Wisconsin engineer. Volume 87, No. 1 October, 1982

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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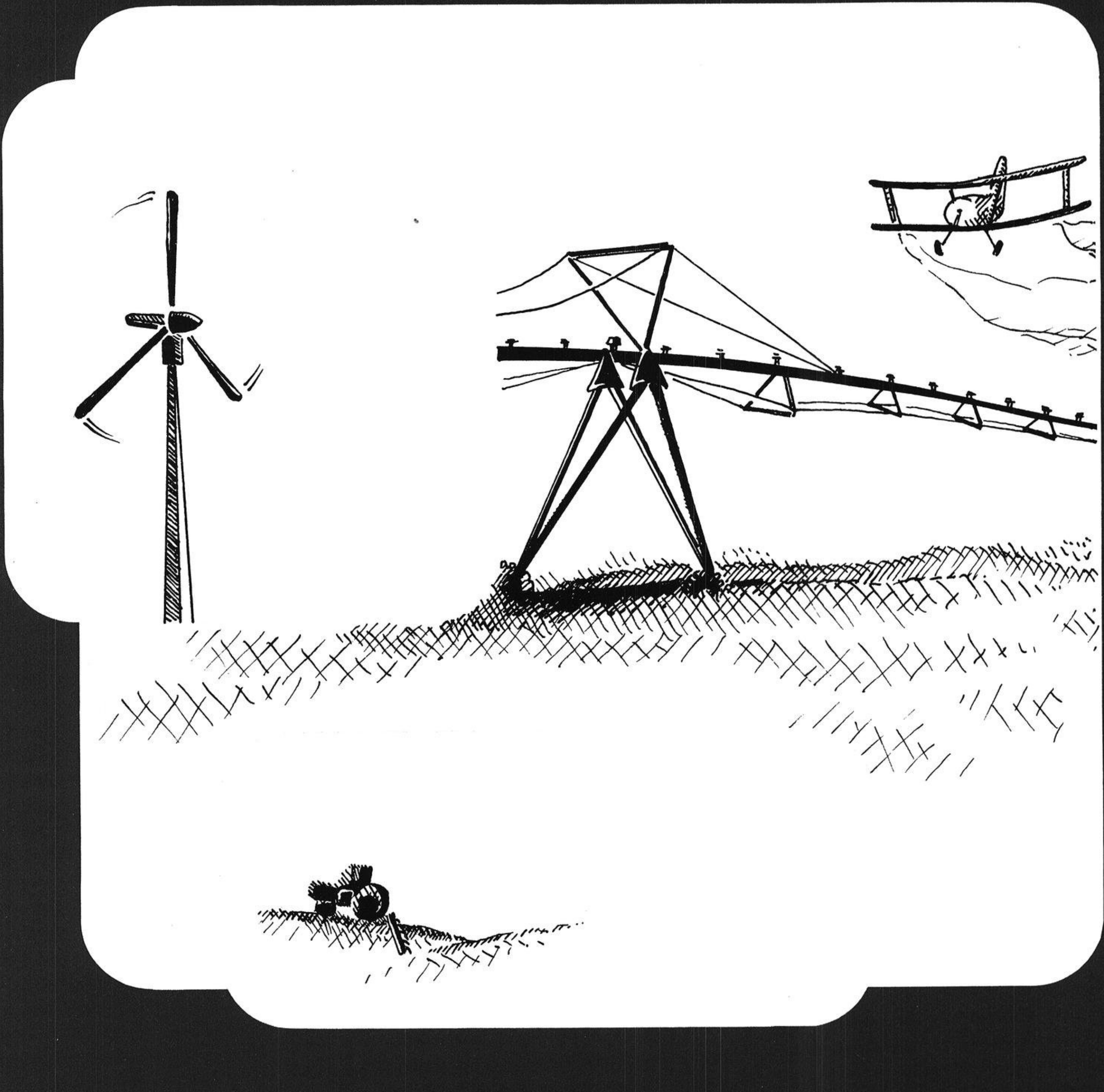
Volume 87, No. 1 October, 1982

wisconsin engineer



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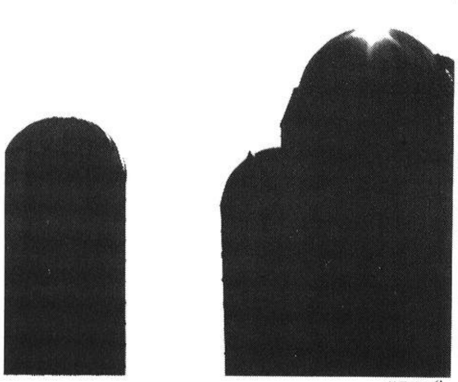
wisconsin engineer

PUBLISHED BY THE ENGINEERING STUDENTS OF THE UNIVERSITY OF WISCONSIN-MADISON, OCTOBER, 1982



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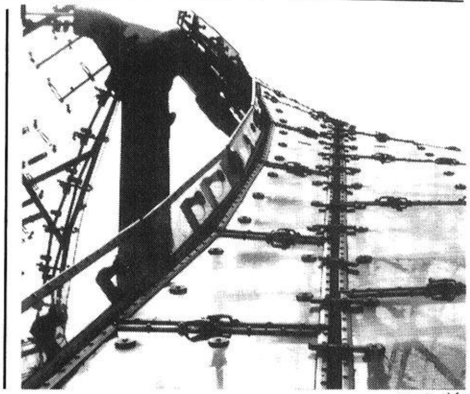
COLUMNS



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FEATURES

The ***Wisconsin Engineer Magazine*** *is written by and for engineering students at UW-Madison. Philosophies and opinions expressed in the articles do not necessarily reflect those of the College of Engineering. All interested students have an equal opportunity to work for this publication.*

Chapter Member of the Engineering College Magazines Associated, ***Chairperson:*** *John Claussen, Mechanical Engineering Building, University of Minnesota, Minneapolis, MN 55455.* ***Publishers Representatives:*** *Littell-Murray-Barnhill, Inc., 1328 Broadway, New York, NY 10001 and 221 North LaSalle, Street, Chicago, IL 60601.*

Correspondence: *Wisconsin Engineer Magazine, Room 460, Mechanical Engineering Building, 1513 University Avenue, Madison, WI 53706. Telephone: (608) 262-3494.* ***Letters to the editor are encouraged.***

Published five times yearly: October, December, February, April and June by the Wisconsin Engineering Journal Association. Subscription: one year -- $5.00.

Editorial

Our's for the Asking

Graphics by Alicia Diehl

Over 10% of all UW students study in the engineering college, yet campus sponsored extra-curricular activity is concentrated on the east side. Also, of last year's Wisconsin Student Association's $98,500.00 budget, only 0.46% of the money found its way directly back to engineering clubs. Any engineer should realize this situation is unbalanced and the eng-campus remains a static member of the college community.

Three general factors contribute to this campus alienation. Engineering students excuse their inactivity by claiming their studies are too intensive for them to get involved. This is a fallacy considering that company interviewers look for the organizational skills learned through campus organization involvement. Secondly, engineering students unconsciously separate themselves from the remaining student body, and thereby fail to realize they aren't the only diligent and marketable graduates in Madison. And finally, by a fluke in the UW infrastructure, the popular social halls and malls are not located on "our side of the tracks." Consequently, we miss a great deal of the campus activity.

But these factors can be overcome if eng-organizations can find new energy to sponsor programs attractive to the entire campus. And the required potential energy is all around us—we have a Union, buildings and fields just waiting to feel the pulse of campus activism. Eng-organizations should also begin petitioning WSA for funding. (Budget request forms can be picked up at the WSA office, 5th floor of the Memorial Union, or phone 262-1081.) Part of each student's tuition goes to WSA, and the cash should start flowing back down University Avenue. With both funding and space, eng-clubs can continue attracting their most important energy source—new members. After momentum gains, students will realize the importance of extra-curriculars as the campus comes alive. □

Lake Water

Plastic Mottos

by John Wengler

I was immediately transfixed by the CEE display case during my first walk through that building two years ago. Behind the glass were models of ballistic missiles and other airborne armaments.

Graphics by Alicia Diehl

Although these toys don't impose any immediate threat, the real danger is what they represent. The defense industry and engineering seem to fit "fist in strange-glove." Indeed, during my first college lecture I learned that Descriptive Geometry was developed by a French Lieutenant who strove for better accuracy with his cannonballs. Reviewing the list of company interviewers, I found a sizable number of our graduate's technical and money-making opportunities seem to be offered by the defense industry and the applied sciences associated with it.

Is this relationship evident in our studies? Only a casual mention here and there. Indeed, the career brochures available at department offices continually repeat the motto: "Engineering, A Good Way to Help People." Do the CEE display missiles represent our means to this end? Maybe our motto should be changed to "Engineering, A Belligerent Way to Help People," or "... Engineering, A Good Way to Vaporize Society."

Though the military is not yet marching down Johnson Street we must be aware of its presence on campus. Greater publicity and discussion of our relationship as engineers with the defense department will increase student awareness of what and for whom we are studying. □

Letters to the Editor

Dear Editor,

I am a junior in Civil Engineering who, experienced the worst registration week of my college career this semester. I attempted to take three classes in the Civil Engr. department and was faced with closings - not closings of desired sections but class closings. These classes were filling up almost entirely with seniors, but at the same time they are listed as typical sophomore year classes. This exemplifies the vast shortage of class sections being offered in many of the Engineering Departments and the Computer Science Department.

What rationale can the University be using when they restrict (and even cut) the number of teaching assistants during record breaking enrollment? Many students will soon be **forced** into spending extra time in school simply because their chain of prerequisite classes will have been broken by this problem caused by university mismanagement. It must be impressed upon the budget officials (university and state) that I'm not ready to stand by and idly watch my right to a complete and top quality eduction within the traditional four year time period be taken away without a fight!

Paul A. Egelhoff, CEE '84

Letters to the editor are welcomed.

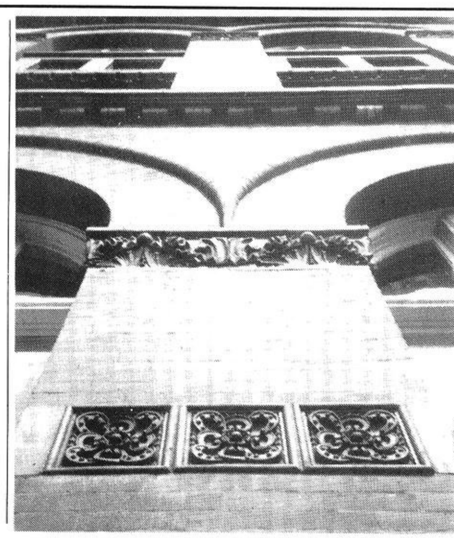

Photo by John Wengler

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UW's Bumper Crop

by Jean Bauer

Each year the UW Agricultural Engineering Department conducts important research and educates students to solve the state's and world's food problems. The scope of this often over-looked field is reviewed here by Jean Bauer. Jean is a junior majoring in Rural Sociology.

In the distance, a cloud of dust billows up behind a monster-like machine as it noisily trundles along; a swath of golden stems topple uniformly over as it is swept by the cutting blade. Down the length of the cornfield on the other side of the narrow country road, a different type of machine swallows rows of yellowed corn stalks, spewing them out the other end into a trailer as tiny little bits. Passing a farmyard, an escalator lifts chopped-up hay into the top of a cylindrical concrete structure.

These scenarios, and others like them, typify the modern American farming culture. Where draft horses and oxen once performed the majority of the heavy labor, large mechanical giants now do the work. Over the past decades farming technology has burgeoned in all aspects of the trade. These technological advances have been brought about because of the contributions of a great many dedicated experimenters and researchers all working to increase efficiency and quality. These industrious professionals are the agricultural engineers.

Agricultural engineering is the principle discipline which serves the agricultural industry. According to the American Society of Agricultural Engineers (ASAE), "Agricultural engineering is the application of any and all branches of engineering to the extent that they may be used in farming, in rural living, processing of farm products, and such allied activities as malaria control and wildlife conservation." It is unique from other types of engineering in that it combines engineering technology with biological and agricultural technology to help produce and process food and natural fiber with increasing efficiency and quality. The latter is especially important to help combat the present world population explosion and the desire for higher standards of living.

Contrary to what the name "Agricultural Engineering" suggests, most ag engineers are not in farming but are employed in industries or by universities or governmental agencies. Their major areas of concern are environmental control, livestock farming, resource management, produce processing, and forest products.

One of the most important areas for the future is modification and control of the water, soil, and air environment of plants. With greater production being demanded from a decreasing land area, the natural environment needs to be modified for better plant growth. Ag engineers experiment in environmentally controlled greenhouses and chambers to find methods to increase plant growth.

Not only must plant production be increased, but animal production within confined housing systems must also be optimized. In order to further develop the efficiency of production at reduced cost per unit of animal product, ag engineers are performing research to determine the best procedures to provide these conditions economically.

Livestock farming involves inputs and outputs just like any other industry. And just like any other industry, it has similar production problems. These include the construction of, the handling of, the storage of supplies, and the disposal of waste products. In the process of solving these dilemmas, agricultural

Photo by Fernando Perez

How can a farm stay in the country when it has seen merry Madison?

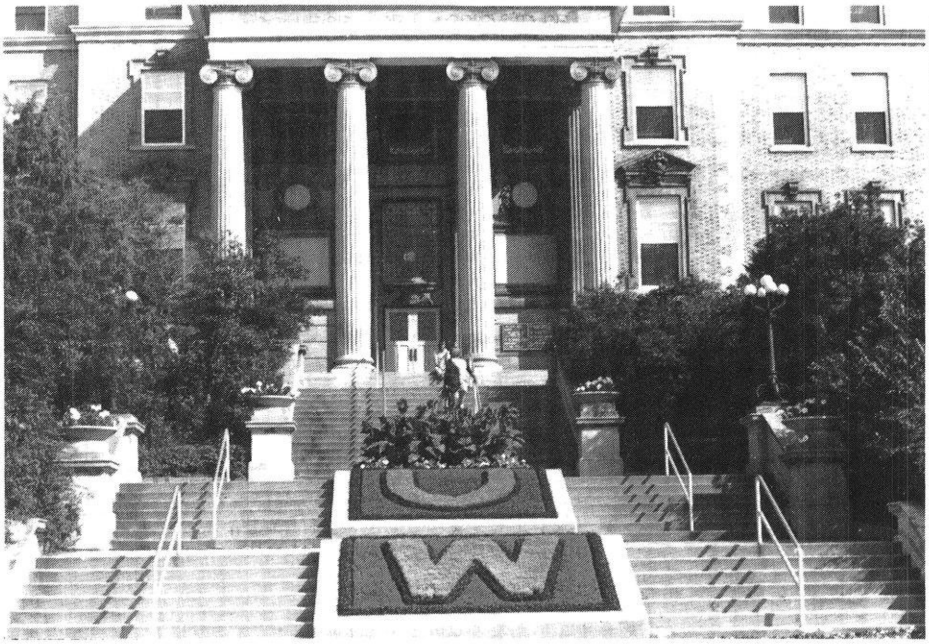

Photo by Fernando Perez

engineers have become largely responsible for the mechanization of the modern livestock farm, and will almost undoubtedly be responsible for the automation of these farms in future years.

Because food and water resources are both limited and a basic to mankind, they must be wisely managed. Ag engineers are researching to develop new techniques and design systems to control soil erosion and soil moisture for crop production, to prevent floods and water pollution, and to provide pure water supplies for human use.

In processing produce, ag engineers work to develop and design machinery for crop production, both for use before and after harvest. The drying of grains and washing of fruits and vegetables are typical concerns for development, as well as methods of processing foods prior to purchase by the consumer.

Lastly, a relatively new field for ag engineers lies in developing the equipment for the production, harvesting, and handling of forest products before their processing.

The ag engineering curriculum here at Madison includes courses in agriculture and biology as well as the engineering and liberal studies courses. Elective courses are available for specialization in power and machinery, structures and environment, soil and water, environmental quality, or food engineering. Most of the courses teach the student how to solve problems, how to develop new ideas, how to design, and how to test and check ideas and designs. In addition, some of the courses are intended to broaden the student's experience so that he will be a valuable and active member of society.

The UW offers three majors in its Ag Engineering Department. Construction Administration is designed for people desiring a career in residential and building design, building construction, and construction supervision, and Agricultural Mechanization and Agricultural Management, intended for those students who are interested in the applications of mechanical technology and principles of business to agriculture and its related industries.

The Agricultural Engineering profession originated here in Madison in 1907, marked by the founding of the ASAE. Since then, much important research has been going on. As stated in the 1982 issue of the Ag Engineering Research Summary, "These research projects are intended to contribute new and valuable engineering information to farmers and agricultural industries in Wisconsin, the nation, and the world." □

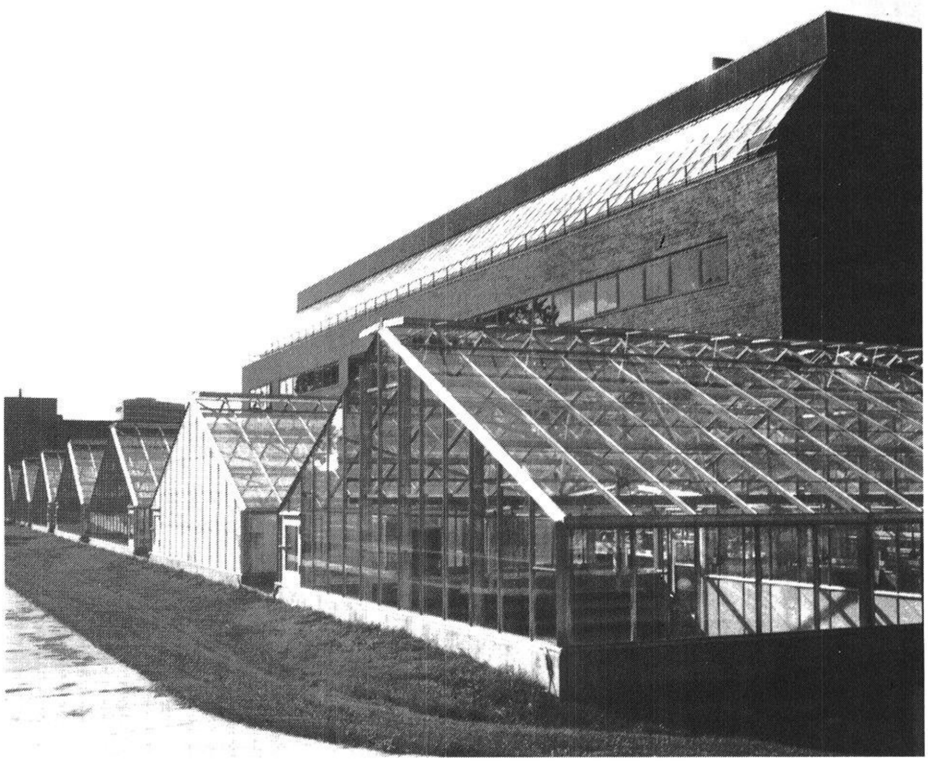

Photo by Fernando Perez

Agricultural Engineers can combine biology and technology to produce and process food and natural fiber with increasing efficiency and quality.

Computers for People

**by Don Schwartz
and Mike Smith**

Don Schwartz is a junior in Mechanical Engineering, and Mike Smith is a senior in Psychology. Both men have a strong interest in technology's role in our society.

Imagine yourself a new UW graduate being offered a job at a major engineering firm. On a plant trip you enter the computer department and, to your surprise, you are met by a deaf and blind programmer. This may seem uncommon to you, but this will be occurring more frequently than many people expect due to the efforts of a non-profit organization called Computers to Help People, Inc.

The name "Computers to Help People" should be taken literally. This corporation is interested in using computers to benefit people everywhere, especially those who may be disadvantaged in any way. Through the use of computers, this corporation aids handicapped individuals to realize and utilize their otherwise unused talents in computer science. In addition, they hope to extend their aid to the people of developing nations, minorities, the elderly, etc.

The president of Computers to Help People, John Boyer, is a handicapped individual himself who has lost his sight and hearing. He is a full-time graduate student of computer science at UW who expects his PhD within two years. Communication with John is not as impossible as one might think, but in fact is quite easy.

"Machine is for man, not man for machine."

Using a typewriter-like device which he carries with him, others speak to him using braille. Each key, as you press it, presents the characters in braille to his fingertips which are inserted into a small cavity in the back of the device. John's basic philosophy, as he said it, is "Machine is for man, not man for machine."

At this point the corporation is primarily an educational institution which teaches computer programming to the

Photo by Alicia Diehl

disabled. In the near future John hopes to expand and diversify the corporation into several divisions thereby becoming an employer of these possible computer professionals. These divisions include: "Computers for the Handicapped" which will specifically promote the use of computers to aid the physically and mentally handicapped; "Education" which will include public education programs, computer aided instruction, and programs to train handicapped persons and members of minority groups as computer professionals; "Computers for the Poor Nations" which will use computers to aid developing nations; and finally, "Friendly Computing" which will create job opportunities for handicapped persons trained as computer professionals.

Currently, these divisions are only in the planning stages. The corporation is presently operating on foundation grants and personal donations which only supply enough money for one Apple Microcomputer terminal and an Epson printer which actually prints in braille.

It is going to take a lot of money, time and effort to get the proposed divisions started. But with the help of volunteers and increased donations, this corporation can be very successful. In the next year or two Computers to Help People, Inc. will concentrate on the Friendly Computing Division and continue serving the needs of handicapped individuals attending the University of Wisconsin. □

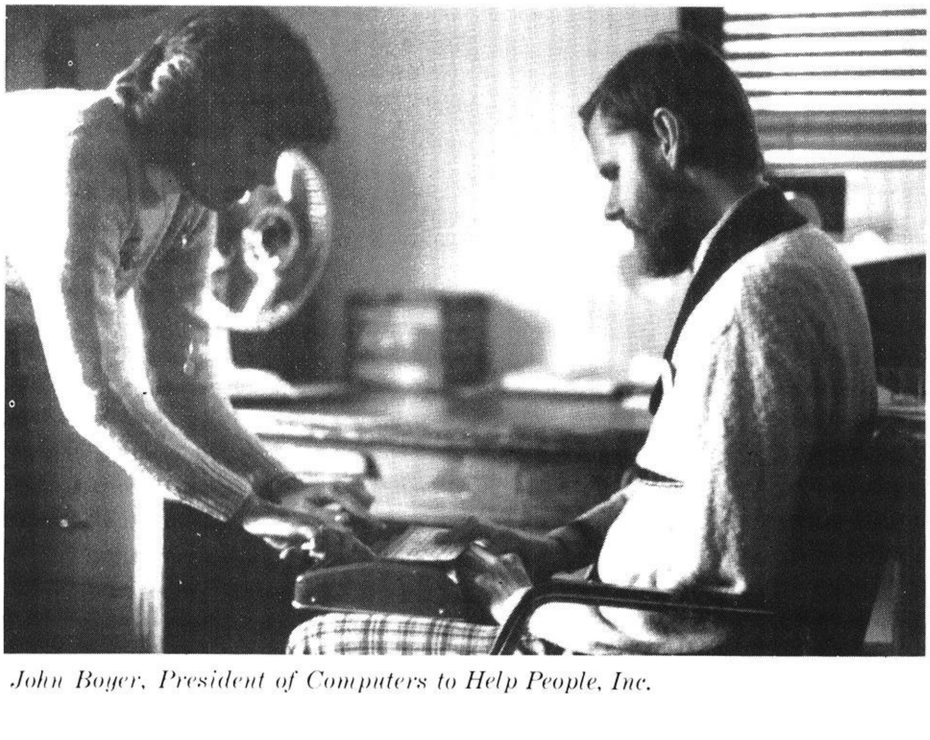

Photo by Alicia Diehl

John Boyer, President of Computers to Help People, Inc.

How to pick a company

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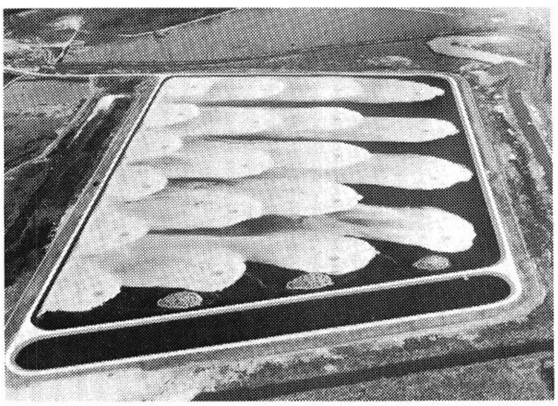

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Engineers find important challenges at International Paper.

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The Registration Blues: A Freshmen's Perspective

by Scott Paul

I had arrived safely at Madison, gotten rid of my parents, and found a place on the sixth floor of Witte Hall to put all my stuff. Then the adventure began.

I came here from a relatively small, calm town in northern Wisconsin, but I was ready to sample the wild, frantic life of a college student in the big city. Madison, I had been told, was the most radical place in the whole world. I wasn't sure what I would find, but I knew it would be new and exciting. However, I didn't know where to start my quest for this new life.

Thank heaven for the knowledgeable, friendly host commonly known as a housefellow. Our fellow gathered a large group of guys from the floor and took us to the Memorial Union to see "The Rage." Once there we purchased several pitchers of beer. Since I did not wish to be recognized as a freshman (freshmen never do), I decided that I would conform to the popular stereotype of the college student. In other words, I drank as much beer as I could possibly handle.

In the Stock Pavillion. Graphics by Rock

As the night progressed, I found myself led to a place known as the "K&K." Soon I noticed that I was sitting next to several pitchers of some green stuff that they called "Swamp Water." Still not wanting to be recognized as a freshman, I conformed. The stuff tasted like Kool-Aide and went down smoothly and easily.

So, after introducing us to Madison, our housefellow led us back to the dorm. Upon arriving there, I found myself frantically pondering the question: "What, are there no toilets in the elevators?"

As time went on, I found new and different ways to look like a college student. I spent a great deal of time spilling beer on my sloppiest clothes. I bought myself one of those little red scarves and a pamphlet detailing 101 ways and places to tie those scarves to your body. And I quickly developed a taste for crowded places and loud music.

Thursday morning came all too fast, and the business of registration was close at hand. So I settled myself down just long enough to plot out an elaborate schedule, carefully putting all of my classes down into their ideal time slots.

Later, as I stood in an endless line outside of the Stock Pavillion, I questioned the propriety of what I was doing. Was it really ethical for me to be standing in line to get into a place where pigs and cows enter without hesitation?

Finally I acquired the needed forms. I sprinted out the door and ran breathlessly down the road. My feet were wings upon the pavement. But I forgot where I was supposed to be going. This was no great matter—I merely whipped out my trusty campus map.

The assignment committee. Graphics by Rock

Ahhrrgg!!&@* I just realized that I did the one thing that I swore I would never do. Looking at a campus map is a great deal like carrying a 22"x36" flashing neon sign that says "FRESHMAN." I felt so small.

After arriving at my first assignment committee I checked the list of sections that had already filled up. Then I took my elaborately plotted schedule, crumpled it into a tiny ball, and threw it as far across the room as I could.

I do not remember much of the four and a half hours that followed. My mind still gets foggy and spins when I try to think about it. There are only two things that I can remember clearly. I remember the look of complete despair and utter hopelessness that I saw on the face of a girl, who at the first stop at the Red Gym, was told that she was ineligible for a certain class and would have to go back to her assignment committee. And I remember that nothing has ever made me happier than to finish the registration process by signing a check for $561.00. I heard myself saying, "I'm so happy that I can sign over a large portion of my life savings."

At the end I was so euphoric that I gladly accepted pamphlets and information from what seemed to be an endless line of hands, but in a few short minutes I was able to compose myself. I then judiciously and selectively threw all of them away.

The current registration process,

Leaving the Red Gym. Graphics by Rock

which ended up forcing me to take a geography course that I never planned on, did have one good point. I walked so far that I practically memorized the layout of the entire campus.

I think that registration is probably

At the book store. Graphics by Rock

the most difficult stumbling block that a freshman can face during his/her first year here. But I made it. And now I feel like a full-fledged college student, with all the rights and privileges thereof.

Give me a beer! □

A freshman engineer, Scott Paul has seemingly conformed by limiting the scope of conversation to Bacchanalian intrigues. Still, Scott has made a smooth transition onto the ***Wisconsin Engineer*** *staff.*

Opportunity for Equals

by Beth John

Beth John is an engineering freshman and is the newest member of our editorial staff.

In the next few years the demand for engineers will continue to grow. The 1982 forecast survey conducted by Fox-Morris Personnel Consultants has predicted a 16% increase in the need for engineers, second only to the need for data processing professionals.

This higher demand, however, will be filled by an ever increasing number of women engineers.

Thirty years ago the idea of a woman studying, not to mention actually practicing, engineering, was almost unheard of. At one point, only 0.17% of all engineering undergraduate degrees were awarded to women. According to a survey conducted by *Engineering Education* magazine, as recently as 1972 only 2.3% of full-time engineering undergraduates were women. By 1980, however, this number had risen to 13.4%. The number of freshman women engineering students also grew drastically from 2.9% in 1972 to 14.5% in 1980.

Researchers have cited a number of reasons for this somewhat sudden change. A major factor has been the progression of the women's movement throughout the United States. As more and more women began seeking activities and jobs outside of the home, the barrier surrounding traditional male fields was broken.

At the same time, job opportunities in the fields previously dominated by women, such as teaching and nursing, diminished. This also helped women's exploration of technological fields.

Consequently, a new awareness of women in engineering spread across the country. Employers have begun recruiting this formerly ignored half of the work force. Women were, and still are, leading candidates for many employers interested in satisfying equal opportunity laws. Said Marilyn W. John, 1981 president of the Wisconsin Section of the Society of Women Engineers, "Opportunities for women engineers have been increasing tremendously in the last few years, equal opportunity laws helping to compel businesses to search for women with engineering knowledge."

Despite the seemingly large increase, the overall numbers are still low. In 1980, while 13% of engineering students were female, women represented only 1.6% of the practicing engineers in the United States, only 19,800 of an estimated total of 1.3 million.

An obvious question, then, is how well women engineers stack up against their male counterparts.

On the average, women engineers finished high school with a higher grade point average than male engineers, according to a survey of Purdue University graduates and current engineering students. College grade point averages and the achievement scores were comparable.

Currently, the average experienced male engineer is receiving a 13.7% higher salary than the average experienced female engineer. This is realistic, however, when one considers that the average male is 39 years old with sixteen years of experience while the average female is 26 years old with less than five years of experience. Women do receive higher starting salaries, however.

In the Purdue University survey, 99% of the women cited the opportunity to use skills and abilities in challenging work as the main reason they chose engineering. According to the Society of Women Engineers, the main jobs held by members were design (20%), research and development (19%), and analysis (14%) positions.

Women are more likely to belong to national, professional or scientific societies than men and, according to *Engineering Education*, women are also more apt to take advantage of continuing education opportunities following graduation.

According to Carolyn M. Jagacinski of Purdue University, continuing engineering education may be one way for women to ensure "career advancement in the future." □

Prodding U.S. Productivity - The M.S.M.S.E.

by Bonnie Buhrow

Innovation has become the seed for progress in our College of Engineering. Our feature editor, Bonnie Buhrow, researched the new Manufacturing Engineering Masters program being planned for the UW. Bonnie already has a creative curriculum of her own by combining her B.S. in English with an Industrial Engineering degree.

Photo by Karen Beisman

The foundations for a new Masters of Manufacturing Engineering are being laid this fall in the College of Engineering.

Anyone who reads a daily newspaper is aware of the fact that America's productivity is not what it used to be.

Productivity can be described simply as the ratio of output, goods and services, to input, which includes labor, materials, energy and facilities. In the 50's and early 60's, the U.S. was the world leader in productivity. Since then, however, the rate of growth in the manufacturing sector has been steadily dropping. Between 1966 and 1976, productivity increased only 2.1% in America, while an increase of 3.4% took place in the United Kingdom, and Japan's output per capita rose 9.7%.

Many factors have been mentioned as causes of this decline: lack of capital to replace equipment, increased energy and labor costs, changes in composition of the workforce—and less than perfect management.

Inadequate management is, in turn, at least partially due to the lack of trained manufacturing professionals. In 1978, only three accredited engineering programs of this type existed in the U.S. Industry has been bridging this personnel gap by "converting" chemical, mechanical, and electrical engineers into manufacturing engineers with on-the-job training. But modern manufacturing systems are becoming increasingly complex; there is a great demand for specialists who can more immediately implement state-of-the-art methods in order to bolster sagging productivity.

To satisfy the demand for technical leadership, the UW-Madison College of Engineering has developed a new degree program—the Master of Science in Manufacturing Systems Engineering (M.S.M.S.E.). If the UW Administration and Board of Regents approve the proposal, the program can be put into effect in the spring of 1983.

continued on page 24.

New SME Chapter Forms

by Mark DeVries

The Society of Manufacturing Engineers, SME, is an international organization for individuals from all areas of manufacturing. With more than 60,000 members in over 60 countries, its main goals are to meet and share ideas, information, and accomplishments.

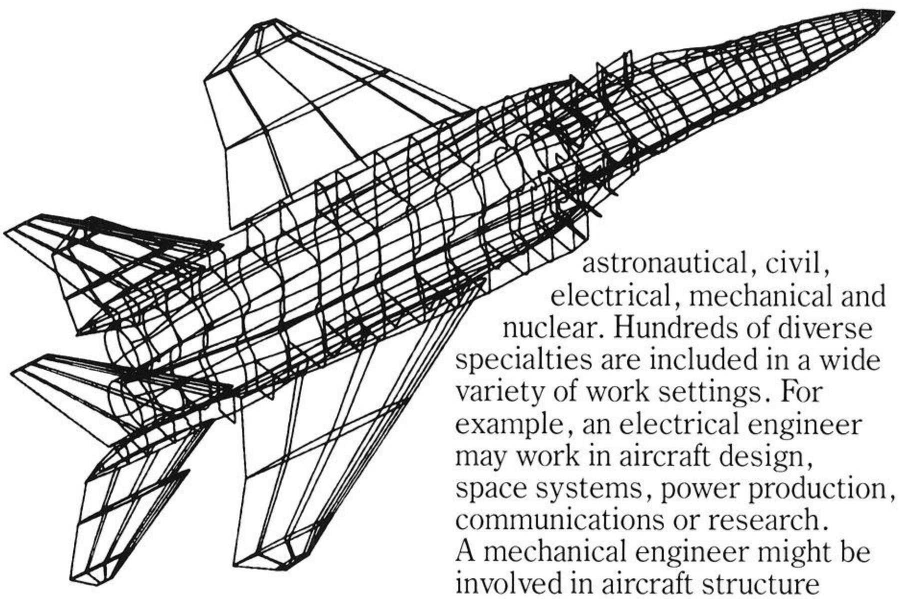
SME has over 230 senior chapters and more than 90 student chapters. From its earliest year, SME has been vitally concerned with student members and student chapters.

A new Society of Manufacturing Engineers Students Chapter is being formed in Madison. The first chapter meeting was held on September 10, in room 174 of the Mechanical Engineering Building.

A student member of SME benefits from the values gained from professional association with fellow members at society meetings. Also, SME's research and educational programs, publications, conferences, and expositions are important and valuable assets to broaden a student's horizons.

If you have any questions or would like to sign up, please contact Professor Marvin DeVries, room 164 in the Mechanical Engineering Building. □

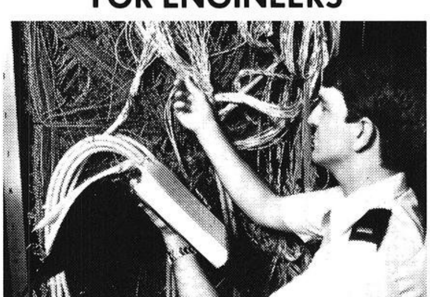
ENGINEERING TAKES ON EXCITING NEW DIMENSIONS IN THE AIR FORCE.



Computer-generated design for investigating structural strengths and weaknesses.

Developing and managing Air Force engineering projects could be the most important, exciting challenge of your life. The projects extend to virtually every engineering frontier.

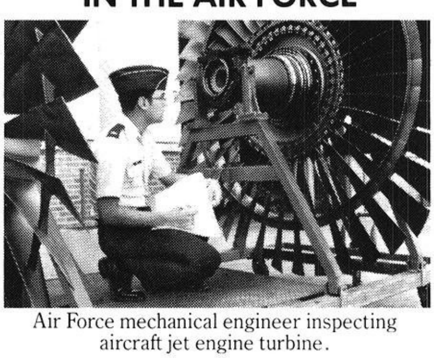
8 CAREER FIELDS FOR ENGINEERS



Air Force electrical engineer studying aircraft electrical power supply system.

Engineering opportunities in the Air Force include these eight career areas: aeronautical, aerospace, architectural, astronautical, civil, electrical, mechanical and nuclear. Hundreds of diverse specialties are included in a wide variety of work settings. For example, an electrical engineer may work in aircraft design, space systems, power production, communications or research. A mechanical engineer might be involved in aircraft structure design, space vehicle launch pad construction, or research.

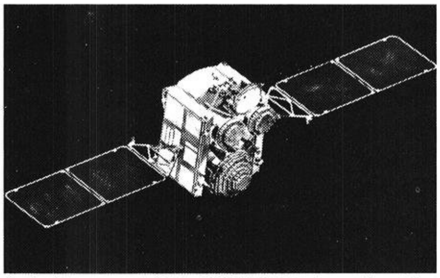
PROJECT RESPONSIBILITY COMES EARLY IN THE AIR FORCE



Air Force mechanical engineer inspecting aircraft jet engine turbine.

Most Air Force engineers have complete project responsibility early in their careers. For example, a first lieutenant directed work on a new airborne electronic system to pinpoint radiating targets. Another engineer tested the jet engines for advanced tanker and cargo aircraft.

OPPORTUNITIES IN THE NEW USAF SPACE COMMAND



Artist's concept of the DSCS III Defense Satellite Communications System satellite. (USAF photo.)

Recently, the Air Force formed a new Space Command. Its role is to pull together space operations and research and development efforts, focusing on the unique technological needs of space systems. This can be your opportunity to join the team that develops superior space systems as the Air Force moves into the twenty-first century.

To learn more about how you can be part of the team, see your Air Force recruiter or call our Engineer Hotline toll free 1-800-531-5826 (in Texas call 1-800-292-5366). There's no obligation.

**AIM HIGH
AIR FORCE**

Bouncing the Ball Up the Corporate Ladder

by John Wengler

This past summer John Wengler played volleyball every Thursday lunch-break with his co-workers from the Village Hall in Wilmette, Ill. Presently though, John limits his physical workouts to climbing the ME buildings stairs to our office.

The grey suit might have impressed the interviewer, but what's really important to your future co-workers is how you play the game—in athletic shorts. Be it tennis, volleyball, or bowling, employee sports are important to the new engineer looking for his/her spot in a company.

At a company outing, employees step from behind their desks to see each other as they really are. The actual game helps assimilate the newcomer into the office because everybody is essentially equal wearing tennis shoes. The gap between the boss and you seems to shrink when you become teammates. Yes, we have all seen Dagwood Bumstead under pressure from Mr. Dithers during a "friendly" golf match. Fortunately, most bosses are not as two-dimensional as Mr. Dithers, and enjoy healthy competition from below.

Attitude, not ability, is paramount. In a game, people take notice of how you take criticisms, react to your own and other's mistakes, and accept victory as well as defeat. Co-workers are then able to see what kind of person you are. Of course, if you have major psychological problems, it might be better for you to forego these company outings.

Not all sport matches will be the type of passive sociological encounters just described. A game could disguise an actual battle between office factions. Battle lines could have already been drawn at the last staff meeting. Workers of opposing opinions will arrive at the gym eager to out-run, out-shoot, and out-laugh their adversaries. These "tube-sock wars" can be a healthy vent for office tension, but much of the final score depends on one's behavior. If the match is successful in calming tension, serving a "no hard feelings" glance to the other side does well to close the conflict. Some workers, however, can remain as belligerent as before. If all your good-sportsmanship has had no effect, other measures are needed. Go ahead and ram a spike into the other court as a reminder of their simple mortality; then lob over a look saying "no more games, we have to learn to work together."

Use extreme caution. There are many factors involved in office politics that a new-comer is unaware of (e.g. jealousy vs. admiration, long-standing feuds, etc.). The trick lies in not buddying it up with only one side, thereby avoiding "entangled alliances" back at work.

So, after graduation don't expect to simply trade your Converse for Florsheim. The way you carry the ball might influence your co-workers opinion of you. By displaying a good-sport attitude, your office partners will want to work with you after returning to the drawing boards. □

Photo by Fernando Perez

A complete athletic background can give a graduate confidence when entering company competition. Faced with the choice between homework or soccer, the student can rationalize the latter as a session in career development.

The Aldicarb Factor

by Jeff Needle

A CEE senior, Jeff Needle is also working towards an Environmental Studies Certificate. Jeff is also the President of the ***Democratic Organization of Progressive Engineers and Scientists.***

Most engineers haven't heard of Aldicarb (there are probably one or two). It's a pesticide that was used on potatoes to kill potato beetles and nematodes. It happens to be a very effective pesticide. Since its first use in Wisconsin, in 1976, it has been widely adopted by the potato farmers of the Central Sands area of the state.

Before getting into Aldicarb's present conflict, let's review its history. It was developed by Union Carbide in 1962. In 1970 it was registered for use on cotton crops, and by 1974 it became available for use on potatoes. By the end of 1977, most of Wisconsin's potato farmers were applying Aldicarb to their land.

Temik, the trade name for Aldicarb, is a non-carcinogenic but highly toxic pesticide. It's chemical structure (for all you Chem. E.'s) is aliphatic oxime carbamate. To reach its non-toxic state, Temik must go through several stages of oxidation. Yet once the pesticide seeps below the potato field, there is no longer enough oxygen in the soil to complete the oxidation breakdown. This is the root of the problem, for once Temik sinks into the soil, it could remain there for up to 20 years. It would then take a relatively short time (a few years) for the pesticide to reach through the soil to the ground water (which is only 15 ft. below the surface in some parts of the Central Sands area.)

Orchard Street Circuit Party

by Steve Baker and Craig Smith

Steve Baker and Craig Smith, who are seniors in electrical engineering, are active members of Kappa Eta Kappa, the electrical engineering fraternity.

These days, most believe there should be more to college besides obtaining a degree. Kappa Eta Kappa's goal over the years has been to provide electrical engineering students with a well-mixed professional and social atmosphere.

Since the Delta chapter of KHK was founded on the U.W. campus in 1924, over 800 of its members have graduated from the school of electrical engineering. The current active membership is 33 students, with 13 members living in the chapter house, located at 114 N. Orchard Street. KHK members devote time to the fraternity and themselves through various activities. These activities include organized study groups, fraternity projects, intramural athletics and social functions with both students and faculty members.

The fraternity is currently involved in an *Expo-83* project that encompasses an assortment of electrical engineering disciplines. Microprocessor and computer control systems, optical communication links and power regulation are among some of the project experience members are gaining. Practically everyone is involved, getting some handson technical experience as well as meeting representatives from Honeywell, Texas Instruments, and other companies who have shown interest in the project.

The alumni of KHK maintain their interest in the fraternity through an organization called The Delta Alumni Association of Kappa Eta Kappa. This association was set up to keep a strong link between students and the alumni members, as well as the electrical engineering industry. To show their support, the alumni offer a scholarship every semester to an active member who has shown outstanding service to the fraternity. They also offer consulting on career preparation as well as on various fraternity projects, including the current *Expo* project.

Kappa Eta Kappa is fortunate to have honorary members of the fraternity which consist of 18 professors from the electrical engineering department. One of these professors is extra special since he also is the fraternity advisor. Dr. R. A. Greiner has been assisting KHK for the last 22 years with their administrative and scholastic affairs.

Just as the school of electrical engineering has changed and developed over the years, Kappa Eta Kappa has also experienced changes and development. With 58 years of service to the U.W.-Madison campus, KHK has grown strong. And with the higher enrollment in engineering, it looks like they will continue to grow and prosper. □

Wis Eng Photo

The Kappa Eta Kappa fraternity house located at 114 N. Orchard Street.

These toxins could be transported by the moving ground water to water well intakes throughout the state. Even if toxins were found in a well and Aldicarbs use was immediatly illegalized, the water user would continue pumping toxic water until the entire groundwater system flushed itself out.

The potato farmers on Long Island, NY had been using Aldicarb about a year before its use began in Wisconsin. In 1979, some NY environmentalists convinced the Sulfolk County Health Dept. to conduct testing. They found aldicarb in several ground water wells at low levels of concentration only 3 to 4 years after it was put into use.

Despite Union Carbide's protests, the pesticides' use was banned on Long Island. Then, during following year, testing was started in the Central Sands area. The results were the same as in L.I.; aldicarb was present in the ground water. A temporary ban was applied against the protest of farmers and (of course) Union Carbide. A more permanent ban is now in effect and will not be removed unless strong evidence proves aldicarb won't continue accumulating in Wisconsin's ground water.

There has been a recent development in Florida involving aldicarb's use on the citrus crop. High leves of the toxic chemical have appeared in Florida's "wetlands." In the wetlands, the water table is almost at surface level, giving the area a swampy character. Therefore, when aldicarb was applied in the wetlands, it didn't even have to spend time passing through soil to reach the "ground water." This has been, by far, the most serious health hazard aldicarb has presented to date.

It's a credit to Wisconsin's D.N.R. that they had the foresight to stop further contamination of our very high quality ground water. It isn't often that the public's future safety and interest are considered more important than short term economic interests of the private sector. □

The Surface Contingent

A recent finding at the General Motors Research Laboratories has changed scientific thinking about the behavior of electrons in metal surfaces. This discovery provides a greater understanding of the fundamental physical processes involved in such surface events as adhesion, corrosion and catalysis.

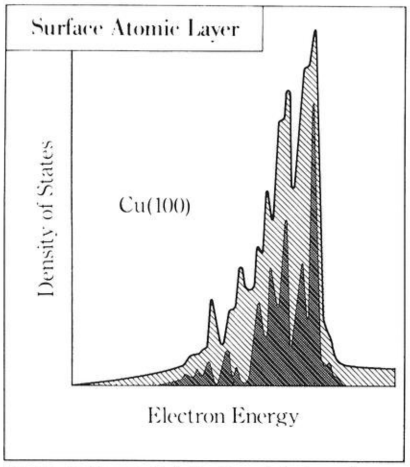
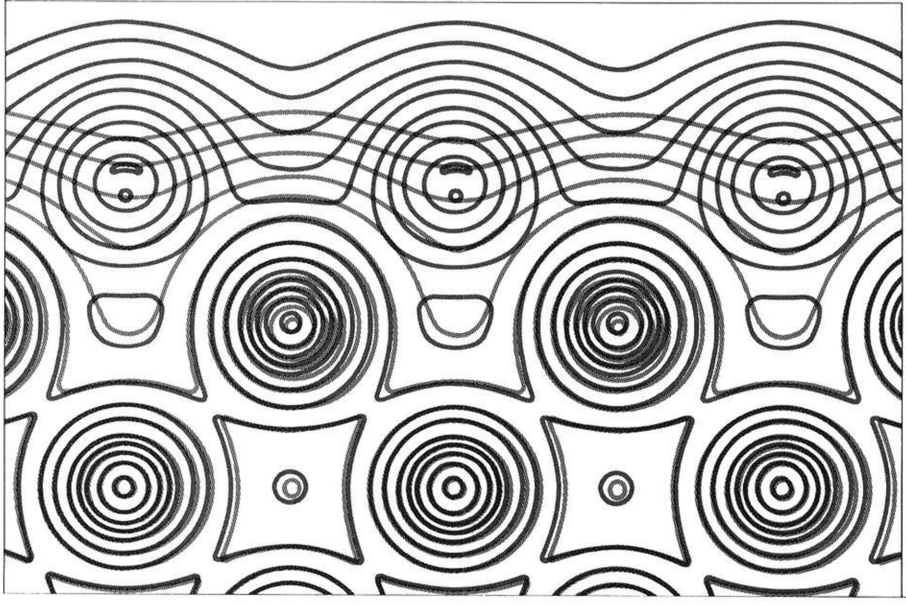


Figure 1: Energy distribution of electrons in outermost atomic layer. Shaded area indicates electrons in surface states.

Figure 2: Two electron density contour maps of the cross-section of a Cu(100) surface. One map shows a clean copper surface (lt. gray); the other shows a nitrogen-covered copper surface (dk. gray).

CONVENTIONAL scientific thought treats virtually all of the valence electrons found in the surface atomic layer of a metal as if they are free to roam throughout the metal's interior. The work of three physicists at the General Motors Research Laboratories suggests otherwise. Through calculations confirmed by experimental data, the theorists have shown that more than a quarter of the valence electrons in the top atomic layer of some metals are effectively trapped in the surface. The presence of so many "surface state" electrons must be considered when analyzing physical and chemical surface phenomena, including such surface events as oxidation leading to corrosion.



Drs. John Smith, Jack Gay and Frank Arlinghaus applied their theoretical analysis to the (100) surface of five metals: copper, nickel, silver, rhodium and palladium. They made bold predictions concerning the percentage of electrons in the surface atomic layer to be found in surface states: Cu(36%), Ni(23%), Ag(23%), Rh(23%) and Pd(19%). The ratio of the shaded area to the hatched area of figure 1 gives the percentage for copper.

Electrons in surface states are not only abundant, but also highly localized on the surface. Chemisorption on a metal is also confined to the surface region. Figure 2 shows what happens in the case of nitrogen chemisorbed on copper. The two contour maps coincide except in the surface layer, where the interaction is largely exhibited. Localization of the interaction holds for the chemisorption of other gases, including oxygen in the initial stage of metal oxidation. These observations led the physicists to conclude that surface states are important in chemisorption.

One way to probe electrons in surfaces is to chemisorb atoms on a clean metal surface and look for changes in photoemission spectra. Such an experiment was performed at GM for fractional monolayers of nitrogen, oxygen and sulfur on Cu(100). The dominant change in the photoemission spectrum was the disappearance of a large peak whose shape and energy location was independent of the chemisorbed atom. It was of special interest that the shape and energy location of this peak was nearly identical to the envelope around the surface state peaks in figure 1. This suggests that surface state electrons play a major role in the chemisorption process.

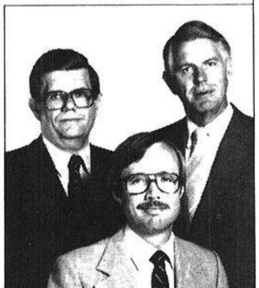
THE THEORETICAL advance at the heart of the discovery is the "Self-Consistent Local Orbital (SCLO) Method" for solving the Schrödinger equation. This new mathematical method was devised by the GM theorists to handle the classic dilemma posed by the self-consistency requirement. The characterization of electron behavior used to complete the equation must be consistent with the behavior predicted by the equation. In other words, one almost needs to know the answer in order to make the calculation.

Self-consistent solution of the equation for a metal surface is made exceedingly difficult by the three-dimensional nature of the electron density distribution. The theorists dealt with this challenge successfully by dividing the electron density distribution into two parts—the first part due to overlapping atomic density distributions; the second part equaling the difference between this atomic contribution and the exact density distribution.

One of the more stringent tests of the accuracy of the SCLO method was an angular photoemission experiment conducted by Heimann et al., at the University of Munich subsequent to publication of the GM research. The German research team confirmed a prominent surface state band predicted by the three GM physicists. This was the first time a surface state band on a solid had been calculated prior to its being seen experimentally. The SCLO method makes possible something that could not be done before—accurate prediction of the actual behavior of electrons whirling around nuclei at the surface of a metal.

"The large body of surface states we found on metal surfaces," says Dr. Smith, "may be a controlling factor in many physical and chemical surface phenomena. By replacing conjecture with calculation, the new surface theoretical methods give us the means to make major steps forward in the analysis of surface and interface properties."

THE MEN BEHIND THE WORK



Drs. Smith, Gay and Arlinghaus are theorists in the Physics Department at the General Motors Research Laboratories.

John Smith (center) and Jack Gay (right) received doctorates in physics; Smith from Ohio State University and Gay from the University of Florida. Frank Arlinghaus received his Ph.D. in physical chemistry from the Massachusetts Institute of Technology.

John Smith, leader of the GM solid state physics group, did postdoctoral work at the University of California in La Jolla. He joined General Motors in 1972. Frank Arlinghaus and Jack Gay joined the corporation in 1964 and 1965, respectively.

Each member of the team brings to the project a different expertise: Smith in surface physics, Gay in solid state theory, and Arlinghaus in bulk band structure calculations.

Incandescent Centennial in Appleton

by David Haak

David Haak is a senior in the Civil and Environmental Engineering Department, and is from Appleton, Wisconsin.

One hundred years ago last September, two milestones occurred in Electrical Engineering that changed the lifestyles of everyone. The first, in 1882, was the operation of the first power company to service homes—the Edison Electric Illuminating Company in New York City. The second milestone was the world's first hydroelectric power plant, built in the small town of Appleton, Wisconsin.

Five men were responsible for the small hydro-plant in Appleton—A. L. Smith, H. J. Rogers, H. D. Smith, C. A. Beveridge and W. D. Kurz. All of the men except Kurz were founders of the Appleton Edison Light Company; Kurz was the plant's first superintendent and an electrical inventor.

The idea of a hydro-plant came to Rogers while he was on a fishing trip with an Edison salesman. No fish were caught, but Rogers did land the great idea of a generator system.

Work began on the power plant in the early spring of 1882. By September 29, three buildings were wired and waiting for power: Rogers' home and papermill, and the Vulcan Papermill. When the final moment approached, the water flowed, moving the turbin, and the wires were connected—ZAP! nothing happened.

Discouraged, the men sent a telegram to Chicago asking for the expert help of E. T. Ames. The next day Ames arrived, and he and the others frantically tried different connections, but still no power. The men were becoming tired and frustrated, but they kept trying. Eventually the lamp in the dynamo room flickered a dull red, then a bright yellow. With a flash, the lamp burst into incandescence. As onlookers watched in amazement, the lamp remained lit all night long.

There were skeptics in the crowd who believed the idea would never catch on, but the Appleton Edison Light Company grew. The five men's vision of water producing electricity had come true. □

Wisconsin State Historical Society photo.

The Worlds First Hydroelectric Central Station.

Fox Valley Festival of Light

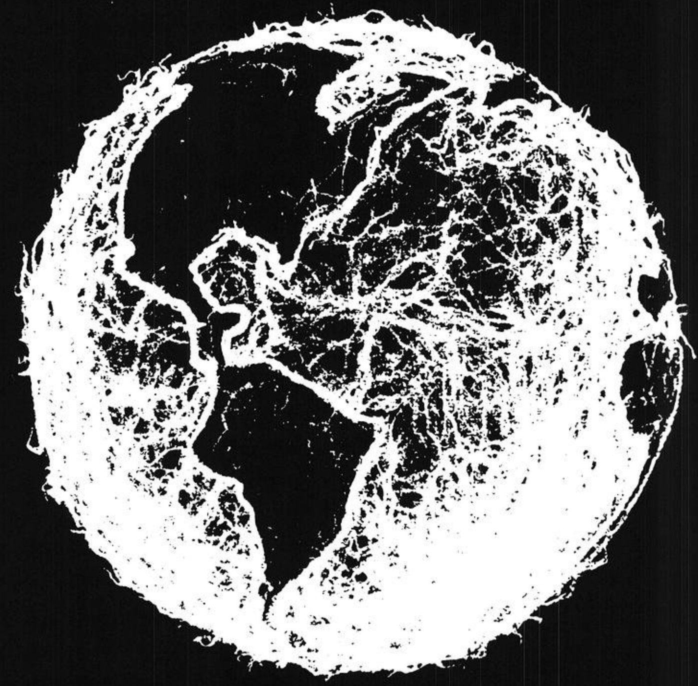
by David Haak

In September 1882, in the small town of Appleton, Wisconsin, hydroelectric power was born when five men began operation of the world's first hydroelectric generating plant. (Please see accompanying story.) One hundred years later, the city of Appleton is celebrating this anniversary with the Fox Valley Festival of Light.

The celebration was kicked off Friday evening, October 1, with a parade and light show near the site of the first hydroplant. The Laser Light Show, performed by Laser Artistry, Inc. of Milwaukee, featured brilliant colors overhead reflected in the rippling waters below. Held in the Appleton West High School auditorium, the 90-minute show combined music with light moving on the water in an electrifying dance. Music was provided by the rock band YAZZ. At the light show there was also a short presentation "A River of Change" on the historical Fox River Valley.

The new Paper Valley Ballroom was the scene Saturday evening for the Electric 80's Ball. Partygoers, dressed in fashions of the 1880's period, danced to the tunes of the Lawrence Brass Quintet. The finale on Sunday was an ice cream social.

Throughout the three-day event, there were riverboat and trolley car rides, music, crafts, dancing and a variety of cultural affairs. Historical homes, the Dard Hunter Museum, the Institute of Paper Chemistry, and the Lawrence University campus were all open to the public. There were also three days of World Class Cycle Racing and sailboat racing on the Fox River. □



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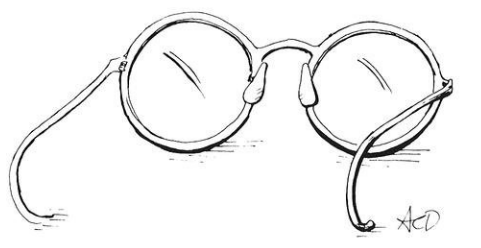


"On a Clear Day You Can See GM"
A book written by John DeLorean

The book "On a Clear Day..." offers a rare glimpse of the engineer's behind the wheels of the auto industry.

John DeLorean discusses many practical engineering solutions with a backdrop of Detroit's factories and boardrooms.

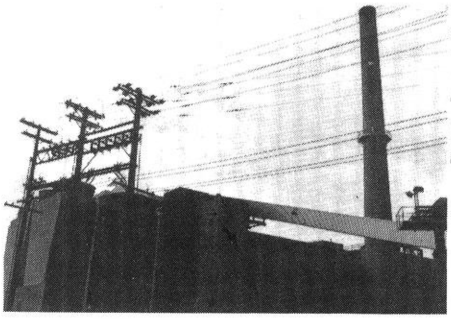


Photo by Fernando Perez

Imagine yourself as a vice-president of one of the largest corporations in the world. You earn $650,000 a year and are poised to assume the presidency. But the higher you climb the corporate ladder, the greater your disillusionment grows. You are dissatisfied with the corporate system and see no way of changing it. Finally only one option makes itself clear. You quit.

A nightmare? For John Z. DeLorean, a precocious General Motors executive, this story was a reality. DeLorean's frustration with GM resulted in the publication of the bestseller, *On a Clear Day You Can See General Motors*. The book gives a unique perspective on the mechanizations of a mammoth corporation, an account untouched by public relations and staffs and unrestrained by fears of retribution upon the author. However, the narrative is not totally objective, since the book focuses in on the opinions of one executive, and a disgruntled one at that.

"The book is less as an idictment of one particular corporation than as a critique of the corporate system in general."

Though dissatisfied, John DeLorean had a fantastic career at General Motors. He was hired as a Pontiac engineer in 1956. His engineering skill and managerial capacity were quickly recognized and he became chief divisional manager of Pontiac, where he increased sales by introducing exciting, trend-setting automobiles. He later headed Chevrolet Division, the operations of which were vast and poorly organized; DeLorean modernized the management system and generated greater profits in the process. He became a vice-president in 1972, while still in his mid-forties.

Although DeLorean is best known for his business successes, he was also a talented engineer. The book provides a great deal of insight on engineers and their profession. DeLorean notes that many engineers become consumed in a project "almost to the exclusion of all else." Engineers tend to be fiercely proud of their work and suspicious of products designed elsewhere. A case in point concerns the Vega, a GM subcompact of the seventies, which was largely designed by the GM Corporate Engineering Staff. Chevrolet marketed and produced the car, but the engineers there disliked it, since they had little input into its initial design. Their distaste for the car was justifiable, for it had an inadequately developed aluminum engine and a poor reputation in general. (In fact, the first Vega prototype's front end fell off one mile into road testing.)

DeLorean credits his engineering and business success in part to his technical training, which developed his ability to think logically and solve complex problems by breaking them down into their simpler components. In fact, he found his duties as a manager more demanding than those as an engineer. He commented,

> *As an engineer, my work was uncomplicated. Engineer is a very logical and precise science. The answers are all there in cold mathematics.*

Perhaps DeLorean found management more complex than engineering because his experiences with people, unlike those with automobiles, were often illogical. He was particularly dismayed by corporate politics, which he illustrates with anecdotes. One deals with sales people eager to please their boss. Finding that he liked beer and sandwiches before going to sleep, they reserved the boss a hotel room and rented a refrigerator stocked with both. However, the refrigerator would not fit through the door, at which point the employees had the refrigerator installed through the window by means of a crane.

Most of DeLorean's remarks concern more important matters, such as the immorality of many high-level corporate decisions. For example, GM management was warned that the rear suspension of the Chevrolet Corvair made it prone to spin-outs. The warnings were ignored, and several deaths resulted from the instability of the car. He feels that such decisions are made because the corporate system urges conformity to corporate goals, and those who refuse to conform find themselves branded as uncooperative. The individual executives almost always have a very high moral character; the problem lies with the individual only insofar as he lets career ambitions obscure his moral judgment.

continued on page 30.

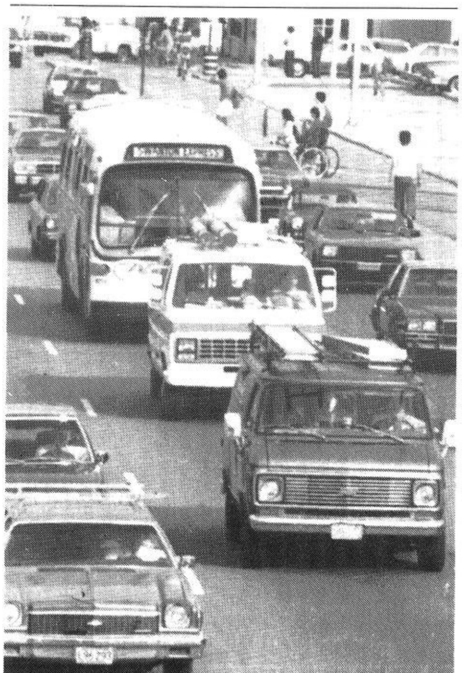


Photo by Fernando Perez

Das Olympiadach in München

by Karen Biesman

The Parisian Eiffel tower, a small hydroelectric dam tucked up in a Norwegian fjord, and the streamlined "tubes" in London: engineering marvels abound throughout Europe. Among the Continent's most striking projects is the 1972 Olympic Village in Munich, West Germany. Visitors are immediately impressed by its graceful but harsh designs. Some are intrigued by its bizarre lines, while others are repulsed by the unorthodox character.

Photo by Karen Beisman

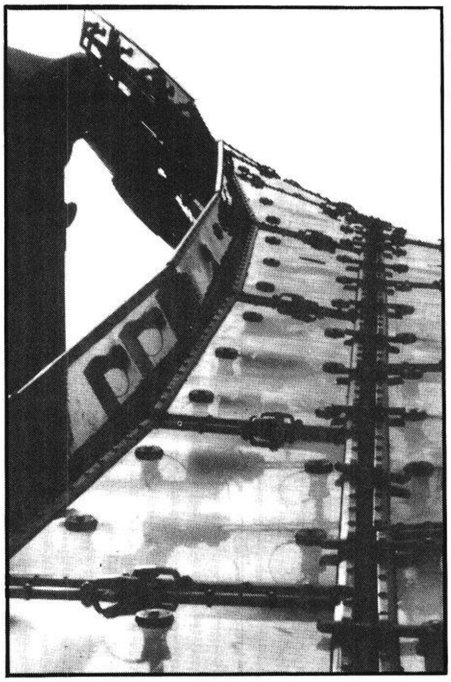


Photo by Karen Beisman

From an engineering point of view, it is a perfect example of the wonders of cable construction.

The 80,000 square meter roof is an interweaving of multistrand steel cables which support clear acrylic sheets. The network is anchored on nodal tubes up to 80 meters long. This lightweight construction is economical, and the translucent sheets allow the sun to naturally light the playing surfaces, thereby reducing electricity costs.

Today, Das Olympiadach caters to more than just structural engineering tourists. The Olympic Village hosts many athletic events. The swimming pool in which Mark Spitz set precedents by winning five gold medals is now open to public swimming. The athlete's quarters, familiar to many because of the televised coverage of the hostage crisis, are now low-cost apartment units. □

A CEE senior, Karen Biesman photographed Das Olympiadach during her ten-week exploration of Europe this past summer.

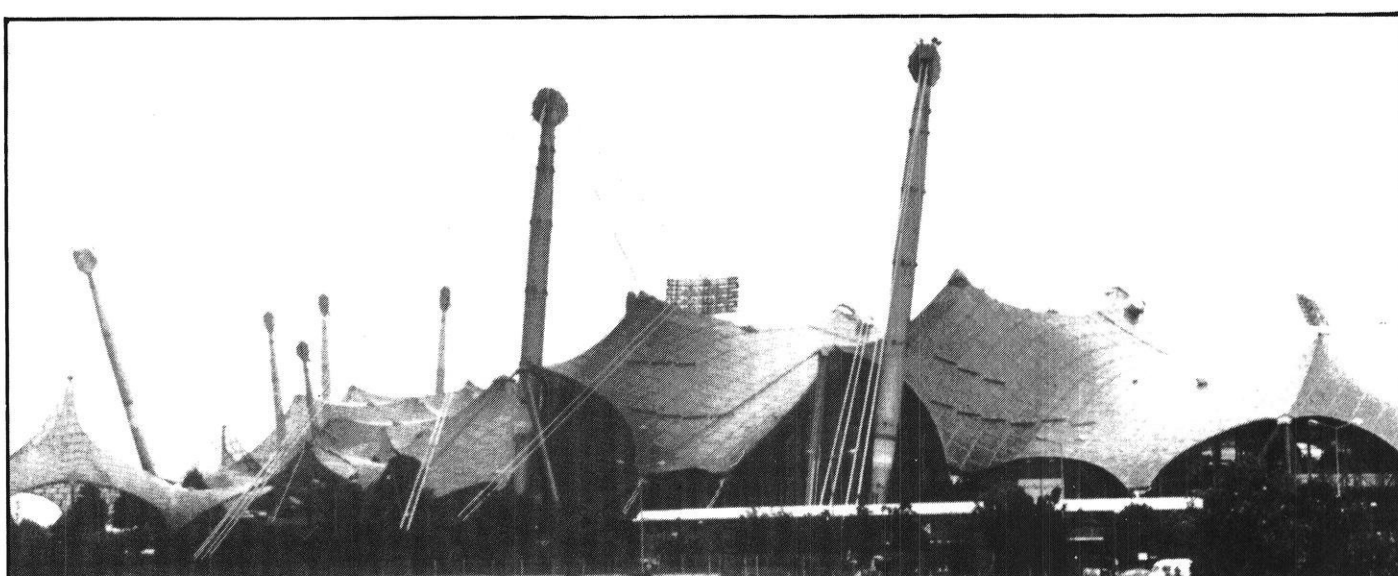


Photo by Karen Beisman

Water For Sale

by Eric Louckes

*This is third of a series of Environmental Issues articles that Eric Louckes has contributed to the **Wisconsin Engineer**.*

It would be difficult to find a city-dweller with complaints about the cost of water. In fact, in all U.S. cities, the water itself is free; home owners only pay their share of the cost for the distribution system's pumps and pipes.

Water is also "free at the source" to farmers, who must only drill a well and pump it out. Yet, the equipment to operate a large irrigation system is too expensive for individuals to undertake. In this light, state governments have always considered cash grants for water systems in their farming sectors worthy investments (considering the increased crop productivity).

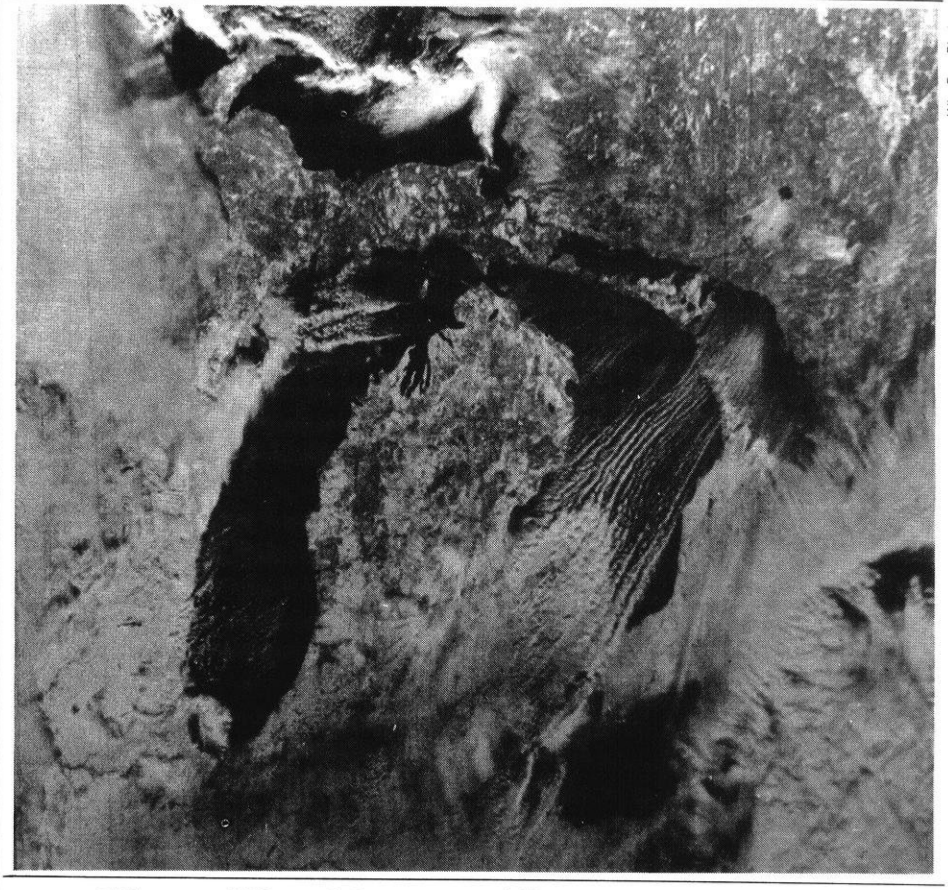
The point is, no entity has ever been actually selling water to anybody. Water has always been a cost-free resource with infinite value, at least until last January. That was when a company, Energy Transportation Systems Inc. (ETSI), signed an agreement to buy 50,000 acre feet of water from the State of South Dakota. ETSI wants to use the water in a coal slurry pipeline; planned to transport the coal mined in Gilette, Wyoming to southern states. The price: an eye-brow raising 9 million dollars a year.

ETSI's long-term forecast concluded that the cheapest means of shipping coal from Gilette to plants in Oklahoma and Louisiana would be to pump it there—a concept similar to the Alaskan Pipeline. The coal will be pulverized at the Gilette mine, mixed with an equal volume of water to make a slurry, and then pumped south. At the other end of the pipe, the coal would be centripetally removed and the water purified and discharged. The original source of all this water was a groundwater deposit near Gilette. A complete analysis of the deposit concluded the project would significantly lower the area's water table. This would mean the water supply cost would increase with time, and also create costly legal problems for the company. It was concluded that pumping water from another water source would prove a more economical plan.

ETSI did not have to look too far for a dependable water source by finding Lake Oahe: a tremendous impoundment of the Missouri River in eastern South Dakota. Since the lake was in the public domain, ETSI planned on offering as much as ten percent of the total project cost to entice the state government into selling its water. The company's strategy was also to outprice any other people wishing to use the water. By cornering the market, ETSI wanted to ensure the state would seriously consider the offer right away. South Dakota, one of the more economically depressed states, was ready to negotiate, and even had some unexpected incentives to offer. The Governor's Office and the Department of Water and Natural Resources pushed through legislation that cleared up legal hitches in the state's administrative code.

The final deal was signed by the parties in January, 1982. Under the agreement, South Dakota will receive 5 million dollars over the next three years just for drawing up the contract. This money's purpose is to defray any legal expenses the state might encounter while clearing the way for the project. Once water starts flowing from Lake Oahe to Gilette, ETSI will then pay 9 million dollars annually for the right to remove up to 50,000 acre feet per year for a period of fifty years. At least 17% of this water will be made available to municipalities in South Dakota along the route to Gilette. Interestingly enough, this provision makes the Oahe-Gilette portion of the project eligible for public financing. This substantially reduces the interest rate ETSI will have to pay to obtain the capital for constructing the pipeline.

As a result of the contract, ETSI will be paying more than 1000 dollars per acre foot for the Lake Oahe water, 250 dollars will go to the State of South Dakota. In comparison, irrigation water from nearby Nebraska costs 10 to 40 dollars per acre foot (but the source cannot supply the required volume). Even at the extreme price, ETSI will come out way ahead because it will get sufficient water at a fixed price for 50 years. Compared to its competitors, ETSI is furthest down the coal slurry road, and due to its pipeline experience, ETSI can expect big dollar returns when similar deals are made in the future.



Wis. Eng. Photo

It is unclear whether or not the ETSI-

continued on page 30.

(cont. from page 12.)

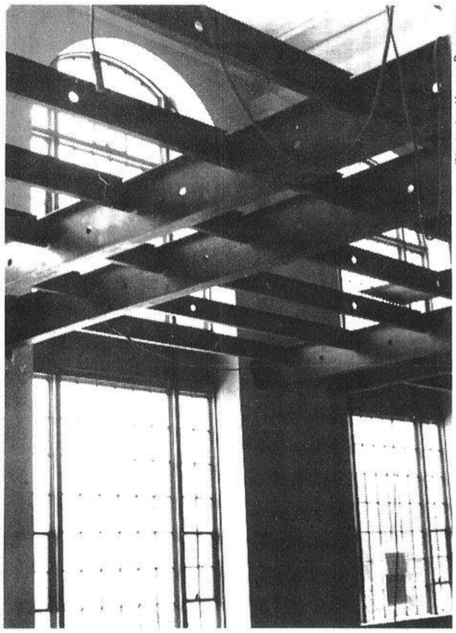


Photo by Karen Beisman

Unlike many traditional master's programs, the M.S.M.S.E. is an interdisciplinary program. In order to fulfill degree requirements (24 credits including a thesis, 30 credits with no thesis), the graduate student can select from a list of courses taught by faculty members of most of the College's engineering departments—chemical, electrical, mechanical, metallurgical, and industrial. Certain courses offered by the School of Business can also be chosen. The student must, however, elect at least one course in each of four areas—materials science, production processes and their control, production planning and control, and production and operations management. In addition, informal seminars on "hot" topics such as CAD/CAM can be developed and taken throughout the student's period of study for the degree.

Another rather innovative feature of the new program is the encouragement of mutually beneficial industry-university interaction. For example, employees might be sent to Madison for a special 12 month program of study leading to the degree. Or a company might sponsor an individual's thesis work on a problem of interest to the industry. If there is sufficient demand, evening classes and alternate course sites could also be incorporated into the program to provide more study opportunities for full-time industrial workers.

Because of the program's interdisciplinary nature and "real world" connections, students receiving the M.S.M.S.E. degree should graduate with a good grasp of the many technical and business issues affecting manufacturing productivity. Their job—improving America's productivity—will be challenging and difficult, but it needs to be done if the U.S. is to continue to compete effectively in the international marketplace. □

Photo by Karen Beisman

Who Insulates During the Summer?

by David Barnas

David Barnas has a long record of involvement in ASCE, Triangle Fraternity, and the **Wisconsin Engineer** *magazine. In writing this article, he wished to convey his experience as a summer employee of a small firm to remind interviewing students that biggest is not necessarily best.*

As energy costs continue to increase, the value of energy conservation products will also increase. In the petrochemical industry, insulation covers for piping are "penny wise" investments for keeping extremely hot pipes warm. Insulation Technology Incorporated is a company that produces custom designed insulation covers. The company was co-founded by UW-Madison graduate Greg Mann (Chem E '72). It has been in business for about three years. By combining sound technology with innovativeness in hurtling obstacles, the company has continued growing steadily. ITI is an excellent case in the practical applications of engineering and management skills.

Coal Gasification Plant

ITI was contracted to insulate 3000 valves and flanges in a new $350 million coal gasification plant being built by Chevron in southwest Wyoming. This huge plant will provide gas for cities as far east as Chicago. It will purify sour gas, which forms when acidic water leaches out sulfur from coal deposits and contaminates the nearby methane with hydrogen sulfide. Hydrogen sulfide is a highly toxic gas and must be precipitated out of the methane before it is burned. This solidified sulfur will not go to waste; it will be processed at a nearby plant also under construction. Chevron's coal gasification plant is the first full-scale project of its type.

ITI employed a group of UW-Madison students to take measurements of valves and flanges for these insulation covers. I was one of those students who travelled to Wyoming and spent six weeks dimensioning covers. Afterwards, I spent two weeks in production of the covers in Niles, Illinois.

The Chevron Carter Creek Coal Gasification Plant is enormous: about one square mile in area. In order to pinpoint the exact locations of pipes to be insulated, we used isometric drawings. These show north, east and elevation coordinates in perspective.

The Covers

The outer fabric of the cover is a woven fiberglass material which is heat, wear, and corrosion resistant. The insulation covers wrap around pipes carrying steam at temperatures as high as 550°F. The pipes must be insulated for acoustic, heat conservation, and safety purposes. The insulation, a pre-formed calcium silicate material, is secured around the pipe by sheet metal, which provides a water-tight seal for the insulation.

At pipe flanges, which connect pipes, gaskets need to be changed periodically. Gaskets also need to be changed at gate valves, which are irregularly shaped. Here, flexible insulation covers have the advantage of easy removability during gasket maintenance. The flexible covers are also easier to wrap around gate valves.

Gate valves have a bonnet protruding perpendicular to the flow and require special covers. The valve takes the shape of two interesting cylinders. You may recall from calculus that the intersection of two cylinders forms a sine curve. This fact is used in the production of gate valves, which can be broken into two parts .

Valves and fittings are held in place by bolts, which must be removed longitudinally with the pipe. The hard insulation only extends to the outer edge of the bolt head. We take measurements of nominal pipe size, flange ratings, and bolt lengths. From the bolt lengths, the overlap of bolt length (plus an added tolerance of 1") is added to the cover on one end. On the other end a dimension "x" is added. This extra length provides room for a wrench to remove the nut from the bolt. The dimension "x" varies with pipe size and flange rating, and is used in line flanges.

Some lines need added heat to insure that the sulphur inside does not solidify. The extra heat is provided by a steam

continued on page 29.

Autumn Campus Officers

compiled by Man Ken Cheung

Alpha Chi Sigma
Andrew Taylor - *President;* Ellen Bergstrom - *Vice President;* Brian Ottom - *M.C.*

American Nuclear Society
Steve Zinkle - *President;* David Dean - *Vice President;* Shari Farrens - *Secretary;* Lauri Loebel - *Treasurer.*

American Society of Agricultural Engineers
John Patterson - *President;* Kevin Torgerson - *Vice President;* Diane Ferrari - *Secretary;* Tom Sendelbach - *Treasurer;* Harvey Stieve - *Scribe;* Andy Seiber, Peter Breyer - *Ag. Student Council Representatives;* Tom Franti - *Sports Chairman;* Kris Krause, Scott Kelm - *Social Committee;* Tom Garvey - *Curriculum Advisor.*

Photo by Steve Salvo

Wisconsin Black Engineers Student Society
Front: Kattie Grant, *President;* Ed Mooney, *Correspondence;* Darita Reid, *Secretary.*
Back: Jefferey Williams, *Treasurer;* Carl Young, *Vice President.*

Photo by Steve Salvo

American Society of Agricultural Engineers
From left: John Patterson, *President;* Kevin Toryerson, *Vice President;* Diane Ferrari, *Secretary.*

American Society of Chemical Engineers
Mark Rounds - *President;* Debbie Larsen - *Vice President;* Tom Pulse - *Secretary;* Dale Schmidt - *Treasurer;* Kristen Scharf - *Program Director.*

American Society of Mechanical Engineers
Mary Ellen Renne - *President;* Mary Semrad - *Treasurer;* Carol Dexter - *Secretary;* Tom Hurrish and Ed Dzirbik - *Polygon Representative.*

Democratic Organization of Progressive Engineers and Scientists
Everybody is President of D.O.P.E.S.

Eta Kappa Nu
Norman Tiedman - *President.*

Institute of Electrical and Electronic Engineers
Glen Shires - *Chairperson;* John Bredesun - *Vice Chairperson;* Dan Chase - *Treasurer;* Sara Mattox - *Secretary.*

Kappa Eta Kappa
Joseph Muehlenkamp - *President;* Randy Kremske - *Vice President;* Dave McFarland - *Treasurer;* Bob Molde - *Secretary;* Gary Drexter - *Pledge Trainer;* John Chionchio - *Social Chair.*

Kappa Eta Kappa Photo by Steve Salvo
From left: Joseph Muehlenkamp, *President;* David McForland, *Treasurer;* Joseph Ruzos Jr., *Executive Board Member;* Gary Choncholas, *Exec. Board Member.*

Phi Ete Sigma
Dennis Tiedt - *President.*

American Nuclear Society Photo by Steve Salvo
Front: Shari Farrens, *Secretary;* Dave Dean, *V.P.;* Steve Zinkle, *President;* Lauri Loehel, *Treasurer.* **Back:** Jeff Sniegowski, *Governor;* John Mulvenna, *Governor;* George Penn, *Governor;* Bob Sindelar, *Public Relations.*

Pi Tau Sigma
Carol Dexter - *President.*

Theta Tau
Dennis Olson - *Regent;* Patti Bowen - *Vice President;* Laura Brins - *Scribe;* Bert Schultz - *Treasurer;* Dave Schultz - *Professional Development Chairperson.*

Triangle Fraternity
George J. Hensesky - *President;* Robert N. Rafson - *Vice President;* James A. Sanic - *Secretary;* David P. Barnas - *Treasurer.*

Wisconsin Black Engineers
Hattie Grant - *President.*

Society of Automotive Engineers
Dan Otis - *Vice President;* Keith Abraham - *Treasurer;* Greg Schwandt - *Secretary;* Mark Hoschuh - *Polygon Representative.*

Society of Manufacturing Engineers
Officer Candidates: Stuart Dobson, Mark DeVries, Shaw Ching Fens, James Issos, and Firouzrh Keshmiri.

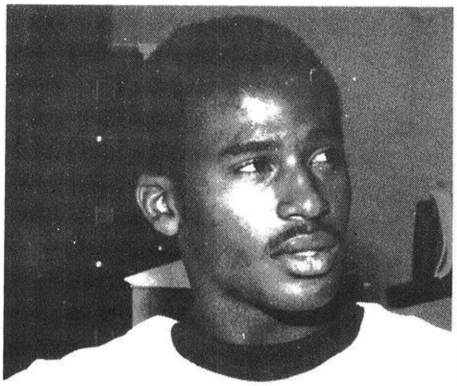
Society of Women Engineers
Cindy Vaessen - *President.*

American Society of Civil Engineers Photo by Steve Salvo
Front: Kristen Scharf, *Program Director;* Debbie Larsen, *Vice President;* Mark Rounds, *President.* **Back:** Tom Pulse, *Secretary;* Dale Schmidt, *Treasurer.*

"So, How Did Registration Go?"

by John Frohna

When 42,300 students, a record number, hit the registration lines, a lot of interesting things were sure to happen. For some students, registration went smoothly, without any hitches whatsoever. On the other hand, some people encountered what may be described as "minor problems." When John Frohna of the Engineer staff asked various registrants the question, "How did registration go?" he received many different and fascinating responses:

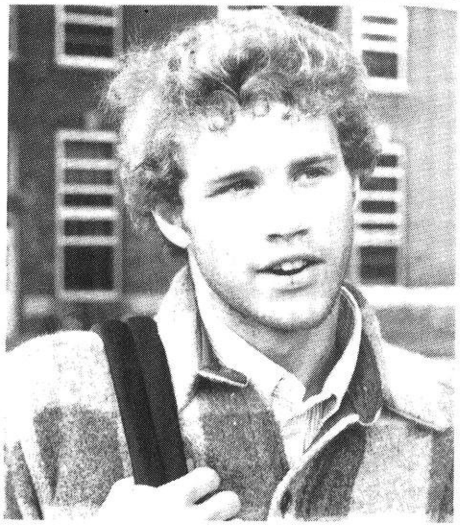


Senior Alphonse Perkins - "For me it went fine. Others had more of a problem. Many sections were closed and some classes were filled. □

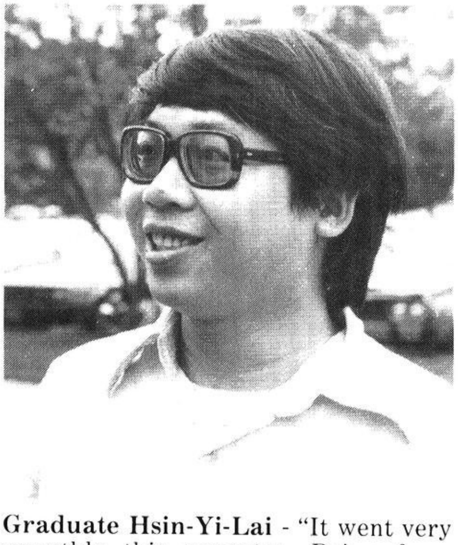
Sophomore Julie Brill - "It took me only 40 minutes. I got all of my classes. It was definitely easier than last time." □

Junior Cindie Jaworski - "I had a lot of help from the girls on my wing. It took a lot of running around. Everyone says that junior year is the easiest and that you get all the classes you want and I did." □

Senior trans. Jim Rupno - "It's a very unique system. Even though I haven't gone to school since 1974, I had taken courses at the University Extension in Menasha, so I registered as a senior. It was still worse than anything I have seen. I guess the hardest part was finding all the buildings." □



Freshman Scott Brown - "It was easy. I didn't get my original schedule but I moved some classes around and it worked. Calculus was tough, but it wasn't as bad as the horror stories I had heard." □



Graduate Hsin-Yi-Lai - "It went very smoothly this semester. Being from Taiwan, my first semester was much harder because of the language problem. □

John Frohna and photographer Steve Salvo took to the streets asking this eternal question and got the following responses. Both are freshman engineers and new members of the ***Wisconsin Engineer*** *staff.*

Freshman Tom George - "There were conflicts and I had to switch some classes. It was *worse* than everything I heard." □

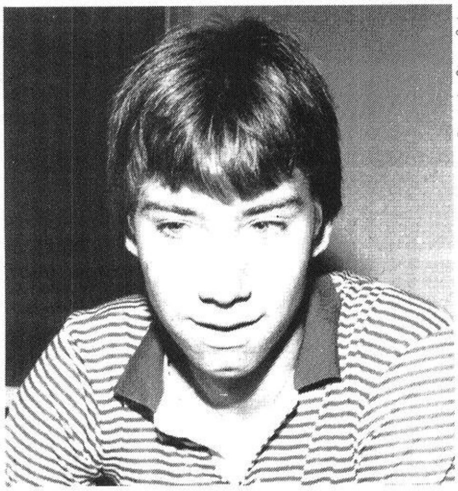


Photo by Steve Salvo

Who Insulates?

(cont. from page 25.)

tracing which runs longitudinally with the pipe. The steam tracing is 1/2" diameter stainless steel tubing attached to the pipe with metal strapping. The insulation material is placed over this. The steam tracing bends to fit around the body of the gate valve. It must, however, bypass the flanges. The tracing then pierces the insulation cover.

Extensive measurements are taken to accommodate the steam tracing. In most cases, a 2" cover is installed. A block of wood 2" thick attached to a thin piece of wood, commonly a ruler, is used to insure tangency when placing the "Rafsonometer" (named after the inventor, Robert Rafson.) The ruler butts up against the tracing and the point of tangency is marked on the flange. Then a circumferential measurement is made from a known point to the mark as one dimension. The second dimension is the distance from the flange into or out of the paper as shown.

Another impractical method was to use sheet metal protractors to obtain an azimuth reading. Unfortunately, this would require a different protractor for each flange diameter. Since a 66" diameter protractor (the maximum pipe size used) could be dangerous if dropped from a height, the idea was unanimously discarded.

Once pipe size, flange rating, overlap and steam tracing data is recorded and checked, a computer program converts the data to plan coordinates for laying out fabric. The final data for length, width and slit placement is given in simple x-y coordinates. After the cover is sewn, stuffed with insulation, checked and shipped, it is installed on the site.

Because of our country's free enterprise system, ITI was able to enter the market. Its product aids in producing another good, methane, at a reduced cost to the consumer so that we all benefit. A case study such as this helps motivate the student to obtain vital engineering skills. It also shows how proper application of these skills benefits all of society. □

Opportunity On Campus

The 1982-83 school year has finally begun and the College of Engineering is ready to offer a variety of activities to new and continuing engineering students. Student organizations are prominent and involvement can lead to increased awareness of a profession, a chance to learn about new advances in an area and maybe even make contacts for job possibilities. On the University of Wisconsin - Madison campus, the person to contact for information on each organization is:

Alpha Chi Sigma - Prof. E. Johansen Crosby
Alpha Sigma Mu - Prof. Carl R. Loper
American Foundrymen's Society - Prof. Carl R. Loper
American Institute of Aeronautics and Astronautics - Prof. T. C. Huang
American Institute of Chemical Engineers - Prof. Dale F. Fudd
American Institute of Industrial Engineers - Prof. Charles H. Falkner
American Nuclear Society - Prof. Michael L. Corradine
American Society of Agricultural Engineers - Prof. Gary D. Bubenzer
American Society of Civil Engineers - Prof. John A. Hoopes
American Society of Mechanical Engineers - Prof. William J. Feiereisen
American Society of Metals - Prof. Frank J. Worzala
Badger Amateur Radio Society - Prof. James B. Beyer
Chi Epsilon - Prof. Charles G. Salmon
Eta Kappa Nu - Prof. Donald W. Novotny
Institute of Electrical and Electronic Engineers - Prof. Allan K. Scidmore
I.E.E.E. Computer Society - Prof. S. Diane Smith
Institute of Transportation Engineers - Prof. Robert L. Smith
Kappa Eta Kappa - Richard A. Greiner
Mining Club (AIME) - Prof. Robert W. Heins
Pi Tau Sigma - Prof. Phillips S. Meyers
Polygon Engineering Council - Prof. James A. Marks
Society of Automotive Engineers - Prof. Gary L. Borman
Society of Women Engineers - Prof. Lois B. Greenfield
Student Chapter of Audio Engineering Society - Prof. Richard A. Greiner
Tau Beta Pi - Prof. Harmon Ray, Prof. David E. Foster and Prof. William E. Saul
Theta Tau - Prof. Gordon H. Robinson
Triangle Fraternity - Prof. John A. Hoopes
Wisconsin Black Engineering Student Society - Mr. Alfred L. Hampton
Wisconsin Society of Professional Engineers - Prof. George R. Sell

These organizations have much to offer the engineering student - so get involved! □

Water For Sale

(cont. from page 22.)

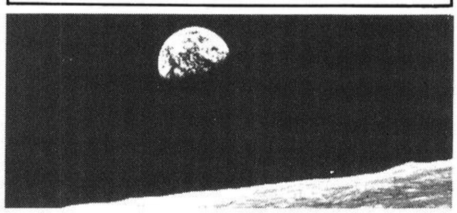
South Dakota project will ever become a physical reality. Many of the legalities remain unaddressed by existing laws. Consequently, policies made during this project could set environmental law precedents that could have a major effect upon our society. This project will never be completed unless a number of questions are resolved:

Does the State of South Dakota possess the right to sell water supplied by one of nature's rivers, stored in a reservoir built by the Corps of Engineers, and resting on a Native-American reservation? (This is no more out of line than it is for Milwaukee industries which are famous for pumping water out of the ground and selling it in cans nationwide.)

Will pipelines carrying either water or slurry be given the powers of eminent domain already enjoyed by private concerns who own railways, gas pipelines, and power lines? If not, coal slurry pipelines are dead since their shipping competition, the railroads, will never yield their tracks for them. If so, since coal is our most abundant national energy source, a coal slurry pipeline could conceivably criss-cross our nation some day.

The role of slurry pipelines in the accelerated development of coal reserves should also be considered. Increased mining of coal might not even be in our nation's best interests. Greater tracks of western land would be defaced, more acid-forming oxides would be released into the atmosphere, and eventually the owners of the coal pipeline might enjoy the same stranglehold on public utilities that natural gas pipeline companies have now. An additional environmental concern is the quality of the slurry water after the coal has been centrifuged out. Little is known about the constituent content of this water and less is known about possible treatment methods.

Professor James McDonald of the UW Law School speculates that it will take at least three and likely five years to work out these problems in Congress and the courts. The battle already began this summer in Washington, D.C. The State of Nebraska filed suit against South Dakota for the abridgement of its downstream rights to the Missouri River. Iowa Congressman Berkely Beddel has introduced legislation that prohibits states from selling water and gives Congress the final say on all coal slurry pipeline proposals. In his presentation on the floor, he summed up the most disturbing feature of the ESTI deal very nicely: "The South Dakota Sale encourages the fulfillment of short term economic interests over prudent water resource allocation." □



On a Clear Day

(cont. from page 20.)

DeLorean's narrative (the book is written in first person) shatters some illusions about corporate management. He complains that as a corporate vice-president, he was forced to waste his time on huge amounts of paperwork and boring meetings, many of which dealt with trivial material better handled on a lower level. He also abhorred the infighting among management which deteriorated corporate morale and eventually led him to resign. In general, DeLorean found that his duties as a vice-president were unsatisfying and unproductive.

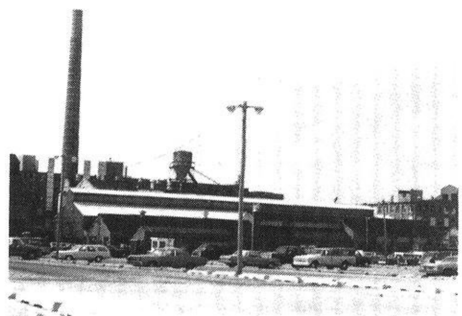


Photo by Fernando Perez

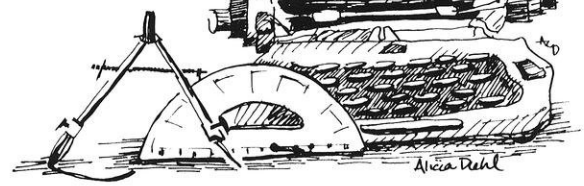
On a Clear Day is crammed with real-world dilemmas and solutions. Consider this scenario: DeLorean is an engineer at Pontiac, which produces cars whose major styling features are chrome "suspenders" on the hood, and whose performance excites only little old ladies. How can the division's image be changed? Another case involves DeLorean's promotion to Chevrolet, which has a huge share of the auto market, but whose operations are so complex that no one can control them. He is bombarded by managers with problems of every sort, from finance to engineering. He receives problem analyses which offer no solutions, while profitability and competiveness erode. How does he solve the problem?

These insights on engineering and corporate life make *On a Clear Day You Can See General Motors* a must for every engineering (and business) student. The book should be viewed less as an indictment of one particular corporation than as a critique of the corporate system in general. In any case, readers will find this book a thoroughly thought-provoking experience.

Note: *John DeLorean re-entered the auto business in the seventies to create his own car company. With the aid of the British government, DeLorean produced stainless steel, gull-wing sports cars in Northern Ireland. The company has had serious financial difficulties, and at latest report, the company's entire car inventory was seized by creditors.* □

Reviewed by David Eiche

Bits & Threads



A computer program developed at the University of Wisconsin may take some of the surprise out of sudden summer squalls and tornadoes. Called MCIDAS (for Man-Computer Interactive Data Access System), the program uses some fancy extrapolation techniques to help local storm watchers locate pockets of impending bad weather that are too small to be picked up by the national weather-monitoring systems. On a cloudless morning in Wisconsin recently it correctly predicted, six hours in advance, severe thunderstorms in the northern part of the state.—***TIME MAGAZINE***

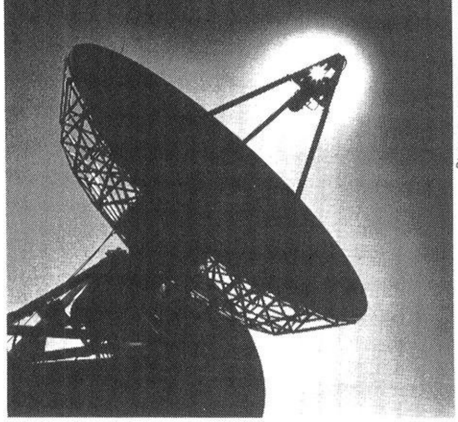


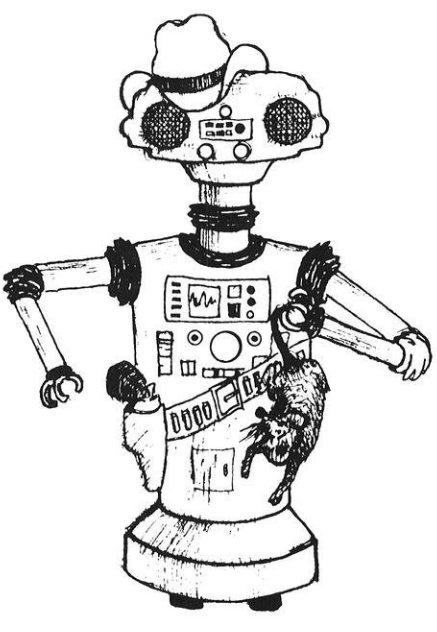
Photo by Norman Lindberg

The MCIDAS disk located on top of the Meteorology and Space Science Building.

Within months after passage of a solar access law in Wisconsin solar access got another boost in early July when the state Supreme Court ruled that a property owner has a right to claim access to sunlight for solar energy. In a 5 to 1 decision, the court said that obstruction of access to sunlight may qualify as a private nuisance, thus providing legal recourse for property owners whose solar access has been obstructed. □

The Space Tablet TM, the first three-dimensional spatial digitizer compatable with Apple II and IBM Personal Computers, incorporates many features of larger CAD systems at a fraction of the cost. Though the hardware/software package costs less than $600, creative financing is available to include fifth dimension capability to the system. □

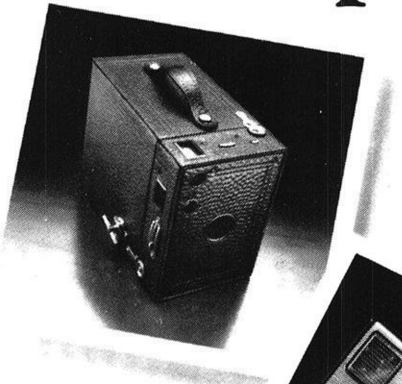

Wis. Eng. Photo

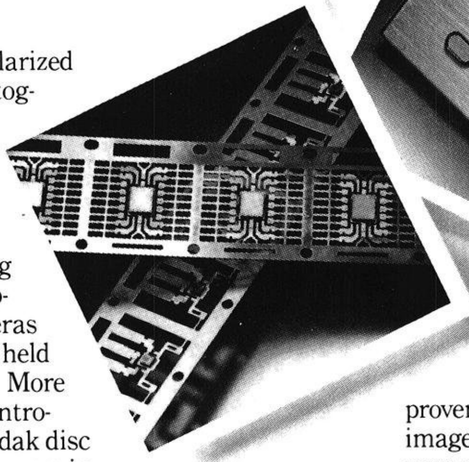


Scientists and entrepreneurs say the first intelligent mobile robots for business use should be on the market within two years. One possible function, the businessmen say, will be performing night-time security tasks for factories, warehouses, and museums.

Early roving robots will have to use most of their smarts figuring out where they're going and where they've been. Instead of having useful arms and legs, they'll get around on wheels, carrying little more than electronic sensors. But they will be able to detect people through walls and pick up certain sounds, like breaking glass. And they can be equipped with loud sirens to frighten intruders, or radio links to summon police or guards.—***WALL STREET JOURNAL***

Electronics at Kodak. Putting good things in small packages is one of our specialties.





Kodak popularized amateur photography when we mass-produced photographic dry plates, leading to the development of cameras that could be held in your hand. More recently, we introduced the Kodak disc camera—a camera in which integrated circuits make the decisions, automatically, at the touch of the shutter release.

Today, integrated electronic components designed and fabricated at Kodak are built into a wide variety of our cameras. But it takes more than the electronics in our cameras to place us among the nation's top companies in sales of electronics-related equipment.

It takes innovative engineers working on projects that use a microcomputer-based software development system to debug application programs for Kodak Ektaprint copier-duplicators. And the development of ongoing product improvements in the Kodak Komstar 300 micro-image processor, a computer peripheral which uses pulsed laser beams to convert digital data to alphanumeric images on microfilm, at speeds up to 20 times faster than many ink-jet paper printers.

If you're ready for the challenges in electronics you'll find at Kodak, see a Kodak recruiter on your campus.
Or send your resume to:
Personnel Resources,
Eastman Kodak Company,
Rochester, N.Y. 14650.

Kodak. The right place. The right time.

An equal opportunity employer manufacturing photographic products, fibers, plastics, chemicals, and electronic equipment. Plants in Rochester, N.Y.; Kingsport, Tenn.; Windsor, Colo.; Longview, Tex.; Columbia, S.C.; Batesville, Ark.; and a sales force all over the U.S.

I · F · Y · O · U · C · A · N · D · R · E · A · M · I · T · Y · O · U · C · A · N · D · O · I · T

Expand the mind of the microchip.

Remember when electronic calculators were considered a luxury? Well, consider this sign seen recently outside a gasoline station in Schenectady, New York: "Free calculator with an oil change."

That's just one sign of the enormous impact microchips have had on the way we do everything – from banking to game-playing.

But how will we use microchips that are smarter, faster, more reliable, and less expensive to design? How will these new microchips be used to improve systems, products, and processes? As one GE engineer puts it, "The sky's the limit!"

That sky is replete with a number of integrated circuit concepts that GE is applying right now.

There's the custom IC, a chip that performs highly specialized functions. Traditionally, creating this chip has been an expensive, time-consuming job. So we're working on ways to cut design time and cost.

We're using computer-aided design (CAD) to design and simulate chips right on computer screens. We're also developing gate arrays, a system that allows you to build inexpensive prototype chips that can be "played" in systems before the final design is fixed.

Another area that GE is developing is VLSI (Very Large Scale Integrated) circuits. These ICs will eventually squeeze one million transistors onto a single chip.

Where will all this super electronic power be applied? GE engineering manager Don Paterson sees it this way:

"At GE you can innovate from the system down to the chip to create...whatever ignites your imagination."

In other words, you can dream it...and do it.

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