxes to work for different conditions. For example, if the temperature was thought to be around 20° F, a wax that has a temperature range of 9° to 21° F could be mixed with a wax of range 18° to 28° F. If you have to guess, it is better to have too cold of a wax on than too warm. Using too warm of a wax will make your skis stick to the snow. To store skis for the long summer, use a warm, nonfluorinated wax.

Step Two: Deciding on a Procedure

There are two different types of waxing to go with the two different styles of Nordic skiing. There is glide waxing and kick waxing. Glide waxing is used in skate skiing. This wax is applied over the entire ski to smooth the base and give maximum glide. Kick waxing is used for the traditional classic skiing. Classic skiing involves two opposing forces: gliding forward and pushing backward. To get the backward kick, a sticky wax is rubbed into the area of the ski under the foot; the rest of the ski has glide wax. Ideally, only the gliding zones touch the snow when gliding to allow for maximum speed.

Step Three: Preparing to Wax

To wax skis, you need a vice to secure your ski into place, a hot iron to melt and spread the wax on the ski, a plexiglass scraper to take the wax off, a brush to polish the ski, a

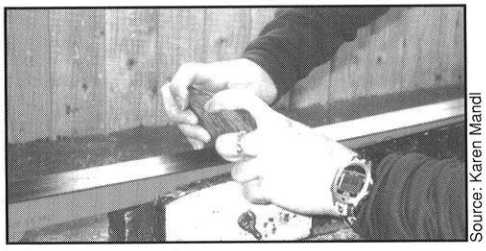
Source: Karen Mandl

The wax is spread out evenly over the entire length of the ski with an iron.

synthetic cork for kick wax and the wax itself. Cleaning the ski base with a base cleaner before waxing is recommended.

Step Four: Applying the Wax

Begin by securing the ski in a vice at about waist level. Allow the iron to heat up enough to melt the wax, but not so much that the iron will smoke. Use the iron to drip a dime-size drop of wax every inch or so on the base of the ski. Then spread the wax evenly throughout the entire length of the ski with the iron. Allow the wax and ski to cool to room temperature. This may take as long as 30 minutes.



Source: Karen Mandl

Using the scraper at a 45 degree angle is the best way to remove the top coats of wax.

Step Five: Removing the Wax

Using the corner of the plexiglass scraper, scrape the wax out of the central groove. To remove the wax from the rest of the ski, start from the tip and run the edge of the scraper at a 45° angle down the entire length of the ski. The first few runs should scrape off a lot of wax; the final few runs should remove almost nothing. Next, aggressively sweep a nylon brush the length of the ski beginning at the tip. The brushing will remove another layer of wax and leave a polished shine.

Sufficient wax will remain in the base of the ski to fill in any small holes or scratches in the ski. This wax guarantees optimal gliding characteristics and base protection.

Step Six: Applying Kick Wax (For Classic Skiing Only)

When applying kick wax for classic skiing, do not put glide wax in the zone underneath the foot, called the "kick zone." How large the kick zone is will depend on the weight of the skier and the flex in the ski. It is usually about a foot and a half to two feet long and begins about three or four inches above the toe of the boot. Crayon on three or four thin, even layers of hard kick wax, using a synthetic cork to rub each layer in separately.

Waxing Cheat Sheet

- Choose appropriate wax
- Clean ski
- Drip on and spread glide wax
- Let ski cool
- Scrape and brush wax off
- Apply kick wax if desired

Once you have your skis all set and ready for speed, you can sit back and wait for the snow to fall. With luck, Wisconsin's whipping winter wind will bring with it an exciting ski season filled with days of speeding along beautiful trails on your waxed skis. I am looking forward to it already.

Author Bio: Karen Mandl is a third-year Food and Bioprocess Engineering student. She has been waxing skis for over eight years and currently waxes and races with the UW-Madison Nordic Ski Team.

Snowmobiles: The Marriage of Snow and Speed

By Jackie Polzin

Let it snow, let it snow, let it snow. It's never too early for snow-aholics to start their rally cry. It's Wisconsin, and if you haven't accepted the fact that winter comes every year, it's about time you do. It will be here before you know it, and you had better be prepared. For most college kids this means grabbing your scarf on your next trip home and checking to see if the heating bill is included in your monthly rent. For snowmobilers, it means finding the right machine with plenty of time to pay it daily visits in your garage before the first snowfall actually comes. This year, the machines are faster, sleeker and better than ever.

Snowmobiles have been around since the 1960s. The machines that were available then are a far cry from the snowmobiles of today. Snowmobiles of yesteryear were smaller than today's. They held about one-third of the gas but guzzled it in a less efficient manner. Materials used to manufacture older snowmobiles are not as advanced as the specially formulated ultra-rigid chassis that is the standard in today's machines.

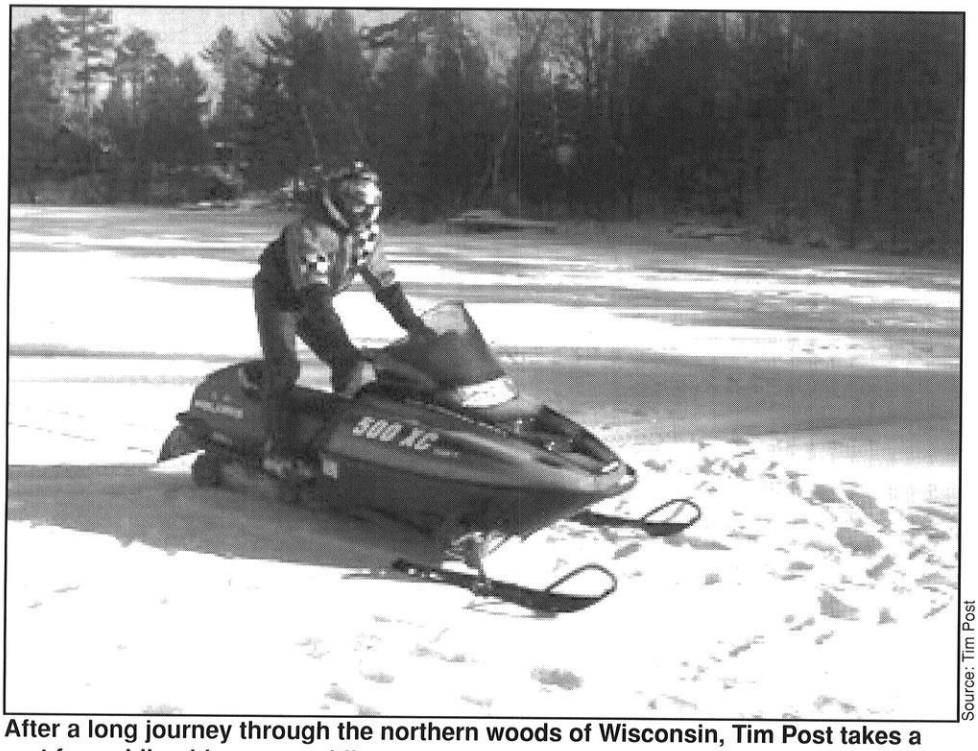
There are two main areas on which snowmobiles have made incredible improvements: comfort and speed. Both are important, though the speedier models provide more of the adrenaline that has made snowmobiling as popular as it is today.

Source: Shane Kapugia

Russ Caya from Kenosha plows through the freshly fallen powder in the outskirts of Upper Michigan.

Comfort is not just a concern for leisure riders. Even speed demons like to cut down on the bumps and jolts that accompany their racing habits. Ski-Doo has recently come out with the Rolls Royce of snowmobiles. It has tilt steering, hand-warming devices built into the handles, plenty of options, and a plush, four-way stretch seat with an adjustable backrest. It makes a great family machine or a nice option for taking your girlfriend out to see a Christmas movie. But comfort has its price, and this machine will cost you $8,000 to $9,000.

The race for the speediest snowmobile is a competitive one. Yamaha, Polaris, Ski-Doo and Arctic Cat are all working to develop the fastest machine, but the verdict is too close to call. Each company has their fastest models out for this winter. The biggest factor in the speed of a snowmobile is the engine. Most competitive engines are right around 140 hp. For a machine that weighs 500 pounds, that is a lot of power. It is 10 times the 12 hp Playmate model from 1971, enough power for any snowmobiler to treat the winding trails of the midwestern wilderness like an interstate highway.



Source: Tim Post

After a long journey through the northern woods of Wisconsin, Tim Post takes a rest from riding his snowmobile.

Like comfort, however, speed has its price. The speediest models of 2002 will cost over $10,000. Just think how much you could learn if you spent that $10,000 on another year of schooling. Aside from the cost, safety is a big concern. As with so many things in life, it is easiest to determine limits by accidentally surpassing them. This is not a good method for establishing speed limits for a snowmobile in a tree-scattered forest, so legislators are taking the speed of snowmobiles into their own hands. This winter there is a 55 mph limit placed on night riding.

Given the highly competitive market for snowmobiles, you are going to be left with an expensive decision between very similar machines. Prices will all be in the same range and speed capabilities as well. So, you are best off simply looking for a machine that catches your eye. If there's a color you fancy, by all means go for it. Baby pink with fire down the sides looks great against a powder white background.

With winter on its way, there are plenty of things for snowmobilers to consider before that first snowfall. As for the rest of you, make a new snowmobiling friend and you won't be disappointed.

Source: Tim Post

This snowmobiler could not make it up the hill with his sleds, but the high horsepower sleds definitely could.

Author Bio: Jackie is an English major whose presence on any snowmobile trail merits fair warning.

Just One More

Reminiscing About Engineering II

As part of our continuing coverage of The History of Engineering conference, the Wisconsin Engineer brings you the following roundtable recollections and comments from engineers from the days when more than half the Earth's population was employed making mud bricks or domesticating animals. Enjoy.

Electrical and Computer Engineering

My things have come a long way since I started working in ECE. Why, I remember my graduate project quite fondly. I got a grant and went out and bought some micro-chips to use. Try getting students to use the chips we had back then today.

MICRO-CHIPS? You were lucky to have micro-chips. When I entered the program we learned what we were doing on transistors and primitive hand wired circuits. We had nothing of that sort till long after I exited the University.

Transistors? We never used to have anything of the sort. We had to use Vacuum tubes, and when one of those blew, you'd be lucky to make it across the stadium of a room you had to put those "computers" in before you needed a new one.

Ohhhhhh we used to DREAM of having something as efficient as Vacuum tubes! When I started out, we were still using gears, steam and a hand crank! Took years to get the "difference engine," as we called it in my day, to calculate the sum of one plus one by crank.

Cranks? Steam? You count your blessings man! When I started out, all we had was water power and some wheel driven belts! You try rigging a factory to work on that!

Water power and belts? Rubbish! In my day, you had to stand around and wait for lightning to strike to get power! You just try to hold that charge in the capacitor called your body long enough to do something useful someday.

Industrial Engineering

Boy it used to be tough out there. I remember when we first tried to institute quality control at the factory. What a hassle! The tools and dies had to be refined and changed, employees retrained. What a headache!

Tools and dies! Blessings on the ghost of father Ford! Back in my day work was done by hand tool, and we had barely invented the production line processes before I was about ready to retire!

Processes! Employees! Try taking a step back into the world of your forefather, youngin'. Back when I started out, we had a twelve-hour day and children to work with! As if they could perform any labor-intensive skills! And parts! We were blessed if the wood, textiles and metal that came into the factory were remotely similar batch to batch.

Batch to batch! We had to gather our materials by hand and work in small family workshops! You think you had it rough. What do you think happened when the talent skipped a generation, eh?

Materials Science and Engineering

These days, I tell you, the children have it easy. Ion implantation doping machines, powerful laser welding techniques, chemical filtration. All these things we didn't have when I started out. You'd be lucky to use the press tester, furnace or diamond saws anytime except the weekend.

Press test? We had a big rock and a "crack-o-meter." Diamond Saws? Get an axe. You'd better count yourself lucky that you had such things. We used primitive thermodynamics, a blast furnace and a little ingenuity to get things done.

When I started my career, we were lucky to have a charcoal furnace to melt samples in and a sink and bottle of vodka to clean them with. And thermo-dynamics had barely been conceived when I finished my day-job. We kept a bottle of caloric in the fridge and another by the fire until just after my mid-life crisis.

A bottle of caloric fluid? Why I didn't even know what that was. All I knew was that hot was hot and cold was cold. And we worked things on the anvil with a hammer to boot. You try and wield a hammer and keep that slacker servant boy (grad student my bum!) going on the bellows at the same time.

Bellows? A forge? In my day, we stuck stuff in the fire and bent if by hand. We didn't even have iron! The best we could do was copper, tin and a bit of zinc to make some poor bronze and brass. You try that on for size sonny!

Metals? In my day all you had was a stout rod with a sharp point or a rock on the end. You can't do much with that I assure you. And samples? Any rock will do you fools!

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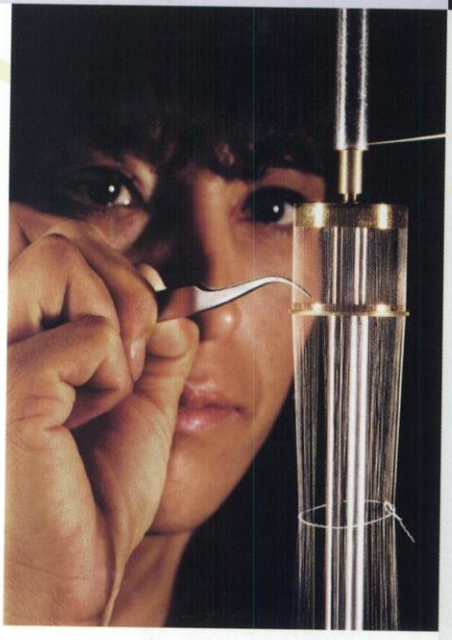

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