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THIS MONTH

The *Wisconsin Engineer* this month was produced with the cooperation of Prof. James Fosdick's Journalism 517 class (Business Magazines and House Publications), and Prof. Hartley Howe's Journalism 306 class (Magazine Article Writing) in the School of Journalism and Mass Communication it the University at the University of Wisconsin. This month's interim staff is listed below.

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Planned Obsolescence

How Durable A Concept Is It?

by Warren Downs

It has been two years since an engineering student I know pocketed his slide rule, packed up his books, and walked out of an engineering school after hearing some lectures on "planned obsolescence." There may have been more to it than that, but he has been homesteading since then in the jungles of British Honduras, which is quite a transition for the son and partner of a Cincinnati plastics manufacturer.

For most of us, fleeing to Central America carries an argument too far. In fact, we might ask why planned obsolescence, which has served the economy in a variety of forms, has become, in some circles, so shabby and disreputable.

The answer is simple: to replace worn or obsolete goods uses up material resources, we are running out of resources, and the engineer is hastening the process.

At this point in history, it is difficult to believe that we must fear for our economic future. The United States, taking a quick jump on the Industrial Revolution, has unearthed a mountain of material wealth from a fallow continent. With a 4 per cent yearly growth in the economy, Americans today are processing a 35 per cent share of the world's resources.

By now our economy is virtually self-generating in its growth. As labor costs rise, engineering seeks to increase productivity and automate much of the work. This puts demands on more raw resources. Accumulated capital and unemployed workers seek new industries, which, once more, draw upon the world's capital and raw resources.

Critics describe the economy as a fast moving train, powerful and efficient. Scientists and technicians are at the controls. It travels beautifully, except that it keeps accelerating. For some passengers, it goes too fast to allow them to climb aboard; some want to get off or at least slow it down; still others wonder how fast they ultimately will have to go, and whether there will be enough fuel, air, and water to keep going.

Our Present Day Economy

The jargon "through-put" can be divided into three parts: input, processing and output. Consideration of these phases of manufacturing may suggest how the engineer manipulates growth in material wealth, and what his role may be in the future.

In **input,** the United States is self-sufficient in only 10 of the 36 most important industrial raw materials. We import the rest. Although industry will increasingly consume resources for the next 50 to 70 years, experts believe the pace will then slow down.

Raymond Ewell in *Chemical and Engineering News* (8/24/70) predicts that living standards will level off sooner, perhaps even decline within 20 or 30 years.

Processing requires enormous expenditures of energy. Wisconsin "consumes" twice as much electricity every 9.5 years. To date, this has required almost 50 dams on the Wisconsin River, and 164 hydroelectric and fossil fuel generators statewide.

Additionally, the state relies on nuclear reactors for 8 per cent of its electricity. (The national average is less than 2 per cent). By 1986, at least five projected new reactors, totaling 5800 MWe capacity, will supplement further fossil fuel installations.

Output is coming to signify more than manufactured goods. Senator Gaylord Nelson said in a 1970 Senate speech, "Progress American style — is adding up each year to 200 million tons of smoke and fumes, 7 million junked cars, 20 million tons of paper, 76 billion disposable containers, and tens of millions of sewage and industrial wastes." The senator estimated this to be five pounds of refuse a day for every man, woman, and child in the country.

Critics are beginning to see engineering as part of the problem of coping with our enffluence. In this view, engineering:

—wastes material by constructing buildings according to excessive safety specifications.

—wastes material by resorting to duplicate systems to bolster reliability of products.

—wastes energy by designing for electric space-heating and year-round air-conditioning.

—often designs commodities that break down sooner, in order to keep production costs low and keep repeat sales up.

—relies on fail-safe systems — perhaps rightly so in the case of engines such as airplane motors — but which still assume that resources are expendable.

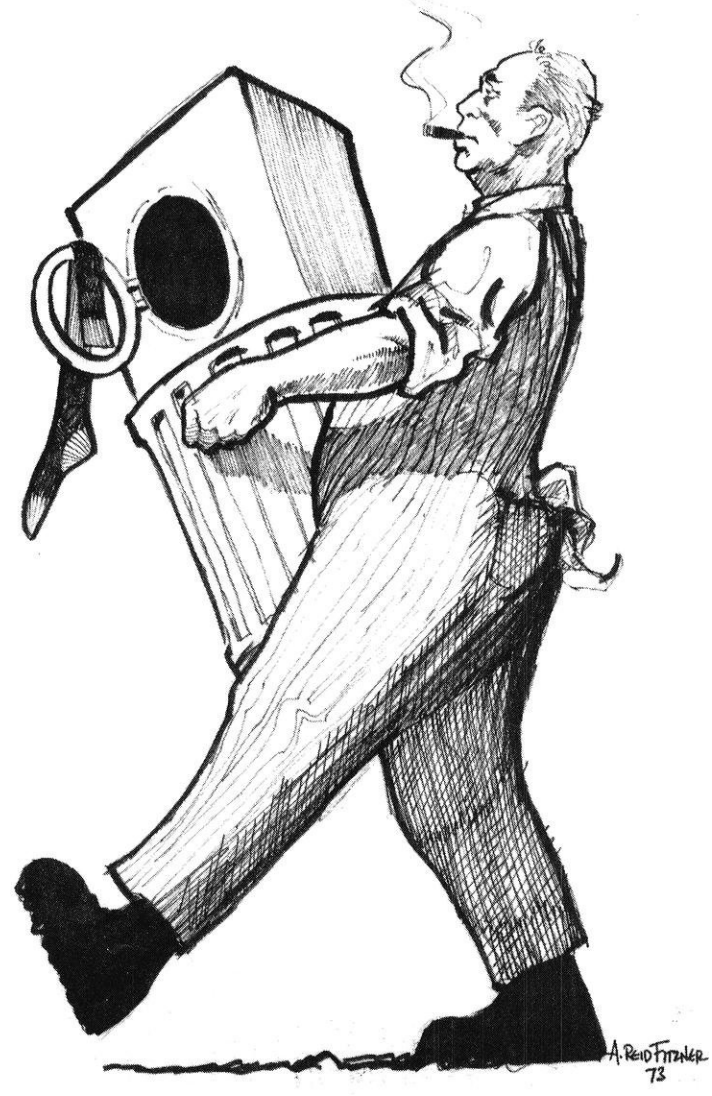
—designs TV sets and other items to allow easy repair by simply jettisoning whole unit parts.

—often adapts stylistic changes that attract buyers but do not provide genuine improvement on the article.

Is the educational system responding?

Although the educational system responds slowly to change, even the layman dipping into quality control text books can find some indication of change in attitude.

In the 1961 text of *Total Quality Control,* Armand V. Feigenbaum wrote, " 'Quality' does not mean 'best' in an absolute sense, but to Industry it means 'best for certain customer conditions.' "



However in the 1963 text of *Quality Control,* Bertrand L. Hansen supported the traditional engineering view when he wrote that there was ". . . no economic sense in designing one component to last for 1,000 hours when another that it is dependent upon cannot possibly last beyond 10 hours." Further, "it may be economically more feasible to manufacture two of an item than to try to make the one item near perfect."

"That is what is done by most manufacturers of consumer items," Hansen wrote. "They would rather manufacture quantities of components and replace free of charge than have a component which is guaranteed not to fail for a long period of time. The feeling here is that consumer tastes are such that there is no requirement for a long-lasting item."

Hansen's example was an interceptor missile that had 0.50 strike capability. By combining two such missiles the capability increased to 0.75.

By 1970, however, Elwood Kirkpatrick of Purdue University came close to endorsing a consumer/environmentalist view in resolving this paradox. Probing the sensitive interface between engineering and management, he wrote in *Quality Control for Managers and Engineers:*

"In addition to the uncertainties involved in estimating the market response to alternative quality-of-design levels, there is also the problem of influencing the customer regarding economic quality levels . . . of encouraging the consumer to pay an extra $50 for a $300 appliance so he can save $300 or more in service charges over the life of the appliance . . .

He continued, "Manufacturers are often concerned with minimizing sales costs in order to stay competitive. Indeed, he may even be looking to the replacement-parts business for necessary income to make a profit. A customer — if he knew the facts — would prefer to pay more at the outset for failure-free hardware. This is, of course, a business problem arising from the organization of our economy."

Quality vs. Reliability in Business Circles

An uneasy discourse about quality and reliability has surfaced at engineering conferences and in business publications.

In the 1971 Reliability Physics Symposium at Las Vegas, RCA's chief research engineer, Dr. James Hillier gave his views on planned obsolescence.

He said that it was better to promote a product built to last only five years at a lower price than a product built to last 10 years at double its price. This allowed for ready adoption of technological improvements.

To facilitate this, Hillier suggested that products could be sold on an actuarial basis for the useful life of the product. In fact, pre-failure replacement of a product would keep the customer happy and expand the market for the manufacture. In sum, this and other marketing practices would reflect "new and sophisticated ways of examining the nature of products and functions."

In this regard, Hillier believes that the consumer tends to misunderstand his material desires. "On the one hand, (the consumer) appears to expect the product he buys to last forever. On the other hand, he would find a world overflowing with petrified products too horrible to contemplate."

He concluded, therefore, that "what is the best 'value' for the customer is not necessarily that which is considered a 'superior product' in the purely conventional engineering sense."

However a growing band of economists, oriented to environmental realities, dispute these views.

Charles Cicchetti, a University of Wisconsin Visiting Professor of Economics, does not accept Hillier's premise that all things can be equal. He does not believe the cost of a 10 year product would be twice that of the five year product.

"If we want built-in obsolescence, then we will develop products that can be made with that built-in deterioration," Cicchetti said. "As an example you could make houses that might be replaced every five years, like cars. On the other hand, you could make houses to last considerably longer. The kind of research and techniques employed in either case, as you can guess, would be quite different."

He continued, "If you have a market which wants to replace its obsolete stock completely every five years, then the quality, materials, and research that goes into it is inevitably going to be directed to finding ways to make it cheaper and cheaper, and reducing the product life. But, if there are rewards and premiums for the longer-lived products, we would expect a whole different line of research and technology."

"From the environmental standpoint," Cicchetti says, "producers don't think of all the social costs, including the costs of extracting resource materials that can't last forever."

How is Wisconsin's College of Engineering Responding?

An outside observer can only speculate as to the academic approach the University of Wisconsin's College of Engineering takes toward quality control and reliability. Although there are stirrings to enlarge the environmental perspectives, these approaches remain specialized within the various engineering disciplines.

In the College Bulletin, Albert Einstein urges engineers never to lose a concern for man and his destiny. And the editors invite student engineers to make their dreams for a better world come true.

Despite these ideals, one faculty member states that no generally accepted code of ethics guides the engineer, and that most professors do not provide for discussions of national economic issues or policies that might bear on the engineering profession.

Whatever, the formative nature of their schooling, quality control engineers are rising today to positions of executive influence. According to *Dun's Report*, December 1972, engineers as John L. Kidwell at National Cash Register, Philip B. Crosby at International Telephone and Telegraph, Phil I. Harr at General Dynamics, John E. Condon at Abott Laboratories, Donald Meek at Pillsbury Company, and John J. McAllister at General Electric are included.

This up-grading of quality control recognizes — among other things—that the cost of reworking faculty parts is 2 per cent of the sales dollar, or about $13.9 billion a year for U.S. industry. Also, that liability cases related to product failure were minimal 20 years ago, but now amount to some 500,000 cases a year. And the cost today in settling such claims has increased nearly six-fold.

Thomas R. Reid, executive of the Ford Motor Company, told a 1970 convention of automotive quality control engineers that their profession must meet this rising demand for higher quality. To fail would create a crisis in public confidence, and invite government intervention.

"More people wanting more things, to paraphrase a point recently made at Harvard by Henry Ford II, eventually means more junk," Reid said. "And junk in the air, in the water, and on the land is a threat to the quality of life, if not to its continued existence. Or, as President Nixon said in his State of the Union Address, 'Never has a Nation seemed to have had more and enjoyed it less' ".

In the United States we will better accept the fact of diminishing resources if we can take satisfaction in durable possessions. In a steady economy, we will promote the reliability control engineer who is like Stradivarius — designing and building violins always at the latest state of the art and for all time.

The Electronics of 'Odyssey'

by Leah Staats

The small square of light speeds back and forth across the screen, traversing a dark bar which represents the net.

Two players manipulate control units—they stare intently at the screen as the squares of light which represent the controls dodge up, down and sideways across the court, trying to intercept the light "ball".

This is tennis the electronic way. No need to leave the confines of your living room to enjoy it—it all happens on your television screen. All you need is a TV set and a $100 game manufactured by the Magnovox Company known as "Odyssey."

Tennis is one of 12 basic Odyssey games, which include hockey, football, ski, roulette and submarine. Different games are created by applying an overlay to the TV screen; the overlays depict a tennis court, a football field and other playing areas. One game, "States", utilizes a colored map of the United States.

Game accesories come with each game. Such accessories include card decks, dice and a game board. For example, the football game is played with a game overlay, a board field, a stadium scoreboard, a football token, a yardage market and four decks of cards. The tennis game, on the other hand, has no game accessories—all that is needed is the tennis overlay.

With each of the games, the television screen acts as an electronic game simulator. The Odyssey equipment consists of a master control unit, two player control units, and six printed circuit game cards. Each different game is programmed by a certain card, which is placed in the master control unit.

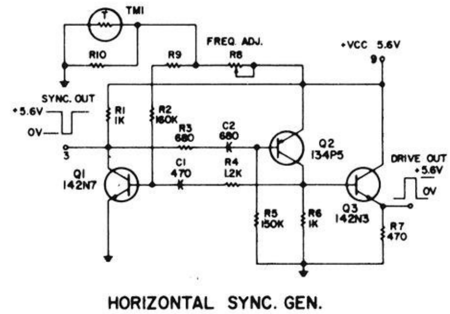
When the card is in place in the master control unit, Odyssey generates a radio frequency to the television set, on either Channel 3 or 4. The sweep signals within the set are synchronized to the external signals generated by Odyssey. The sweep signals affect the magnetic yoke which encircles the electronic beam inside the set; the yoke produces a field that causes the beam to move back and forth. Thus, the Odyssey printed circuit cards control the image on the TV screen.

This is the basic way that Odyssey works. More technical information is provided by Gordon Allison Jr. of the Magnavox Company.

* * *

Sync Generator

"To provide the synchronization signal for the TV receiver, two complementary astable multivibrators produce positive and negative going 5.6 V pulses. The horizontal and vertical sync pulses are adjusted for five microseconds and 400 microseconds, respectively. Thermistor comprensation has been added for temperature stablility to hold the frequency tolerances of ±70 Hz and ±1 Hz. The sync generator operation may be seen in Figure 2.



HORIZONTAL SYNC. GEN.

Figure Two

Initially in this diagram Q1 and Q2 are off. C1 is first charged through the frequency adjust potentiometer, then R2, R4, and R6 to ground. When the charge on C1 is large enough, Q1 turns on and C2 charges through the path of Q2, R3, and Q1, turning on Q2 until C2 reaches a sufficiently positive voltage to turn off Q2. Q2's collector returns to ground potential to allow C1 to begin charging for the next pulse. Thus, the sync generator transistors are only drawing large currents simultaneously on a very small duty cycle basis. Figure 3.

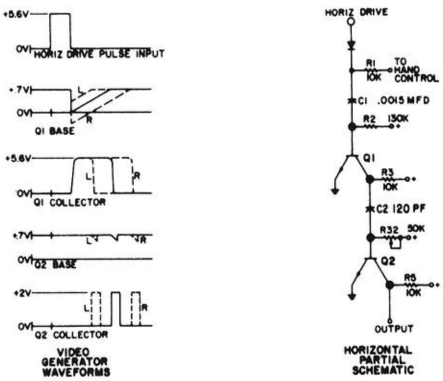


Figure Three

Video generators

Four identical video generators each consist of vertical and horizontal sections operating as voltage controlled delay one-shots having their outputs wire-AND'd together. The wall or net is produced with the video generator horizontal section only. An external potentiometer is provided on the master control unit for limited centering corrections of the wall or net on the individual TV receiver. The variable delay voltage is derived from vertical and horizontal poteniometers in each player hand control. Referring to Figure 3, waveforms and a partial schematic are shown with time constants set for the horizontal section of a video generator. In operation, the positive going drive pulse is coupled through a diode to capacitor C1. As the pulse transitions to ground, Q1 is turned off for a length of time depending upon the time constant of R2, C1 and the D.C. voltage applied through R1. Transistor Q2 is turned off for a period of time depending upon the time constant C2-R32. A tap is made in the collector load resistor common to the collectors of both output transistors of the delay one-shots for an SCR crowbar discussed later.

Summation matrix

The summation matrix combines all four video inputs with a diode OR gate. Sync is resistively added to the gate output to form ≈1 Vpp composite video for the modulator diode. Two switching diodes driven by the sync generators blank the video inputs to remove the possibility of an off-screen generator pulse cancelling out the sync. Figure 4.

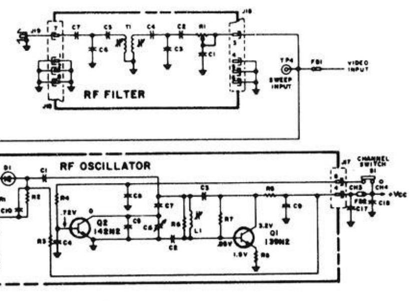


Figure Four

R.F. section

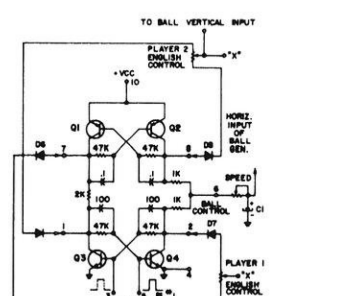
Figure 4 shows the diode modulator and RF oscillator used for generating the Channel 3 or Channel 4 RF television signal. Q1 forms a standard Colpitts oscillator modified by the addition of switch transistor Q2. When +Vcc is applied to the base of Q2, the collector to emitter impedance is low and shunts C6. In this condition, L1, C7, and C2 determine the Channel 3 frequency of the RF signal. With Q2 open, L1, C7, C6 and C2 form the frequency determining network and Channel 4 carrier is produced. Temperature compensating components hold frequency drift to less than 50 KHz over the 20°C. to 50°C. range.

The modulated RF signal present at TP4 in Figure 4 above is applied to an overcoupled double-tuned bandpass filter with peak responses set at 61.25 MHz and 67.25 MHz. Circuit values give a 50Ω RF output at J19. R1 adjusts RF output to 800μv.

Flip-flops

Simple diode resistor AND gates driven from the video generators supply the set and reset pulses for the flip-flop. To control the horizontal motion of the ball, a complementary RS flip-flop is employed. An RC network integrates the Q output to provide the horizontal control voltage for the ball video generator. The resistor is externally adjustable for ball speed control.

Referring to figure 5, let's assume Q1 and Q4 are on. Pin 6 is "low" and causes the electrolytic C1 to discharge, causing the ball to move from the left to the right side of the TV screen. When the ball and player 2 contact, a positive pulse from the gate matrix appears at pin 3 turning Q2 and Q3 on. Pin 6 is now at a positive potential and the electrolytic charges, thus moving the ball from the right to the left side of the screen.



ENGLISH F-F

Figure Five

"English"

A signal must be derived for controlling the vertical movement of the ball as it makes each traverse of the screen. This is accomplished by "English" controls tied to the outputs of the ball control flip-flop. Ball English control potentiometer arms are tied together to the ball vertical positioning input. This voltage is also integrated by the stepped RC network. When Q1 and Q4 are on as illustrated above, D6 and D7 conduct, allowing current to flow through the Player 1 English control. This gives Player 1 vertical control of the ball movement. When Player 2 intercepts the ball, Q2 and Q3 are on, allowing D5 and D8 to conduct, applying voltage to Player 2 English control.

Controls

Both hand controls are identical and contain a reset pushbutton switch in addition to the paddle position and "ball" English controls. Odyssey's projected life span require the potentiometers to last 100,000 cycles of rotation and the pushbutton switch must survive a minimum of 30,000 activations, while maintaining acceptable electrical performance.

Naturally if both buttons are depressed simultaneously, the RS flip-flops enter the indeterminant state ("hang-up") and one reset must be depressed again to clear the flip-flop.

Odyssey contains a second flip-flop to control the horizontal motion of the ball while the first activates the "English" function. This is necessary when the ball control does not synchronize with the English control as in the case of handball. The program card automatically offsets the wall to screen left and widens it to ensure that the ball bounces back toward the playing court. Both players must be on the right side of the screen. Should the gate pulse fail in resetting the ball control flip-flop and allow the ball to penetrate the wall, Player 2 reset will return the ball to the playing court. Player 1 serves the ball first and can utilize his English control until Player 2 intercepts the ball after wall contact bounces it back into the playing court. Ball motion is then reversed and Player 2 has English control while the ball moves to the wall and back to the point where Player 1 intercepts it."

* * *

This complex, sophisticated game has been on the market since December. So far, sales have been encouraging, according to McCormick TV, the Madison distributor. Apparently there is a substantial number of people in the United States who are truly "arm chair athletes." Odyssey is a new development in the leisure time market; future possibilities are endless.

EXPO '73 Award Winners

Large Group overall Best Exhibit
- First—ASAE, David Gallenberg $100
- Second—Cerebral Palsey, Andrew Volk $75
- Third—ME 437 (Gary Baumgarten) $50

Large Group Best Presentation
- First—SAE (Dan Kapellen) $75
- Second—AFS William McRoberts $50
- Third—SAE (Dan Kapellen) $25

Small Group Overall Best Exhibit
- First—Richard Straub $100
- Second—Geo. Roman $75
- Third—Eugene Ionescu $50
- Fourth—John Ekerdt $25
- Fourth—Duane Lom $25
- Honorable Mention— $15
  - Al Taffel
  - Russ Fisher
  - Brian Robinson

Small Group Best Presentation
- First—Amr Baz $50
- Second—Martin Mastenbrook $25
- Third—Jim Feldbruegge $15

Best Originality
- First—Less Rusche $50
- Second—Dipanker Dasgupta $25
- Third—Jim Pertzborn $15

Chairman—Student Exhibits,
Dennis Bachelder

EXPO '73

Thousands of spectators filed through the corridors of the Engineering buildings April 6-8, marveling at more than 100 exhibits on display during the 1973 Engineering EXPO.

The exposition featured exhibits of all sizes, designs, and complexities.

Attendance throughout the show was sporadic, as most spectators came at rush hours on Friday and Sunday. An anticipated mass rush on Friday, April 6, consisted of hordes of high school groups making their way through the maze of rooms and hallways.

A disappointing low turnout on Saturday was followed by a surprising crowd of students and families on Sunday, April 8, despite the bad weather.

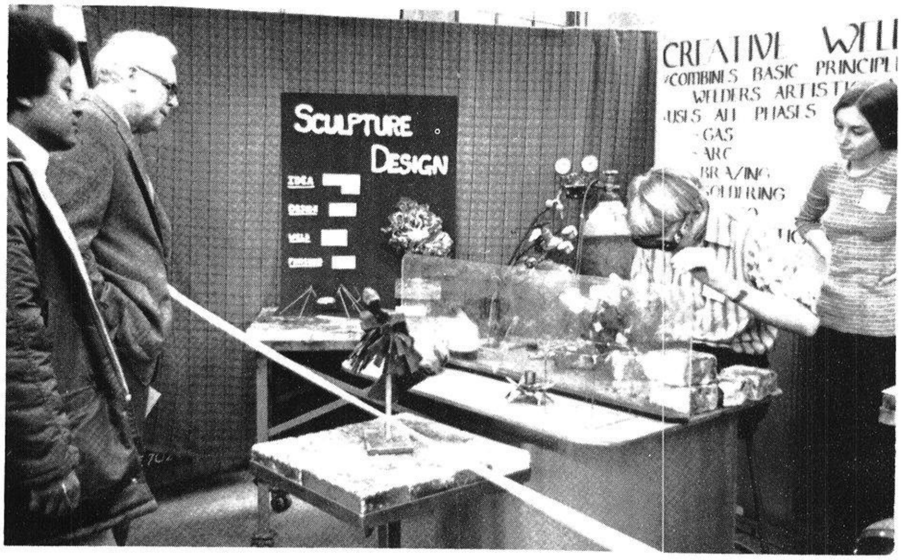
The theme of the exposition was "Engineers: Transforming The Hope of Today Into The Reality of Tomorrow," inspiring exhibits in the fields of biomedical enginering, computer science, environmental engineering, and many other disciplines of engineering.

Many of the exhibits of the position demonstrated fundamental scientific principles and phenomena, while others showed specific applications of engineering knowledge in solving the needs of humanity. Some examples were: the safe car restraints for children, an electronic communicator for the handicapped, and a cryogenic recycling exhibit. Many offered audience participation, notably the welding exhibit and the "computer crap game". There was even an exhibit demonstrating creative welding techniques.

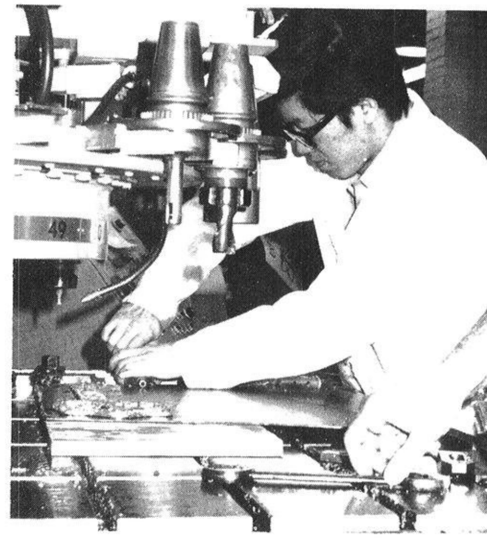
Dennis Gauthier demonstrates computer programming

Steve Meiley, M&ME-4, Casts Pewter Spoons

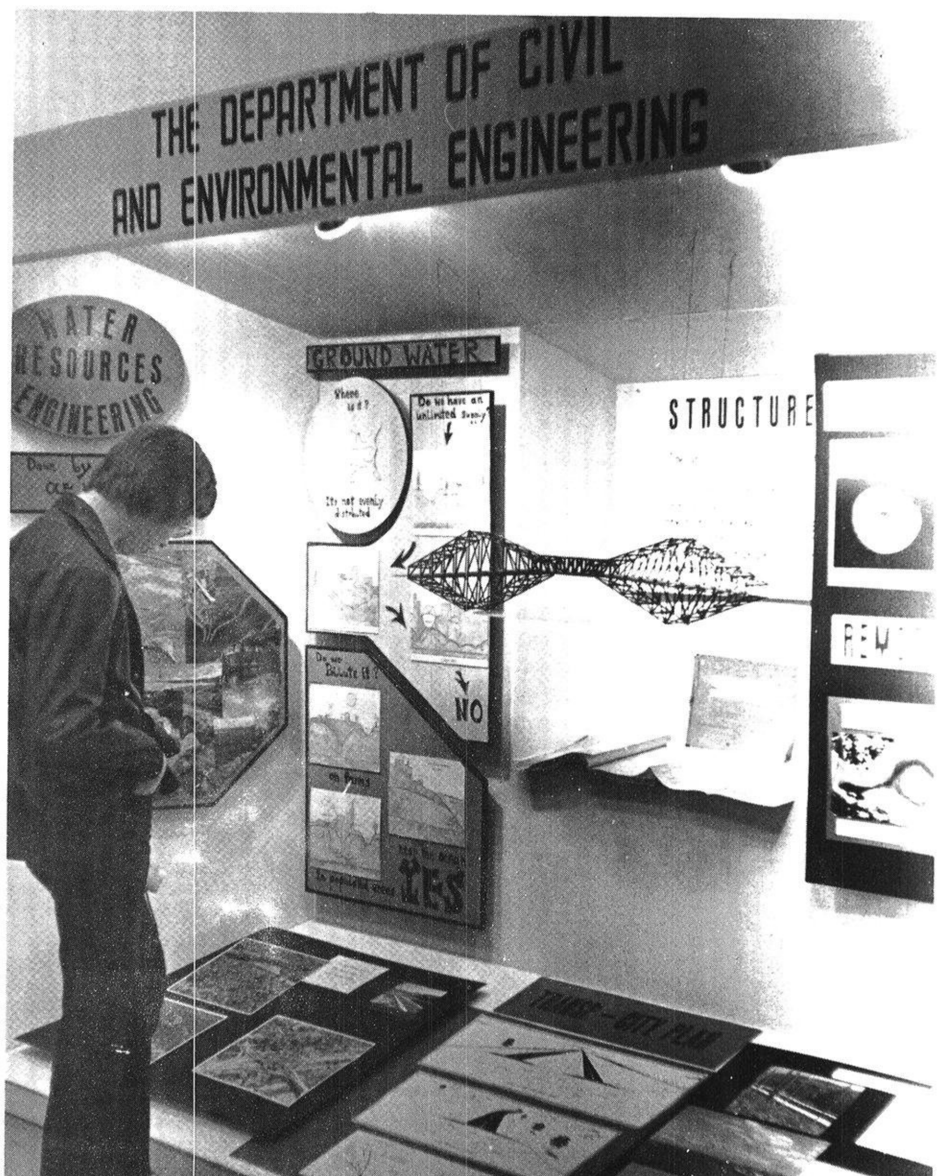
Cryogenic recycling shown by Gary Wegner.



Creative welding intrigues visitors.



Aun Poo, PhD Candidate in ME, uses computer-controlled tools.



Credit — Photo by Jim Erven

"And every one who hears these words of mine and does not do them will be like a foolish man who built his house upon the sand; and the rain fell, and the floods came, and the winds blew and beat against that house, and it fell; and great was the fall of it." Matthew 7. 26-27

Lakeshore Homeowners: —How Safe Is Your Home?

by Molly Fifield

Despite this ancient observation of the natural phenomenon called erosion, with its effects upon man-made structures, there are those today who desire to live as close to a lake, river, or ocean, as they can possibly get. Often they shop for a house on a calm, sunny day, exclaim over the marvelous view, and plunk down a large sum of money for it. The irony appears in the fall or spring when the wind, rain and waves erase the bluff beneath the foundation or bring a river into the living room.

Houses are falling in the water all around the Great Lakes. Typically newspapers and network news shows have covered the shore-erosion "problem" with such banner headlines as "Man vs. Nature: How can you stop lake erosion?" One of the basic assumptions in modern American society seems to be that technology is the panecea for almost everything—even to the point of stopping natural processes that have been going on since time began.

Actually, the Great Lakes are relatively young, geologically. They took their present form and outlets only about 5,000 years ago. They are still in the process of rapid geologic change and their shorelines have not yet reached an equilibrium that older systems might have developed. The U.S. Army Corps of Engineers reports that rapidly eroding bluffs and upland areas are common, especially where shores are exposed to prevailing winds and waves.

In addition, the water level varies from year to year within a range of 4 to 8 feet for the different lakes. Storms and prevailing winds can pile up water at one end of a lake over a short period of time, raising the level as much as 8 to 10 feet above the average. These short and long term variations can combine for severe erosion and inundation effects. Storms and high lake levels in recent years, have eroded part of the southern shore of Lake Michigan as much as 150 feet inland in parts of Indiana. These high water levels of recent years are a direct result of above average precipitation over the Great Lakes.

Man has affected, and is in turn effected by, these natural processes. Man-made structures and landfills alter currents along shorelines, blocking the movement of sand which causes deposition on the up-current side of a structure, and erosion on the down-current side.

A federal breakwater for a harbor at Michigan City, Indiana, is largely responsible for the severe erosion along the Indiana shore including the beaches at the newly-formed Indiana Dunes National Lakeshore.

Several homes had to be evacuated along the Indiana shore, and over four blocks of a lake-front road have collapsed. Nearly 20 homes continue to be threatened by waves from spring storms. It will cost almost $3 million to create a 3 mile sand and stone revetment and replenish the beach sand in an effort to save remaining homes and beaches of the National Lakeshore.

As man encroaches on lakeshore areas, he causes increasing economic loss. Beaches and dunes provide natural barriers for absorbing the energy of waves and provide protection during storms. But many of these areas have been leveled for real estate developments.

In 1951-52, damage along the shores of the Great Lakes due to high water level and severe storms amounted to $61 million, according to the Corps of Engineers. The Corps estimates that a recurrence of the storms would cause $120 million worth of damage today, not including those developments constructed since 1951.

Out of a total of 3,679 miles of shoreline in the Great Lakes, the Corps estimates that about 215 miles of shoreline "has critical erosion where the loss of land, economic loss, and other considerations appear to justify protective measures". Also, over a third of the shoreline is subject to significant erosion.

Various engineering techniques are available for the protection of the shoreline for use in the public interest. Breakwaters and jetties provide protection for harbors and aid navigation. However, they have their disadvantages too. Breakwaters and jetties while providing protection, also stop the flow of sand and interrupt currents. Refinements have been made to create permeable breakwaters or to provide hydraulic pumping of sand to the down-current side. Optimum protection is provided by coodinated action over long stretches of beach.

According to the Corps, research has shown that those engineering techniques most similar to natural protection are the most effective. Dunes and beaches are rebuilt artifically to predetermined dimensions for the best natural protection.

Engineering techniques, while essential along shores already developed, do not provide the total solution to shoreline problems. **Perhaps even more necessary is the management of land use and control over the various public uses of the shore area.**

According to the Corps survey, forestry and agricultural uses of the shoreline gave way to urban demands. Even the shores of Lake Superior are 30 per cent urbanized. **If the urbanization rate continues, most of the Great Lakes' shoreline would be urbanized by 2020.** Various governments are beginning to recognize the potential consequences of development on such a massive scale and its possible economic and environmental ramifications.

The state of Wisconsin has 619 miles of Great Lakes shoreland. Of these, 289 miles sustain erosion, 39 miles of which is critical. It would cost about $25 million to protect those 39 miles. The 1965 Wisconsin Water Resources Act, and the more recent Shoreland Protection Ordinance should help to reduce damage to new structures from erosion and flooding.

Counties are required to enact shoreland zoning ordinances under State guidelines for unincorporated areas. Zoning ordinances vary somewhat from county to county, but in general they establish setback requirements for buildings which are measured from the highest known water level along the shore. They also provide for the establishment of conservancy districts to protect areas which enhance animal or aquatic life. These ordinances would need to be strictly enforced by the individual counties to be effective.

The State of Michigan contains 2,900 miles of Great Lakes coastline over a third of which is highly erodible. The State has been increasing its planning and management of shoreland areas. Emphasis is placed on preserving fish and wildlife areas, minimizing shore erosion damage, and decreasing conflicts of use.

The State will designate areas of high risk and environmental areas necessary for the preservation and maintenance of fish and wildlife habitats. Local governments are expected to zone the areas in a manner compatible to these designations within three years. The areas for zoning are confined to 1,000 feet inland from the ordinary high water mark.

Other than zoning of shorelands, governments could purchase areas; obtain scenic easements to provide more public recreation areas; or negotiate long-term purchases. Property taxes could be tied to actual, rather than potential use, decreasing the pressure for development. Finally, the right of eminent domain could be exercised to acquire property by condemnation at a negotiated price.

In order for any shoreline protection technique to be effective, local citizens and taxpayers must understand the principles involved. Engineers can be at the forefront in finding solutions to shoreland problems. They can develop and implement the optimum techniques to affect the physical interface between land and water. With knowledge of the relationship between man and his environment they can have great influence on government policy and public acceptance of technological or management decisions.

It is no longer sufficient to know how to build a good breakwater. The engineer must know how the structure he builds affects the natural environment, and be aware of the ramifications it has on the social environment. Paving the shores of the Great Lakes with cement is not a viable solution.

The Do's And Don'ts of Consulting

by Jim Jerving

Seeking a "unique interplay of the government, industry, and academic community," the University of Wisconsin permits professors to offer outside consulting.

Chapter 10c of the "Laws and Regulations governing the University of Wisconsin" requires professors engaging in outside activities to "report in writing the nature and scope of such activities to the chairman of his department and to the appropriate dean or director . . . university facilities shall not be used by staff members for outside activities of a commercial character without previous arrangements with the appropriate authorities."

The School of Engineering has no written rules concerning consulting, but two criteria exist, according to Associate Dean Robert Ratner.

- Consulting can be done one day a week, and it cannot interfere with work.
- Non-attendance in class or committee meetings would be considered interference with one's work.

The Industrial Relations faculty, which includes labor mediation and arbitration, is often called upon to consult. Ron Kent, a graduate student in Industrial Relations, said, "We are subsidizing the professor's entrepreneurial activities. The state and the people are paying professors to do research and teach, not consult." Kent said that consulting often interfered with student learning, and adequate numbers of consulting firms exist to handle industry's needs.

Why does industry come to the university if consulting firms can serve the need?

Professor William C. Boyle of Civil Engineering said the reason a professor offers consulting is that technical expertise is not available anywhere else. In addition to full-time teaching duties, Boyle has his own consulting firm that deals with water pollution and the construction of sanitary facilities.

"I don't think it's proper for a staff member to provide a service that is now being offered. Hopefully most of us are consulting in an area where there is little expertise." Boyle said.

Boyle actively supports consulting as a classroom help. "We have to teach engineers in the context of today's problems. I try to use applications from my consulting and research in the classroom," Boyle said.

Dean Ratner, who has worked as a consultant, said industry seeks the expert advice of a university professor, "presumably to receive an independent objective evaluation." For the same reason a university professor might be asked to be an expert witness in a law suit.

While there are no written rules limiting the amount of time a professor may consult, Dean Ratner said that he doubts that more than 2 per cent of the engineering faculty consult more than 10 days a year. One engineering professor said, "The man who consults 25 days a year is extraordinary."

Consulting problems for the School of Engineering in the past included a request from a local restaurant to solve leaking pipes and a request from one of the world's largest corporations to find the cause of a fractured pump piece. The leaking pipes were solved at no cost to the restaurant, but that was an exception.

Consulting is a lucrative business. Consultants have been known to make up to $1000 a day, or as 'little' as $80 a day. As in industry, high consultant fees are awarded to those with special knowledge, gathered from years of research.

Professor Alton C. Johnson of the School of Commerce said that industry seeks knowledge of anticipated trends and changes. Johnson added that in any professional school a professor brings in his own experience.

"Would you prefer to listen to a professor who says go to the textbook for the answer, or to a professor who can give his own experience?"

Consulting has evolved greatly from the days of the Roosevelt era when "brain trusts" were called to Washington. Its continued evolution, like that of science, will bring the scholar in closer contact with the rest of society.

Women In

by
Christy Brooks
and
Heidi Holler

(Editor's note: It can almost go without saying that women today are active in vocations and avocations previously placed "permanently" off-bounds to them.

In presenting this article, the ***Wisconsin Engineer*** *wishes to spotlight a rather small but vital segment of engineering students.)*

* * *

The University of Wisconsin-Madison College of Engineering, like others across the country, has a problem women's liberation may help solve. The problem is shrinking enrollment.

In September, 1965, there were 736 freshmen in the College of Engineering undergraduate student body of 2,456.

Last fall, of 1,913 engineering undergraduates, 348 were freshman—and only 23 were women.

Nonchalance within engineering faculties over the scarcity of women in their classes and among their peers is changing to concern, for women represent an almost untapped pool of potential engineering students: last spring, United States' school of engineering averaged out to be .82 per cent female.

But steering women to the engineering campus isn't easy, says engineering education Prof. Lois Greenfield, lone woman on the UW-Madison College of Engineering faculty. She says the steering-away process begins early.

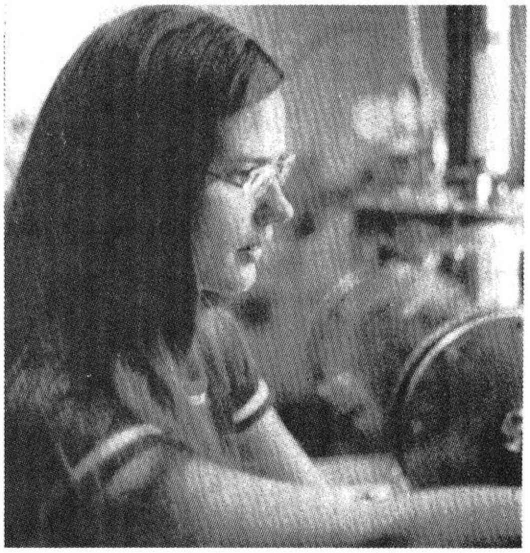
"In our society, little girls are given dolls to play with, not erector sets," she noted. Young women who excel in math or science in high school meet with, 'Aha! You should be a nurse!' or 'Aha! You should be a science teacher,' It's always the traditional roles. Often counselors never consider the prospect of engineering."

Jean Fox, a freshman in electrical engineering at the University, said her counselors and her father had the same attitude.

"I like math, and my counselors said, 'Be a nurse or a teacher. My parents were wary, too. My father wanted me to be a teacher." Jean's father is an electrical engineer.

"I knew it would be difficult, and I'd have to fight a little to get into it, but it's worth it," Jean added.

The UW engineering faculty seeks to attract freshmen by means of an informal outreach program in state high schools. However, the professors who speak before bleachers of students are usually men.



Joan Etzweiler, Nuclear Engineering Student

"I don't think we know how to present our work properly for girls," mused Associated Dean John L. Asmuth. Professor George Maxwell of the Metallurgy Department added that, while he may often have more girls than boys speak to him after his recruiting program in high schools, very few of them enter engineering.

Engineering

"Role models," (women other women copy) for would-be engineers are hard to come by. Hiring women to fill faculty positions in the College of Engineering would be desirable," Asmuth said. But parsimonious budget-makers aren't likely to be impressed by pleas for more professors to teach declining numbers of engineering students.

Then, too, there's no glut of women engineering professors to hire.

If a woman were determined to find reasons not to go into engineering, she could. "Current myth has it that the half-life of an engineer—the time it takes for half of what he learned in school to become obsolete—is from five to ten years," Prof. Greenfield said.

"That means a woman who's serious about her profession can't take a complete time-out for five to 10 years while she gets her family started. She has to look at the possibilities of continuing in a professional role at least part-time while her children are young."

Joan Etzweiler, a graduate student in nuclear engineering at the University, agreed that combining engineering and a family, "is a tricky question."

"When it comes right down to the practical details, it's hard to raise children and know how to divide the work load. Hiring someone else to care for your children—well, I think that's making someone else a slave. But as far as giving up my career for 5-15 years, I just don't know if I'm willing to do that," Joan said.

Updating engineering knowledge will be imperative for male enginers as well as women engineers in the future. "Technical renewal is becoming painfully necessary," said Dean Asmuth. "I think engineering is going to face the re-training problems for engineers of both sexes, at about the same time."

If that's one move in the right direction, the engineering field has plenty of other inviting aspects especially directed toward women.

According to the Women's Bureau in the U.S. Department of Labor, engineering offers equal pay and equal opportunity. They say that salaries are tops, and that women graduating from college in 1970 with a bachelor's degree in engineering were offered salaries averaging $10,128 per year.

Their report also mentions that two-thirds as many women as men have shown aptitude in the engineering field. They add that, while there are problems managing family life with engineering careers, seven or eight of every 10 women engineers do have families.

Foreground: Cheryl Brandt, CHE-4
Background: Kathy Ernest, CHE-3

Many of the women engineering students at the University agree with these facts. None that spoke with the *Wisconsin Engineer* felt that there was overt discrimination in their departments, that they would have difficult times finding jobs, or that they would ever have problems establishing their own identities as engineers equal to men.

"I'm usually the only woman in my classes, but I get the same attention from the professors that everyone gets. In fact, I'm probably treated nicer by the professors ,and as far as our relation to the men in the classes—well, I guess I'm 'one of the gang,'" Liesel Geyer said. Liesel is a senior in civil engineering who transferred to engineering after two years of vacillating among the math, physics, and philosophy departments.

"I talked to a professor in engineering here, and he more or less suggested that if I could maintain my work level, engineering would be a really good field—it's a field responding to women," Liesel added.

Kathy Ernest, a junior in chemical engineering, said, "My father told me to try chemical engineering—then I could go anywhere. I'm going to specialize in chemical sanitary engineering — a combination of chemical, civil and environmental engineering, and that's a job area that needs people."

Alicia Butcher, a graduate student in nuclear engineering, maintained, "I don't think there is any consciously directed sexism here, but I wouldn't be sure about subconsciously. Sometimes discrimination works toward our benefit because the men feel guilty."

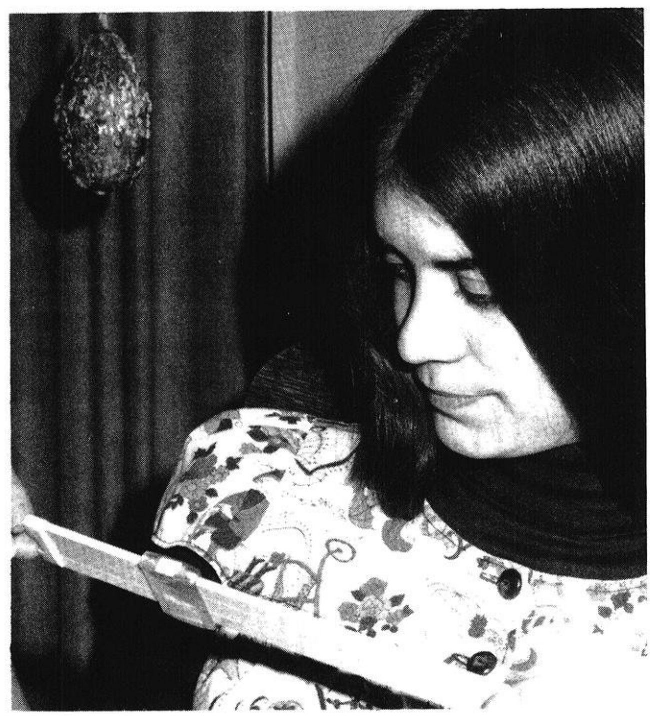
"I've had no problem in my classes with discrimination. After all, I've been with the same guys for three years," she said.

Although she is interested in Ph.D. work and future research in nuclear fusion Alicia has had several job offers without any searching on her part.

"I had two offers this year that appeared out of nowhere. Someone was looking for a token woman to teach mechanical design, and another school in New York wanted me as a faculty member. I had to say, 'Number one: I'm not in your field, and number two: I'm not even ready.' Although I'm not looking for jobs, there seems to be a very open market," she said.

Alicia stressed that she was drawn to her field because, "It's a field where everything hasn't been done. There are still possibilities in a field that's not completely controlled. Outside of space travel, nuclear fusion is a field I personally can make a contribution to."

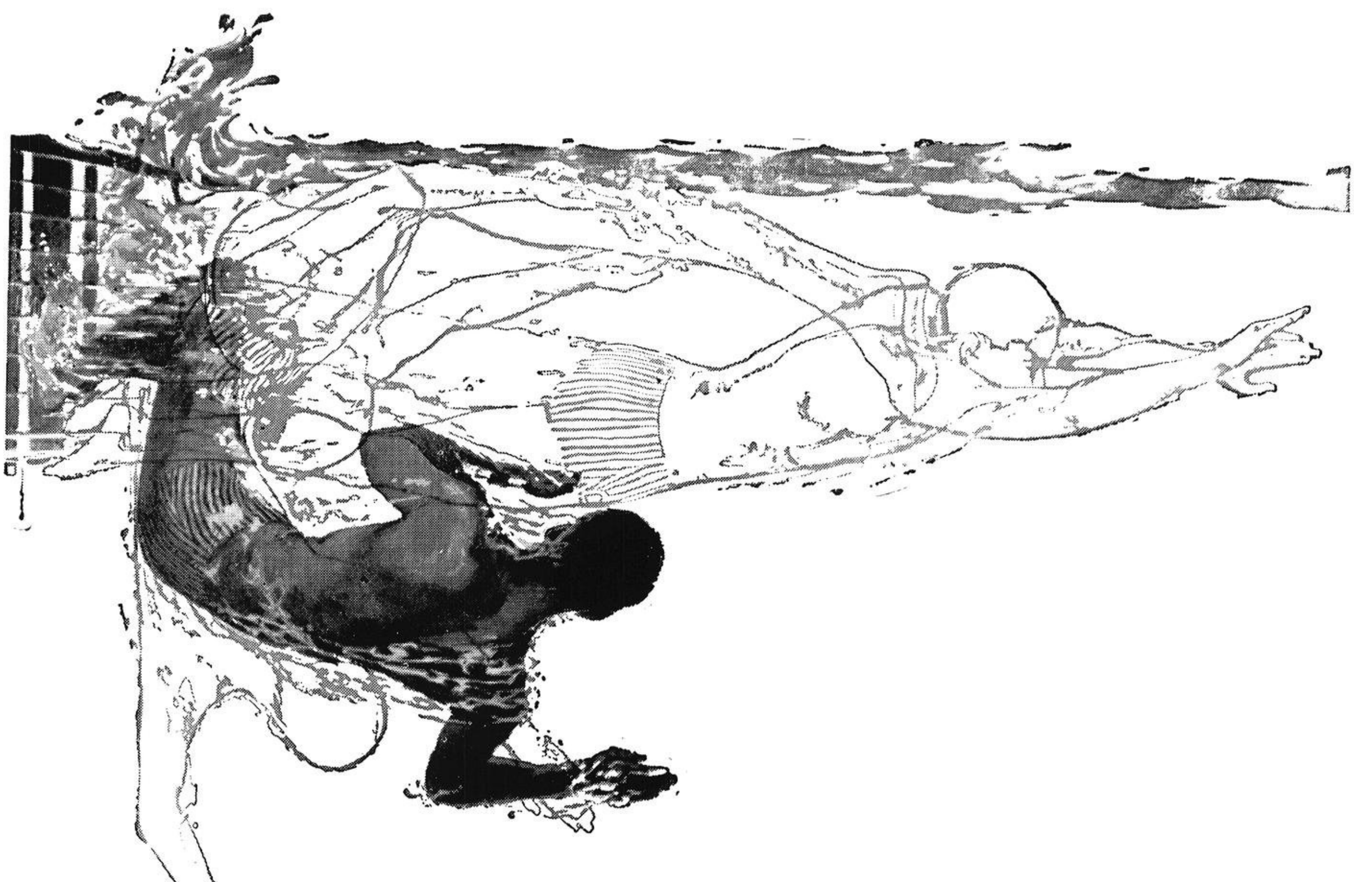
Jaclyn Horsfall orginally planned to be an English teacher. "But one day my father (a state civil engineer) said to me, 'Look kid. One half the drivers in the world are women, but all the road designers are men.' He wanted me to design roads with a 'woman's touch,' she recalled.



Jaclyn Horsfall, Civil and Environmental Engineering, Junior

"For a long time, I said 'no way,' but the more I thought about it, the better it looked," she said. She's now a junior in civil and environmental engineering.

The engineering field is looking better for everyone, with enrollment falling and employment opportunities rising throughout the country. With little discrimination and many chances for success and satisfaction, the biggest problem, as freshman Jean Fox sees it, is: "I just wish there were more women in engineering."



How good are you on the turns?

A strong stroke isn't enough to win in freestyle swimming.
Experts say: "Watch the turns."

"A champion won't touch with his hand," they tell us. "He begins his overhead tumble with a downward stab of his right arm, twists as his feet hit, then explodes forward with a powerful pushoff."

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